CHAPTER II

HISTORICAL RESUME
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Studies regarding pollution and pollutants specially in developing countries like India and other countries are going on with reference to the impact of the industrial effluents. Over the water environment has been main point of biological research throughout the entire world in the past fifty years. Human generated pollutants may be most important in urban and rural industrial areas. Many of the wastes of human disposals and industrial effluents are disposed off in the fresh water bodies like river, lake, ponds, pools and oceans. Reports are available which clearly indicate that the such pollutants have variously affected the ecobalance (Sprague, 1970; Larsson, 1975). The untreated industrial effluents reaching in the fresh water bodies have been reported for bringing about gross changes in the water quality. The change in water quality causes mass damage to fresh water fauna of the fishes (Goel and Maya, 1986; Venkteshwarlu, 1986).

Pollution of aquatic environment by untreated or treated industrial effluents both in acidic and alkaline medium with other pollutants like compounds, pesticides and heavy metals have contributed to fish mortality due to a change in pH of natural waters. Alkaline water with pH range between 8.0 to 9.5 has been found unfavourable for the growth of the aquatic organisms. Literature survey on the toxicity of heavy metals to fish revealed that the pH plays a vital role in modification to toxicity (Ray (1961); Betts and Wilson (1967); Sprague (1969); Bhattacharya et. al. (1975); Verma (1976); Fowler (1977); Whittle and Flood
(1977); Johnson and Julin (1980); Azad et. al. (1984); Ansari, et. al. (1986); Pandey and Narain (1989); Augustine and Diwan (1990); Gouda et. al. (1991); Singh and Srivastava (1996); Dhanpakiam and Ramsamy (2001); Tilak et. al. (2002); Singh and Mishra (2004); Verma and Singh (2011).

In India pollution of river waters takes place at various centres of industrialization and increased human population of big cities as Mumbai, Kolkata, Chennai, Kanpur, Delhi, Allahabad, Varanasi and other places where there is a large concentration of factories and mills. Industries like aluminium, steel and iron, textiles, chemicals, synthetics, pulp and paper, sugar, distillery, petrochemical, pesticides and large number of agricultural pesticides and insecticides, domestic wastes and sewage etc. discharge their high toxic wastes and effluent into the canals and rivers thus affecting the fish fauna Cope (1966); Banerjee (1967); Macek et. al. (1969); Agrawal (1976); Lone and Javaid (1976); Saxena and Bhatia (1983); Azad et. al. (1984); Bilgrami (1984); Kulshrestha and Arora (1984); Narayan and Sathyanesan (1987); Baskaran and Palavichamy (1990); Dalela et. al. (1990); Alone et. al. (2002); Bhodhe et. al. (2002) and Dubey et.al. (2008).

Various types of industrial pollutants present in the varieties of effluents are reported to cause serious damage, biochemical and physiological faults as well as fish diseases including mortality in aquatic habitats, pulp and paper mill effluents are considered as major sources of contamination to aquatic lives. Besides producing bad odour and taste in the receiving water, these effluents also cause ecological hazards like oxygen depletion. Pulp and paper mill effluents are reported to be very toxic for all types of aquatic
bodies. Fish populations are adversely affected by the suspended matters (Sprague and McLeese, 1968) in the effluent waste. The population dynamics of certain fishes like *Perca fluviatilis* inhabiting in swedish coast contaminated by pulp and paper mill effluents, revealed a significantly decreased larvae and fry abundance within the fish population (Karas *et. al.*, 1991).

The pulp and paper mill effluents are rich in organic constituents which cause fish mortality (Rogers *et. al.*, 1975), and are also reported to produce bad taste and odour problems in varieties of fish inhabiting in such polluted media (Thomas, 1973). Beside certain organic and inorganic materials like Terpenes cellulose fibres, lignin products, organic acids methanol, ethanol, methylmercaptans, methylethyl, ketone, acetone and inorganic materials like chlorides, phosphates sulphates, nitrates, calcium, sodium, hydrogen sulphide and disulphides (Davis, 1976; Fox, 1977; Mishra, 1992; Pandey, 2003) etc. are also present as the toxic constituents in paper mill effluents.

Fish toxicity in respect to industrial water pollution of river have attracted to several workers. Investigations pertaining to river water pollution are chiefly related to physico-chemical analysis of water planktons dynamics fish toxicity (mortality) and reproductive cycle and also fish diversity. The distillery effluents are rich in organic constituents and cause fish mortality and also produce bad and odour problems in varieties of fishes. Other types of toxicological changes in the fish are subjected to toxic constituents of industries effluents i.e. histopathological changes, bio-chemical disturbance in certain vital tissues (Alderdice and Brett (1957); Betts and Wilson (1967); Denilenko (1971); Campbell (1974);
Bhattacharya et. al. (1975); McLeay et. al. (1977); Zeitoun et. al. (1977); Kapoor et. al. (1978); Wedemeyer and Yasutake (1978); Singh and Singh (1980); Pierson et. al. (1981); Saxena et. al. (1982); Srivastava and Mishra (1982); Singh and Shahai (1984); Haniffo and Sunder vadanam (1984); Haider and Upadhyay (1986); Ansari et. al. (1986); Imura and Saito (1986); Shukla and Pandey (1986); Lal and Singh (1987); Singh and Singh (1987); Narain and Pandey (1988); Narain and Pandey (1989); Rao et. al. (1990); Ghose and Bhattacharya (1990); Harilal and Sahai (1990); Augustine and Diwan (1991); Mishra (1992); Kumar and Agrawal (1993); Singh (1995); Muley et. al. (1996); Khillarte (1996); Dhanpakiam and Ramsamy (2001); Dhage and Malva (2001); Pandey (2002); Mishra et. al. (2003); Pandey et. al. (2003); Ansari et. al. (2005); Tilak et. al. (2005); Pandey et. al. (2005); Bajpai (2009) and Singh and Mishra (2011).

