Chapter 1

General Introduction
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Natural waters are extremely varied in chemical composition and factors controlling the composition include physical, chemical and biological processes. Rivers are the most important water resource. Unfortunately, the rivers are being polluted by indiscriminate discharge of sewage, industrial wastes and toxic wastes generated by other human activities. The rivers are always the victims of the negative impacts of urbanization. Most water bodies become contaminated due to incorporation of untreated solid and liquid waste.

In recent years with unprecedented population growth and intensive agriculture, ground and surface waters are being exploited on increasing scales all over the country and water quality and safety have become major issues in public health. In India, river waters are mainly used to meet potable water needs of urban population and a number of studies on physico-chemical and biological quality of these waters have been extensively carried out (Busulu et al., 1967; Chakrabarty et al., 1977; Adwant, 1989; Khatavkar and Trivedi, 1992; Joshi and Bisht, 1993 and Gill et al., 1993).

Comparative account of water quality of Tapi and Aner rivers (North Maharashtra) was given by Lohar and Patel (1998). Meiti et al. (2004) have studied the water quality of Purna River, Maharashtra. River Godavari, considered to be the Ganges of south originates at Maharashtra and enters Andhra Pradesh near Kandakurthi village in Nizarmabad District of Andhra Pradesh.

Limnological studies of lotic waters in Jammu and Kashmir have received the attention of Malhotra et al. (1991), and Dutta et al. (2001). The river Basantar, an important tributary of river Ravi, originates near Kharai Dhar at an altitude of 1300 m and flows from southern slopes of Bani. The Catchment area is 630 sq km with maximum discharge during rainy season. River Tavi rises in the middle Himalayas, below Seoj Dhar Peak at Kalikund has a large number of tributaries, both torrential and sluggish, joining at various places along its length some of these tributaries
support a diversified fish fauna and are important breeding and feeding, grounds for migratory fishes (Dutta et al., 2001).

**Importance of zooplankton:**

The zooplankton occupies a central position between the autotroph and other heterotroph and form an important link in the food web of a freshwater ecosystem. The occurrence and abundance of zooplankton depends on its productivity, which in turn is influenced by physico-chemical parameters and the level of nutrients in the water controlling the phytoplankton productivity. The zooplankton of freshwater habitats in general belongs to four main taxonomic groups, namely Rotifera, Cladocera, Copepoda and Ostracoda.

The zooplankton which play a role of converting the phytoplankton into food, suitable for fish and aquatic animal, have assumed importance in fishery research also. The zooplankton can play an important role in indicating the presence or absence of certain species of fishes or in determining the population densities. Various ecological aspects of zooplankton have been a subject of study in India by several workers (Saxena and Sharma, 1981; Haque et al., 1988; Ansari, 1993; Somashekar et al., 1994; Pule, 2000; Narsimha Rao and Jaya Raju, 2001; Pawar et al., 2003, Prasad, 2003; Lendhe and Yeragi, 2004 and Somani and Pejavar, 2004).

Zooplankton has been used as an indicator for monitoring the water quality, trophic status and pollution level. The temperature, dissolved oxygen and organic matter have influence on zooplankton community structure. The literature on zooplankton and biological indicators of water quality have been reviewed by many workers, such as Sampath et al., 1979, Mahajan (1981), Khan and Seshagiri Rao (1981). These studies have pointed out that the rotifer species are capable of indicating pollutional status of the water bodies.

Rotifer populations are very useful in indicating the water quality, particularly in pollution studies (Sladecek, 1983). According to Radwan (1980), nanoplankton biomass exerts direct effect on rotifer's fertility, while algal toxicity inhibits their fecundity. Pejler (1957) showed that there is no direct effect of pH on rotifer population. Edmondson (1965) and Baker (1979) observed that the high rotifer
population in winter could be attributed with favourable temperature and availability of abundant food in the form of bacteria, nanoplankton and suspended detritus.

The zooplankton community constitutes an important component of aquatic ecosystem and many species are suitable as live feed in aquaculture. The Copepoda and Cladocera are the dominant groups of crustacean found in freshwater habitats. Rotifers are the smallest metazoans of which over 2000 species have been described, 90% of which inhabit freshwater habitats (Shiel, 1995). Among rotifers, *Brachionus calyciflorus* and *Brachionus rubens* are the most commonly cultured rotifers in freshwater mass cultures. They tolerate temperatures between 15°C and 31°C.

Development of mass production of live feed offers immense scope for large scale larval rearing and can run concurrently with other aquaculture programmes (Bryant and Matty, 1980; Watanabe et al., 1978 and Jana and Chakrabarty, 1991). The success of any hatchery system (shell fish or fin fish) entirely depends on the availability of suitable live feed organisms. Depending on the size of larvae, either shell fish or fin fish and the level of attainment of development of their digestive system at the initiation of exogenous feeding, the choice of live feed remains an essential prerequisite for many fish species. Success in culturing planktivorous fish fry totally depends on the zooplankton and their composition and density (Diraviaraj, 1998).

Experiments conducted by many investigators proved the worth of copepods as live feed organisms for a variety of larvae of commercially important species (Ovie et al, 1993; Paulraj and Altaff, 1999; Zehra, 2000; Sujatha, 2000 and Ashok Prabu et al., 2004). The role of copepod as live feed is gaining more and more importance due to the scarcity of *Artemia* cysts. The differently sized larval forms can be used as live feed to the different economically important cultivable organisms such as oysters, shrimps, prawns, and fishes.

The river Kaveri is perennial and runs through Karnataka and Tamil Nadu states (800 km). The river becomes widest when it enters Tiruchirappalli as a fifth stream order because of the confluence of two tributaries namely the Noyyal river and Amaravathi river near Karur. The river traverses the city a distance of 32 km from Upper Anicut to Grand Anicut. During its urban penetration the river is contaminated by the discharge of urban sewage, industrial effluents, agricultural drains and several
non-point source of pollution. Therefore it is considered worthwhile to undertake investigations to probe the impact of urban discharges on the physico-chemical properties of the water and on zooplankton diversity. For the present study three stations were chosen in the urban stretch of river Kaveri namely Upper Anicut (S1), Cinthamani road bridge (S2) and Grand Anicut (S3) for assessing impact of urban discharges on water quality as well as on zooplankton community. The study of zooplankton diversity in this riverine system also leads to screening of candidate species among copepods for live feed culture.

The primary objectives of the present study are:

1. To survey the hydrological parameters in the three selected station of river Kaveri.
2. To make a qualitative and quantitative study of zooplankton.
3. To study the systematics of zooplankton.
4. To evaluate the impact of urban discharges on the zooplankton diversity and ecological indices and to identify pollution indicator species.
5. To identify the candidate species, among the copepods for live feed culture by undertaking the investigation of reproductive biology of selected copepod species, in order to explore the mass culture potential of these species and to promote aqua hatcheries.