CHAPTER - 6

CONCLUSION
6.1. **Conclusion:**

In the present work the toxic stress caused by acute and chronic exposure of Cadmium, Mercury and Copper has been observed. Selected parameters such as alteration in growth, behavioural changes, bioaccumulation and histopathological abnormalities in the Gill, Liver and Kidney of *Cyprinus carpio* and *Heteropneustes fossilis* have been studied.

Acute toxicity test demonstrated the effects in short period (4d) of exposure and chronic toxicity test concluded the effect for relatively longer period of time. By acute toxicity test it is concluded that increase in the mortality of fish is observed by increasing the concentration and increasing the time period. Higher LC50 value show that metal is less toxic because great concentration is required for 50% mortality of the organism. In the present study it has been observed that Mercury is highly toxic than Cadmium for *Cyprinus carpio* and Copper is least toxic for *Heteropneustes fossilis* because the LC 50 value of Copper is higher than Mercury and Cadmium. By increasing the time period the value of LC 50 was found to be always decreasing. The LC50 value is highest at 24h and lowest at 96h.
Heavy metals directly influence the behaviour of the fish by impairing neurological functions. Metal influence neurotransmitter production and the alteration of metabolic processes. Lethargy and loss of equilibrium which has been observed, may due to depletion of energy in the body of animal. The impairment of carbohydrate metabolism in heavy metal exposed fish has been reported by several workers. Donaldson and Dye (1975) reported the release of corticosteroid hormone in Sockeyes salmon when treated with Copper. Behavioural changes in fish C.carpio and H.fossilis for three metals have the same pattern of effect. The lowest concentration of metal Cadmium, Mercury and Copper can not cause any significant change in behaviour. In second higher concentration of metal treatment increased swimming activity has been observed with higher breathing rate and more higher concentration of metals caused lethargy and loss of equilibrium.

Growth fluctuation in animal is due to disturbances of body functions and disturbance of body's metabolic path way. Present study was conducted to investigate the growth abnormality in fish C.carpio (Linn.) exposed to Cadmium and Mercury and H.fossilis (Bloch) on exposure to Copper treatment. It was noticed that fish growth rate reduced by increasing the
concentration of metal. It is evident from the observations that the change in growth of fish *C. carpio* and *H. fossilis* due to all heavy metals have the same pattern of effect. In comparison to control fish metal exposed fish show slow growth rate. In higher concentration of metals *C. carpio* and *H. fossilis* fishes show negative growth.

Changes in histological structure in specific vital organs due to exposure of sub lethal concentration of metal in various fishes have been reported by several workers. Gills are the primary respiratory organs of fish. The gill epithelium of the fish is major site of gaseous exchange, acid base balance, ionic regulation and excretion of nitrogenous waste. Gills are the primary target organs for water born toxicant such as heavy metals. Liver plays major role in metabolism of excretion, digestion and storage of various substances including metal substance of fish. An investigation on the effect of heavy metals Cadmium, Mercury and Copper on gill, liver and kidney of *C. carpio* and *H. fossilis* was carried out in the laboratory. The result show that degree of distortion of gill, liver and kidney was proportionate to exposure period and concentration of metal and that is it was dose and time dependent.
Heavy metals enter and accumulate in the body tissue faster than body detoxification pathway and gradual build up accumulation of these toxic metals occurs. It has been observed that accumulation of metals varies in various tissue of fish.

6.2 **Further scope of research:**

The present investigations suggest that:

1. Combination of metal may be taken to study the toxic effect of mixture of metals on fish.

2. Other metals and other economically important species of fish may be taken to study the toxicity of metals on fish.

3. Further study may be undertaken to assess the toxic effect of metal on fish at molecular level (alteration of gene).

4. Eggs and larval stage of fish may be used as test organism to ascertain the toxic effect of metal on early life stages of fish.

5. Effect of metal on physiology of blood serum may be studied because blood is a good physiological indicator.

6. Further work may be undertaken to study the effect of metal on endocrine glands and hormones of fish.
7. Heavy metals tend to reach the aquatic medium from their sources and further take their way to human being through the aquatic life. Some experiments have been arranged to check the passage of the heavy metals to reach the human body and the removal of metal in aquatic medium, which may be taken up for further research.