Suspended solid present in the effluents also affected the fish fauna adversely by causing mechanical injuries to the fish gills and disturbed the osmotic regulation. This resulted into the suffocation even in the presence of adequate dissolved oxygen. High concentration of total dissolved solids lead to fish mortality by coagulating the gill mucus and thereby interfering with the respiratory metabolism. Kumar and Agrawal (1993), Mishra and Trivedi (1993), Chaturvedi and Agrawal (1993).

The other types of studies are related to pH, temperature, seasonal photoperiod, dissolved oxygen concentration and salt, alkali like factors of paper and distillery effluents affecting acute toxicity. Investigation on several toxic metals present in blood and muscles of certain species of fishes of river Sai and river Ganges
was carried out during post monsoon period at Raebareli by Singh and Srivastava (1996), Kanahere (1996) have also analysed the physico-chemical parameters of industrial effluents and their effects on water quality and biota of fresh water ecosystem. Joshi and Patil (1977) reported significant decline in total R.B.C. numbers and no change in total W.B.C. When *Rona cyananhyctis*, exposed to lethal and sublethal concentration of Cromium, Investigation pertaining to river pollution, plankton dynamics, fish toxicity and fish production have also been made by Namade and Srivastava (1997); Pandey and Patil (1997); Singh *et al.*, (1997) studied the effect of water pollution on *Channa gachua* inhabiting the lake Hussain sagar. The enzyme activity occurred in tissues like heart, gills, liver, ovary and testis, was found to be low in fish from polluted water when compared to that in the tissue of the control fish. Praveen and Srivastava (1997) analysed physico-chemical characteristics of distillery effluents for correlation and regression among various parameters. Singh (1995) observed fish mortality in river little Gandak near Captaininganj, Uttar Pradesh. He reported that the reason for the mortality of fish could be ascribed to depletion of oxygen and high contents of total ammonia with alkaline pH in the river water. This could be due to inflow of the sugar factory effluents containing high value of BOD, COD, total ammonia and alkaline pH. Barauch *et al.*, (1996) analysed water samples of river Jhagi from twelve different stations in three different seasons for heavy metals. The study revealed variation of metal content with time and space and their concentrations are found to be within WHO guidance value except iron. Saxena and Chauhan (1996) reported that the depletion of dissolved oxygen content in tap water and in effluent concentrations caused a stress
and altered the normal oxygen consumption. The condition of industrial effluents cause reduction in the oxygen content of water body in which most of the aquatic lives depend including the fish.

A detailed study on the age and growth of *Channa orientalis* from mudaslab stream of Vishakhapatanam in relation to slaughter house pollution has been under taken by Rai and Hymarthi (2001). Kumar and Gupta (2001) have reported the increase in use of pesticides which have introduced a new hazard to fish. Some of the compound can be dangerous if wrongly used. The clinically manifestation of pesticides poisoning in different species of fishes has been recorded.

Tiwari *et al.*, (2003) reported the physico-chemical characterization of distillery effluents. Physico-chemical characteristics of distillery effluent and its chemical treatment have been reported by Singh and Singh (2004). The effluent contained extremely high amounts of organic matter with dark colour and foul odour, when discharged untreated into water bodies. Singh and Mishra (2004) studied the influence of distillery and sewage effluents in relation to the physico-chemical nature of river Terhi and Parvati lake of district Gonda. The results revealed that the water quality is greatly polluted from the distillery effluents from Narang Distillery Ltd., Nawabganj, Gonda. The edible fishes are retarded to their growth by high percentage of pollutant and toxicant released from distillery.

The industrial effluents affects the mucous membrane, epithelial lining and the sub-mucosa of the stomach and the intestine undergo degeneration and rupture. The kidney of the
fishes showed rupture of the renal epithelium and collapse of the renal tubules (Devi (2004); Kumar and Sardhaman (2004); Maruthanayagam and Sharmila (2004); Shashikala and Moan (2004).

The liver being the main metabolic centre as well as detoxifying organ of body has proved to be most sensitive to environmental contaminants. Any fault in liver tissue can produce harmful effect in the whole body. The change in fish liver chemistry due to damage produced by environmental, contaminants and other pollutants have already been reported by different workers like Cope (1960); Dore et. al., (1975); Bhattacharya et. al., (1975); Lal et. al., (1986); Mandal and Kulshrestha (1990); Mishra (1992); Mishra et. al., (2003); Devi (2004) and Prasad et.al. (2007).

The concentration of total protein present in the blood, serum, liver, testis and ovary tissues was measured using the standard methods as described by Lowery et. al., (1951); Mishra and Patnaik (1974); Lone and Javaid (1976); Popove and Georgion (1971); McLeay (1977); Zeitoun et. al., (1977); Shukla and Pandey (1984); Shukla and Pandey (1986), there are various evidences of environmental contaminants producing an increase in the amount of glucose of fishes Wedemayer et. al., (1976); Dalela et. al., (1981); Mishra (1992); Mishra et. al., (2003); Bajpai (2009) and Tripathi (2010).

The low production of RNA bio-molecule would be invitable in the event of DNA reduction because as in the case of mammals, RNA synthesis in growing fish tissues also depends upon the amount of DNA template in the tissues Zeitoun et. al., (1977); Ahmad et. al., (1970); Mishra (1992) and Singh & Mishra (2011).

Cholesterol being a lipoid material is a major component of the cell wall of growing oocytes of fishes: Love (1980); Srivastava and Narayan (1985); Srivastava (1989) and Devi (2004).