CHAPTER VIII

SUMMARY AND CONCLUSIONS
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The normal ecological conditions existing in an water body are disturbed under anthropic influences which not only modifies the physico-chemical qualities but also alters the biological composition. In general chemical analysis has been largely used to evaluate the quality of water body and to assess its trophic status.

Most tropical rivers present strong periodical fluctuation in water levels. They have large flood plains where small lake-like water bodies associated with the main river occur. The periodical floods determine the alternating presence of aquatic and terrestrial stages during which the aquatic system is reduced or completely disappears until the next rainy season.

In the present study the data on a detailed analysis of water, sediment, phytoplankton, zooplankton, macrobenthos, macrophytic vegetation of river Cauvery is presented. Of the hydrochemical characteristics greater fluctuation was seen in the levels of dissolved oxygen, organic matter, alkalinity, sulphates, nitrates, sodium, calcium and magensium. The variation was both seasonal and spontaneous. The spontaneous alterations were due to "One off" pollution, floods and addition of allochthonous materials. Accordingly there occurred changes in the biotic composition.
The range of variation in soil physico-chemical factors was not as wide as water component. In both the cases, higher values for several parameters observed during second year. The concentration of heavy metals in the sediment also showed narrow range of fluctuation, higher concentration of heavy metals were noticed at Balamuri, Talakadu and Kanakapura sangama. A comparison of the data on the heavy metal concentration of Cauvery with other river systems of India revealed some interesting observations.

Of the four plants investigated their Hydrilla verticillata appeared to be efficient accumulator of several metals. The higher concentration of metals at some sites is attributable to the sessional partial decomposition of rocks situated on the bank of the river and the associated drainage from the rocky substratum. Besides large scale contamination of water by biogenous components was responsible for elevated concentration of zinc and lead.

The macrophytic vegetation of several major river systems of India have not been well studied. A detailed study undertaken here by the use of methods described by Haslam (1978) has not only provided valuable information on the composition of macrophytic vegetation but also have confirmed that the method can suitably be adapted in respect of tropical rivers. This method involves the estimation of damage rating based on the observed values of species
diversity, decrease in diversity, decrease in cover, quantum of pollution tolerant species, physical damage etc.

The commonly observed width in the river is 4-8 m. The floating plants although removed completely during flood season, reappeared during post monsoon season with the concomitant decrease in the level of water. This process of disappearance and appearance of floating macrophytes is regarded as a cyclic process. In places with medium water flow and grainy substratum *Apium nodiflorum* and *Berula erecta* dominated. *Hydrilla verticillata* and *Ceratophyllum demersum* were found to be easily eroded forms while *Potamogeton pectinatus* was indifferent to erosion. *Eichhornia crassipes* was observed only at Bannur, experiencing large scale contamination with agricultural and domestic wastes. *Vallisneria spiralis*, *Chara vulgaris*, *Ottelia alismoides* and *Ceratophyllum demersum* have been considered as species that prefer unpolluted sites while *Arundo donax*, *Carex acutiformis*, *Eleocharis* sp., *Scirpus lacustris*, *Polygonum amphibium* and *Rabdia* sp. showed preference towards polluted sites.

The trophic status of water body of river has been studied and accordingly different stations with different saprobic degrees viz., dystrophic, semi-oligotrophic, mesotrophic and semi-eutrophic zones were evident. The
sparse, abundant and less abundant plants encountered at these sites have been listed. Species of Potamogeton namely Potamogeton crispus, Potamogeton perforatus, Potamogeton gramineus in addition to Crinum defixum, Typha latifolia, Veronica beccabunga, Veronica analgalis aquaticus preferred meso-saprobic conditions. Vallisneria spiralis, a gregarious species in the upstream of river up to T. Narasipura almost disappeared from Talakadu onwards. The other plants like Potamogeton crispus, Ceratophyllum demersum, Hydrilla verticillata, Chara vulgaris and Azolla sp. exhibited differential distribution.

Yellowing of plants was observed at sites exposed to pollutants. The deposition of silt on the macrophytes had devastating effect not only on photosynthetic production but also was responsible for dynamic changes in the density of zooplankton and macrobenthos. The zooplankton preferred the leaves having silt and occasional flooding and or heavy flow resulted in the dislodging of zooplankton and macrobenthos present on the leaf. Generally, the density of phytoplankton was more at sites supporting an abundance of macrophytes and ninety per cent of the total plankton was found associated on Vallisneria spiralis. Species of Oscillatoria and Lyngbya dominated the plankton.

At Balamuri with rich algal diversity zooplankton were also abundant. The density of zooplankton was higher at
Sreenivasakshethra receiving industrial effluents and, at Bannur having extensive mat of *Eichhornia crassipes*. The zooplankton density was generally more during summer when the grazing pressure was minimum.

Rotifers were the second dominant group of zooplankton at all the stations. Their density was more at Sathyagala, Bannur, T. Narasipura and Talakadu. Maximum species diversity was observed during post-monsoon and summer season. The perennial species were *Keratella tropica*, *Monostyla tunaris*, *Lepadella patella*, *Colurella bicuspidata* etc. Rotifers tolerated wide range of carbonate and bicarbonate alkalinity. Generally the density of rotifers was more than the crustaceae and inverse relationship between the two was also evident.

*Cyclops* species constituted the primary crustacean group. The Copepods were present at all the stations except Sreenivasakshethra. The density of nauplii larvae and *Cyclops* remained linearly related at many stations. The dominant crustacea were *Cyclops strennus*, *Cyprid opthalmica*, *Daphnia pulex* and *Diaptomus* species. Generally Crustacea were abundant during summer and their density correlated with pH, magnesium, potassium and total phosphates. Cauvery water supported an abundance of Copepods than *Daphnia*. 
The macro-invertebrates were found associated with \textit{Vallisneria spiralis}, \textit{Potamogeton crispus}, \textit{Chara vulgaris}, \textit{Ceratophyllum demersum} and \textit{Hydrilla verticillata}. The distribution of several macro-invertebrates was species specific. The predominant insects included species of \textit{Enalagme}, \textit{Tubifex}, \textit{Corenoneura}, \textit{Tanypus} etc. \textit{Rabdolaimus aquaticus} and \textit{Rabdolaimus axei} were common to all the stations and occurred in abundance at polluted sites. The molluscs were abundant at sites rich in aquatic macrophytes. Among macro-invertebrates, Chironomids and Tubifids were most tolerant to pollutants.