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WHITE SPOT DISEASE OUTBREAK IN CONFINED RAIN-FED SHRIMP CULTURE PONDS OF CHILKA LAKE: A CASE STUDY

K. V. Rajendran, K. K. Vijayan, S. V. Alavandi, S. C. Rangaswamy, S. Srinivasagam and D. Rajababu[1]

Central Institute of Brackishwater Aquaculture,
141 Marshalls Road, Egmore, Chennai 600 008, India
[1]Puri Research Centre, Central Institute of Brackishwater Aquaculture, Puri, India

Incidence of large-scale mortality of cultured shrimp due to white spot disease caused by the white spot syndrome virus (WSSV) has been recorded from the confined rain-fed pond culture system in Haridas and Kusubenti villages of Chilka Lake, Orissa (India). Gross signs and symptoms of the disease and behavioural changes in shrimp were observed. Some of the soil and water quality parameters have been analysed and no adverse conditions could be observed. Detailed histopathological observations made on the moribund shrimp indicated the presence of WSSV. The probable source of the disease transmission in the confined culture system is discussed.

INTRODUCTION

White spot disease caused by the white spot syndrome virus (WSSV) (Lightner, 1996) has been reported from shrimp farms in almost all coastal states of India (Alagarswamy, 1995; Manohar *et al.*, 1996; Karunasagar *et al.*, 1997). Mortality of shrimp and the economic loss due to the disease outbreak have been of great concern to aquaculturists. In Orissa, extensive culture in rain-fed confined ponds around the Chilka Lake is widely practiced in Puri, Khurda and Ganjam districts. These are dug-out shallow ponds constructed on saline soils with an area of 0.2 - 0.5 ha. The ponds are filled with water during monsoon and become dry in summer, and there is no exchange of water during the culture period (Alagarswami *et al.*, 1988; Gupta *et al.*, 1990). There are about 4019 ponds under this system covering an area of 2344 ha. Disease problems were not generally encountered in these systems. However, in 1995, instances of large-scale mortality of cultured shrimp in confined ponds in Haridas and Kusubenti villages were observed, and the results of the investigations carried out on the cause of mortality of shrimp are presented in this paper. The probable source of disease transmission is also discussed.

MATERIAL AND METHODS

A total of four confined ponds, two-each in Haridas and Kusubenti villages were surveyed in December 1995 and samples of moribund shrimp were collected. Clinical

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signs, symptoms of disease and behavioural changes of the shrimp were recorded. Water and soil samples from affected ponds and normal ponds were collected, and analysed as per the standard methods (APHA, 1971; Jackson, 1967). Data on the farming practices were also collected.

To observe the presence of white spots/patches, carapace of shrimp was removed and examined under a dissection microscope. Squash preparations of gills and lymphoid organ were stained with haematoxylin, and observed under a microscope. Squash preparations of hepatopancreas were observed for monodon baculovirus (MBV) occlusions, after staining with 0.1% malachite green. Tissues fixed in Davidson's fixative were processed for histological analysis and tissue sections were stained with haematoxylin and eosin (Bell and Lightner, 1988).

RESULTS AND DISCUSSION

The occurrence of the disease was observed when the culture was about 90-days old and the shrimp attained a size of about 20 g. Frequent swimming at water surface and later, congregation of shrimp at pond periphery accompanied by reduction in feed consumption were the first symptoms noticed in all the disease-affected ponds. Following this abnormal behaviour, 100% mortality of cultured shrimp occurred within a week. Moribund and dead shrimp appeared reddish (both body and appendages) with occasional white spots/patches on the carapace (Fig. 1). A few animals showed white spots on abdominal segments also.

