M.S.69. PRADEEP, R.–Studies on Bacterial Indicators and Pathogen in Cochin Backwater–1987– Dr. P. Lakshmana Perumal Swamy

During recent years the use of marine and estuarine ecosystem for the disposal of sanitary and industrial wastes has increased greatly. Due to overloading the self purification power of the sea, these aquatic ocosystems are getting eutrophied giving ample chances for the survival and growth of sewage borne microorganisms. In tropical situations, the range of hazard is wide including infections arising directly from water contact or from consuming uncooked or undercooked sea foods.

The range of presence of bacterial indicator organisms in an aquatic environment determines the extent of sewage pollution and portrays the suitability of the environment for recreational or fishing activities. Studies on bacterial indicators in Cochin backwater are scanty and information on the seafood borne pathogen *Vibrio parahaemolyticus* in the above environment are rare. The present investigation was carried out to determine the extent of faecal indicator bacteria and *Vibrio parahaemolyticus* simultaneously in this backwater system. The main objectives of the study was to findout whether there exists any significant relationship among bacterial indicators and *V. parahaemolyticus*. Further, influence of various environmental parameters on these indicators and pathogen, and some experimental studies on *V. parahaemolyticus* were also in view.

The thesis contains six chapters. First chapter forms the introduction covering

preface, review of literature and objectives of the present study. Chapters, two and three describes the ecology of faecal indicator bacteria and *V. parahaemoloyticus* respectively. Experimental studies on selected *V. parahaemolyticus* isolates were discussed in fourth chapter. In chapter five a general discussion bringing information on seasonal variations of bacterial indicators and *V. parahaemolyticus* collectively were presented. The entire work is summarised in sixth chapter bringing salient findings. Apart from these, references and list of publications are also included.

In the preface section the role of bacterial indicators in sanitary evaluation of environment is presented. Review of literature covers the evolution of coliforms, *Escherichiacoli*, streptococci and *Vibrio* spp. as indicators of pollution through chronological corridors. This chapter also includes relevant works done on *V. parahaemolyticus* in India and abroad. The major objectives in undertaking this work were 1) to monitor the population dynamics of bacterial indicators (total coliforms, faecal coliforms, *E. coli* and faecal strepatococci), *V. parahaemolyticus* and allied organisms, in water, sediment, zooplankton, fish and prawn collected from Cochin backwater, 2) to ascertain the influence of hydrobiological parameters on the seasonal distribution of these indicators and pathogen, 3) to findout whether there exists any significant relations between these indicators and pathogen in their distribution pattern, 4) to characterize *V. parahaemolyticus* isolated from this ecosystem along with reference cultures, 5) to findout the influence of varying temperature, pH and NaCl concentration (individually and collectively) on growth of selected *V. parahaemolyticus* isolates and 6) to determine the sensitivity/resistance pattern of *V. parahaemolyticus* to various antibiotics and heavy metals.

In the second chapter, details of sampling stations, collection of samples, estimation of physico-chemical parameters, preparation of samples and enumeration of faecal indicator bacteria and their results are presented. The data show that faecal contamination in Cochin backwater has crossed the permissible limits. Faecal index in fish and prawn exhibit that there is high risk of enteric disease outbreaks in consuming them. Monsoon rains influenced the distribution of bacterial indicators in water and sediment.

In chapter three ecology of *V. parahaemolyticus* and allied organisms in this backwater are presented. Enumeration of *V. parahaemolyticus* and allied organisms, their seasonal variations and influence of hydrobiological parameters on them are detailed in this chapter. In spite of occassional disappearance from few samples *V. parahaemolyticus* were consistently present in all samples throughout the study period. This warrants strict precautionary measures in preparation and processing of sea foods. Distribution of this pathogen in water and sediment were influenced by salinity and pH while in fish and prawn they were independent of environmental parameters. Zooplankton blooms influenced distribution of *V. parahaemolyticus* in them. No definite significant correlations were found between bacterial indicators and *V. parahaemolyticus*. However in sediment samples at station 1 *V. parahaemolyticus* showed significant negative correlations with FC, EC (P < 0.01) and FS (P < 0.05).

Fourth chapter is fully devoted to experimental studies done on *V. parahaemolyticus* isolates. In the first section of this chapter characterization experiments done on *V. parahaemolyticus* were presented. 120 isolates were subjected to about 85 tests which included various morphological, cultural and

biochemical characters. Isolates from Cochin backwater were similar to those from Japan and U.S.A in more than 94% of the characters. In the second section two isolates of *V. parahaemolyticus* were tested for growth at various temperatures (5 – 45°C), pH (5–9) and NaCl concentrations (0.05–8%). An alkaline pH with salinities from 2–4% and temperature 20–40°C are found to be most favourable for growth of *V. parahaemolyticus*. These conditions are prevalent in Cochin backwater. In the third section selected *V. parahaemolyticus* isolates were tested for sensitivity to various antibiotics and heavy metals. Gentamycin and chloramphenicol are found to be the antibiotics of choice in controlling *V. parahaemolyticus*. High concentrations of metals like lead, molybdenum, zinc, iron and copper were tolerated by this bacterium. Each of these sections contained materials and methods, results and discussions separately.

In the fifth chapter a general discussion is brought in. This includes various interrelated aspects influencing the ecology of bacterial indicators and *V. parahaemolyticus* in this ecosystem. It also highlights the results of the experimental studies in relation to the ecological conditions prevailing in this ecosystem. Importance of this work from the view of public health and sea food industry are emphasised.

Sixth chapter summarises the objectives, salient findings and conclusions in a lucid manner.