M.S.103. ARUN SHIVNATH NINAWE–Studies on Certain Nitrogen Cycle Bacteria in the Prawn Culture Fields of Kerala–1988–Dr. R. Paul Raj.

In the South-West Coast of India an extensive type of prawn culture operation is being practised in certain paddy fields, known as "Pokkali fields" found in the vicinity of Cochin Backwaters, and high rates of prawn yield have been reported from this culture system without any artificial nutrients enrichment or supplemental feeding. The high natural productivity of these fields may be the probable reason for such high yields. The productivity of these brackish water ponds, however, depends to a greater extent on the physico-chemical properties of water and sediments, particularly the availability of nutrients, such as nitrogen and phosphorus. Moreover, marked changes in the salinity of the water occurring during the different seasons are likely to bring about profound influence on the bacteria associated with the biogeochemical transformation of nutrients. However, there has not been any concerted attempt to study the bacteria involved in the turnover of nutrients in these prawn culture systems. The present investigation was undertaken to study the ecology of certain groups of bacteria involved in the nitrogen cycle in selected perennial and seasonal prawn culture fields.

The investigation was carried out during 1982–1985, at Narakkal (76° 14'E longitude and 10°0.3'N latitude), a fishing hamlet in the Vypeen Island, about 15 km North-West of Cochin on the South-West Coast of India. Four ponds were selected for the study: two of which are perennial prawn culture systems located within the premises of the prawn culture laboratory of the Central Marine Fisheries Research Institute, and the other two are seasonal prawn culture fields, where prawns and paddy are cultivated during the intermonsoon (October to May) and monsoon periods (June-September) respectively.

Water and sediment samples were collected fortnightly from four fixed sites from each pond for enumeration of the nitrogen cycle bacteria and for monitoring the environmental parameters. Sampels collected from the four sites of the same pond were pooled, throughly mixed, and representative sampels were taken. Water samples for bacteriological studies were collected aseptically in sterilized BOD bottles of 300 ml capacity. Sediment samples were collected with a impact corer (100 cm x 4 cm diameter) made of perspex material. Sediment from the upper layer of 10 cm was aseptically removed with a sterile spatula and collected in sterilized glass bottles.

Enumeration of bacterial groups involved in the nitrogen cycle, such as aerobic total heterotrophs, proteolytic, ammonifying, nitrifying (ammonia-oxidzers), denitrifying and nitrogen fixing bacteria, were carried out for two years using standard microbiological methods with a view to studying the seasonal variations in their abundance.

Environmental parameters such as temperature, pH, Eh, salinity, nitrite, nitrate, ammonia, dissolved oxygen, organic carbon, total nitrogen and total phosphorus were regularly monitored from all the ponds to study their effect on the distribution and abundance of the selected bacterial groups in water and sediment.

Studies were also carried out on the *in situ* bacterial nitrogen fixation rate, fortnightly, using micro-kjeldhal method, and the effect of environmental factors on nitrogen fixation was computed.

Data were analysed to find out if there were any differences in the bacterial population and nitrogen fixation rates among the ponds, between the seasons, and also between the water and sediment in each of the ponds.

Linear multiple regression analysis of the data was carried out to determine the influence of the various environmental factors on the distribution of each of the bacterial groups, as well as on the aerobic bacterial nitrogen fixation rates in the water and sediment in the ponds.

Thirty nitrogen fixing *Azotobacter* strains isolated from water and sediments were identified based on their morphological, physiological and biochemical characteristics. Experimental studies were made to elucidate the effect of salinity on the growth and nitrogen fixing ability and thirty isolated strains of *Azotobacter* in the laboratory. The optimum salinity required for maximum growth of each of the strains was determined. Effect of incubation time on nitrogen fixing ability of the thirty strains of *Azotobacter* was also studied by sampling on the 15th, 30th and 45th days of incubation.

Experimental studies were also carried out on nine selected *Azotobacter* strains (*Axotobacter chroococcum*- 3 strains; *A. vinelandii* - 3 strains; *A. beijerinckia* to evaluate the effect of pH, certain vitamins (cyanocobalamine, biotin, ascorbic acid and thiamine) and trace elements (cobalt -$CoCl_2 6H_2O$; copper - $CuSO_4$ $5H_2O$;zinc-$ZnSO_4$ $7H_20$ and iron-$FeCl_3$) on the growth of the strains.