B. SUMMARY

Title	:	Physico-chemical factors influencing the spread of white spot disease in *Penaeus monodon* cultured in the North-Western province, Sri Lanka.
Research Institute		University of Kelaniya
Chief scientific investigator	:	Dr. (Mrs.) Mangalika Hettiarachchi
Period of Contract	:	From 15th January 1997 – 31st May 2000

Scientific Background and Scope/ Objectives of Project

"White Spot Disease" caused by Systemic Ectodermal and Mesodermal Baculo Virus (SEMBV) has affected the export oriented shrimp farming industry in Sri Lanka since 1996 causing heavy mortalities of cultured shrimp, *Penaeus monodon*. Repeated occurrence of this disease is a severe threat to the shrimp farming industry in Sri Lanka. The present study was conducted to determine farm level risk factors triggering the occurrence of the white spot disease in cultured *P. monodon* in the North-Western Province, and to find out whether there are other identifiable disease signs prior to noticing the white spots on the cuticle of affected shrimp which follow mass mortality.

Experimental methods

Retrospective and prospective studies on natural disease outbreaks were carried out to investigate the farm level risk factors associated with the occurrence of white spot disease in *P. monodon* cultured in the North-Western province. Information on disease occurrence and management activities was gathered from shrimp farms (retrospective study). Three farms were selected and physico-chemical parameters of pond water were monitored on the day of stocking and subsequently once a week over three production cycles (prospective study). Diurnal changes of some physico-chemical parameters of pond water were monitored during the third production cycle. Occurrence of white spot disease was monitored by gross clinical signs and histopathology. External parasitic and bacterial (*Vibrio*) infections were also monitored. Risk factors associated with the occurrence of the disease were determined using appropriate statistical tests.

Results obtained

Seventy five percent of the farms visited had been affected by white spot disease and the disease had recurred in 31%. Risk of white spot disease occurrence was significantly higher in the farms having Chilaw estuary or Dutch canal (Daduruoya to Pullichakulama) and Mioya estuary as their water source where as the risk was significantly low in the farms situated in the hypersaline areas. Risk of occurrence of the disease was higher in juvenile shrimp less than 60 days old, weighing less than 15 g and in the farms that had pumped water directly from the water source without storing.

Low temperature, dissolved oxygen, chlorophyll-a content, salinity and high visibility of pond water showed significant positive associations with the occurrence of white spot disease. Salinity level of pond water less than 20 g l^{-1} during the production cycle was a highly significant factor associated with the occurrence of white spot disease. The study revealed that the presence of viral inclusion bodies in the nuclei of ectodermic and mesodermic tissues of affected shrimp was a consistently prominent feature of SEMBV infection that develop prior to the appearance of white spots on the cuticle. Appearance of external signs and occurrence of mortality were significantly rapid in shrimp challenged with the virus under sub optimal salinity and hardness conditions compared to shrimp challenged under optimal conditions.

Conclusions

Location of the water source, young stages of shrimp, direct use of water, high visibility, low salinity, temperature and dissolved oxygen levels of pond water are significant risk factors that would trigger the occurrence of white spot disease in farms. Low salinity (< 20 g l^{-1}) in pond water was the most highly significant risk factor. Storage of water for a few days before using in grow out ponds, maintenance of dissolved oxygen, temperature and hardness of pond water at desirable ranges while maintaining the visibility and salinity at 30 – 40 cm and 20 – 30 g l^{-1} respectively would minimize the risk of occurrence of disease outbreaks. Quick confirmation of the infection can be made by rapid staining/histopathology of sampled shrimp which would allow the farmers to plan for emergency harvest before mass mortalities occur in the farm due to the disease.

Papers Published on Work Done under the Contract

Hettiarachchi, M., A. Pathiratne and R. P. H. Somatilake, (1999); Effects of physico-chemical parameters of the pond water on the occurrence of white spot disease in *Penaeus monodon* cultured in the north-western province Sri Lanka; Proceeding of the fifth Annual Session of "Sri Lanka association for Fisheries and Aquatic Resources (SLAFAR)" ; p-24.

Hettiarachchi, M., A. Pathiratne and R. P. H. Somatilake, (1999); Effects of physico-chemical parameters of pond water and *Vibrio* infection on the occurrence of white spot disease in *Penaeus monodon* cultured in Sri Lanka; Fourth symposium of "Diseases in Asian Aquaculture (DAA IV)" held in Cebu City, Philippines; p-27.

Somatilake, R. P. H., M. Hettiarachchi and A. Pathiratne, (2000); Experimental transmission of white spot disease virus (SEMBV) to tiger shrimp, *Penaeus monodon* under different salinity and hardness levels in water, Proceeding of the first research symposium of Faculty of Graduate Studies, University of Kelaniya; p-10.