CHAPTER 1. GENERAL INTRODUCTION

Despite water being the largest medium on earth’s surface, water purity and potability for life sustenance is severely being challenged since the inception of industrial revolution and introduction of other sources of biological contamination. A recent estimate by World Health Organisation reports that about 1.1 billion people drink unsafe water and associated poor sanitation was the sole reason for 88% of the diarrhoeal diseases globally (WHO, 2007). Technological advances have made it possible to make water readily available for human consumption as part of bottled water civilization. But at the same time, it is well known that the vital role of water never ends merely with potable usage for human beings, since water is the primary source of carving molecules of life and their continuity in time and space on the blue planet.

An aquatic ecosystem in its natural form, lentic or lotic, freshwater or marine, has its own important role in sustaining and regulating the life of man, animals, plants and microorganisms. With the commencement of hydrological cycle on earth, water started its run all over earth and played the most crucial role for survival of freshwater and terrestrial life. Since then, the tempo of evolution seemed amazing in all its possible ways of occurrence giving rise to enormous and diverse species on earth. Purity and quality of water was vital for all these phenomena. Human civilizations were established in “recent” epoch on the banks of major rivers and related ecosystems.

Rivers are not only important links in the hydrological cycle but also ecosystems that use and release biological reactive elements. They are shaped by environmental factors that control essentially all aspects of the rivers physical appearance, vary from place to place and can be organized hierarchically according to special scale (Snelder and Biggs, 2002; Wiens, 2002). The river ecosystems include its hydrology, diversity of channel and habitat types, solutes, sediments and biota. Rivers, the immediate source of freshwater for the common man
play pivotal roles in water cycle, nutrient cycle, purification of water, recreation, maintaining
the delicate balance of aquatic food chain and control of infectious organisms (Allan et. al., 2005). Human societies extract great quantities of water from rivers, lakes, wetlands and underground aquifers to meet agricultural, municipal and industrial demands. But their impact on rivers and other surface waters is staggering (Postel and Richter, 2003; Meitei et. al., 2004). Unfortunately, existing and projected future increases in water demand are leading to intensifying conflicts between these human uses. Therefore conservation and management of functioning riverine ecosystems becomes a global challenging issue.

Kerala, one of the most tranquil states of India, located at the extreme southwest of Indian peninsula has 44 rivers of which 41 are west flowing and 3 east flowing. The rivers originating from Western Ghats and flowing through Kerala are considered as hotspots of freshwater biodiversity. Freshwater biodiversity is very important with tremendous economic, social and environmental impacts as they provide human species with nutrient rich food, water and other resources (Schuyt and Brander, 2004; MEA, 2005; Neiland and Bene, 2008). Rich biodiversity is an indication of the health of a particular habitat and its potential to sustain life. But the freshwater biodiversity of Kerala is not well documented and the role of possible biodiversity loss is not yet quantified (Biju, 2004). Most river systems of Kerala are not frequently monitored for assessing current ecological status or surveying the major component of its biodiversity.

Achencovil River is one of the major rivers of Kerala. It originates from the Achencovil mount of Western Ghats. The river flows through three districts of Kerala – Kollam, Pathanamthitta and Alappuzha. The longest segment of this river flows through Pathanamthitta and Alappuzha districts; both are densely populated and the river is depended for various domestic and agricultural purposes. The recent trends of agricultural practices, especially in paddy fields on the river bank, pose severe problems to the potability of water.
Achencovil River is comparatively less polluted from large industries. But at the same time, small-scale factories situated near the banks of river at several segments were found discharging large quantities of polluted water into this river which of course has a deleterious effect on the diversity of biota. Studies on pollution of water had always been dealt with respect to the impacts on public health and hence discharge of industrial wastes has to be monitored frequently (Whitten 1975; Macdonald et. al., 1991). Physico-chemical analysis of water quality provides sensitive and specific information on a particular spatial unit during the time of sampling (Roy et. al., 2003; Duran and Suicmez, 2007). But at the same time, out of thousands of toxic chemicals that may be discharged to surface waters, only a few chemicals are routinely selected for analysis in traditional monitoring. Concentrations of pollutants also vary radically with time. If a pollutant is discharged into a river, it is chemically detectable over a very short period of time, but its effects may last for many months. In this context, living organisms are best able to indicate the synergistic effects of two or more pollutants acting together (Norris and Thomas, 1999; Walsh et. al., 2005). Such an assessment of health of an ecosystem is called biomonitoring, which is a type of applied ecology. The primary goal of biomonitoring is to use organisms living within natural communities to monitor the impact of disturbance and to utilise this knowledge in the management of the ecological system (Resh and Jackson, 1993; Kay et. al., 1999; Smith et. al., 1999). Standard physico-chemical analysis cannot completely be substituted by biomonitoring procedures alone, but both can be conducted in conjunction for a comprehensive evaluation of perturbation in freshwater ecosystems.

Biomonitoring of river Achencovil using entomological indicators and an ecosystem threat assessment has not been worked out so far in any of the known studies. The present study is an attempt to fill the gap in the knowledge of biomonitoring of river Achencovil with following objectives:
Objectives

1. To assess the physico-chemical parameters of river Achencovil,

2. To determine the intensity of agrochemicals and heavy metals in the river,

3. To quantify the pollution intensity of river using aquatic insects and indicator bacteria &

4. To conduct an ecosystem threat assessment of the river.