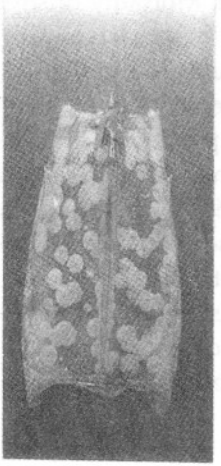

Fig. 1. Carapace of infected shrimp showing white spots/patches

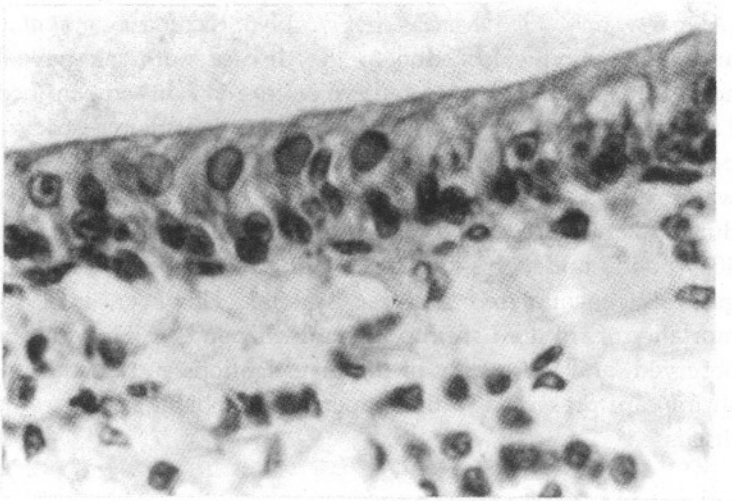

Fig. 2. Histological section of stomach wall showing the viral inclusions. H&E x 400

Histological sections of gills, lymphoid organs, subcuticular ectodermal layer and gut wall revealed marked necrosis and eosinophilic to basophilic intranuclear occulusions characteristic of white spot disease (Fig. 2). However, hepatopancreas was found to be normal and no monodon baculo virus infection was detected. Sections of gills showed protozoan infestation also.

Data on farming practices, and water and soil quality parameters of normal and disease-affected ponds are presented in Tables 1 and 2, respectively. From the data, it is evident that no abnormality could be observed in the water and soil quality parameters.

Table 1. Farming data on the confined rain-fed ponds in Kusubenti and Haridas villages

Village	Pond area (ha)	Stocking rate (no./ha)	Source of seed	Feed used	Culture period (d)	Remarks
Kusubenti	0.8	30,000	Wild	Him feed	90	Unaffected pond
Kusubenti	0.8	30,000	Wild	Him feed	90	Mortality of shrimp occurred
Haridas	0.4	35,000	Wild	Pila meat and Him feed	90	Mortality of shrimp occurred
Haridas	1.6	30,000	Wild	Pila meat and Him feed	90	Mortality of shrimp occurred

Table 2. Water and soil quality parameters of confined shrimp ponds in Kusubenti and Haridas villages

Parameters	Normal pond	Affected ponds
Water:		
Temperature (°C)	26.0	24.2 - 27.0
Salinity (‰)	2.4	2.2 - 3.0
Transparency (cm)	18.5	17.5 - 19.0
pH	8.2	7.6 - 8.3
Dissolved oxygen (mg/l)	7.60	7.00 - 11.60
Free CO_2 (mg/l)	Nil	Nil
Soil:		
pH	7.1	6.4 - 7.0

The present observations have indicated that mortality of the shrimp was due to the white spot disease caused by WSSV. All the diseased shrimp showed typical clinical signs and histopathological changes described for white spot disease (Inouye *et al.*, 1994; Wongteerasupaya *et al.*, 1995). White spot disease outbreaks have been reported in cultured shrimp from different culture systems, *viz.*, semi-intensive system, pump-fed system and tide-fed extensive system (Anon. 1994; Alagarswamy, 1995). However, the present study pertains to confined rain-fed ponds where no exchange of water had taken place through the culture operation. Hence, the source of infection may be attributed to wild seed used for stocking, migration of infected crabs into the culture ponds or brids which can pick the infected animals and drop into the culture ponds. All these factors are significant in the epizootiology of this viral disease even in the confined culture conditions.

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