



# Impact of white spot syndrome virus (WSSV) on the traditional shrimp farms of Kerala

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## Abstract

Present study analyses the impact of the WSSV outbreaks on the culture technology in traditional shrimp farms along with its impact on cost of production and life of farmers. The production of shrimp from these farms have considerably reduced ever since the outbreak of WSSV, and this coupled with the additional costs for preventive measures, increasing labor cost and general price rise in the state has contributed to the decrease in income. The crop losses have forced the farmers to leave the sector and seek alternate occupations. Early harvesting and closure of the farm along with disinfection of the facility with chlorine were practiced in the eventuality of a disease outbreak. However, farmers have observed varying level of survival of shrimp after outbreaks and many of them have completed the culture with some success. The farms did not face any disease other than WSSV. The risk factors farmers perceive as responsible for the repeated outbreaks were also analysed. A pretested structured questionnaire survey was used for collection of data. 135 farmers from 22 pachayaths of Ernakulam district were interviewed for data collection. The results indicated that farmers considered inconsistent water quality as the major risk factor in traditional shrimp culture followed by overstocking of the ponds.

**Key words:** prawn filtration, risk factors, farmers perception

## Introduction

Penaeid shrimp farming in brackishwater impoundments is an age old practice in West Bengal and Kerala (Jhingran, 1991). The tidal water along with the assorted shrimp and fish seed is impounded in low lying backwaters of Kerala by raising bunds (Ayyappan *et al.*, 2006). Consequent to the intensification of scientific aquaculture elsewhere, diseases also started occurring in aquaculture countries. Diseases of viral etiology were of high significance, leading to mass mortality of shrimps and crop losses. White spot syndrome is a major pathogen of cultured shrimp in all shrimp growing regions since early nineties. The causative agent, White Spot Syndrome Virus (WSSV) could lead to mortalities close to 100% in less than 10 days in culture ponds. As control of infection yielded little success, preventive strategies were developed to contain

the outbreaks with emphasis on the stress on cultured organisms, avoidance of carrier organisms and minimizing water exchange in culture ponds. However, the disease has jeopardized the culture of *Penaeus monodon* in most parts of the world, and the focus has off late, shifted to rearing of alternative species *Litopenaeus vannamei* specific pathogen free stocks, which has led to a revival of shrimp aquaculture in many countries. The traditional shrimp farms were also not spared by this disease and massive losses were reported by farmers. The ecosystem services offered by these wetlands are also of tremendous significance for centuries. There is a need for sustaining the traditional shrimp farming practice ensuring the profitability of the farmers. With this background, a study was undertaken with the objective of determining the impact of WSSV outbreaks in traditional shrimp farms of Kerala with emphasis on economic



returns, cost of production and modifications in culture technology.

## Material and Methods

### Selection of the study area

Ernakulam district was purposively selected for the present study. The area under traditional culture includes 941.9 ha of perennial fields and 9,655.1 ha of seasonal fields. Shrimp culture has served an important role in increasing the employment opportunities and family income of the local community. About 135 farmers from 22 panchayaths in Ernakulam district involved in traditional shrimp farming actively participated in this survey. Main area for traditional shrimp culture in Ernakulam is Edavanakkad and Kuzhuppilly panchayaths. The study was conducted during July – September 2010. The study is based on primary and secondary data. Primary data was collected from the sample respondents, in the selected district, by personal interview method. The personal interview was conducted with the help of a pre-structured, comprehensive questionnaire (interview schedule), specially designed for the purpose; and which was pretested with a reconnaissance study (Kothari, 1990). The questions were primarily on the nature of outbreaks of WSSV in the traditional fields after 1995 and management measures undertaken to control the outbreaks. The nature of losses and risk factors were also assessed. The primary data were also recorded on site characters, species stocked, seed and feed requirement, water quality maintenance, time and labor requirement, harvest and gender issues along with other aspects of culture. The existing literatures were also used as an important source of information for the study. The secondary data was collected from sources like BFFDA, various journals, periodicals, magazines, reports of the state fisheries departments and websites. Descriptive statistical analysis of the data generated was done using Microsoft Excel 2007.

### Results

The survey of traditional shrimp farms of Kerala was undertaken to study the impact of repeated outbreaks of White spot syndrome on the culture technology, profitability and overall life of the farmers. A total of 135 farmers were surveyed

from 22 panchayaths of Ernakulam district. The study showed very frequent outbreaks of WSSV in the region during the period. 13% of the farmers have faced about 9 to 12 WSSV outbreaks in the fifteen years. However, in 73% cases, the outbreaks did not spread to the neighbouring farms. Most of the farmers (99%) agreed that indiscriminate release of effluents from infected farms into the open waters may be considered as the single most important factor responsible for the outbreaks of WSSV in traditional shrimp farms. 77% of the farmers strongly agreed that water quality deterioration due to industrial pollution as a major reason for outbreak of WSSV. Overstocking in shrimp ponds was also identified as an important factor leading to outbreaks of WSSV by 80% of the farmers. 32% of the farmers considered the movement of carrier organisms like crabs and birds between farms as another reason for outbreaks. However, stocking with infected seeds was not considered as a decisive factor for WSSV outbreaks. Farmers (62%) observed that the mortality due to WSSV outbreaks have reduced over the years, however, the number of days of survival after infection was not predictable. All the farmers have completed the culture cycle with some level of success after WSSV outbreak several times. The production from cultures completed after WSSV outbreaks varied from less than 100 kgs to 200 kg/ha. Farmers indicated that bacterial infections like luminescent Vibrios and external parasites were not found during the outbreak of WSSV. 39% of farmers observed fouling organisms on the shrimp shells during WSSV outbreaks.

### Management measures to prevent WSSV outbreaks

Several management measures were undertaken by the farmers to prevent the outbreak of WSSV in traditional shrimp farms. 36% of farmers ensured stocking with seeds certified negative for WSSV after PCR test. All the farmers felt that periodic water quality monitoring will be an ideal management measure in the region. They also considered reducing the water exchange rate as a strategy to control WSSV outbreaks. However, chlorination of the farm during pond preparation to eliminate carrier organism, use of medicines to treat the infected shrimps and use of



immunostimulants and probiotics were not considered suitable by farmers. Periodic testing of stocked shrimp for WSSV was favored by less than 5% farmers. The increase in cost of production with additional management measures for controlling disease outbreaks varied greatly. However, 51% of the farmers felt that the present level of management of the traditional shrimp farms is not sufficient to prevent the outbreak of WSSV. When the farmers notice a WSSV outbreak, 42% of them harvested and sold the shrimps in the market. Immediate disinfection of the pond and taking the harvest for home consumption were also common. However, the farms were never closed down due to WSSV outbreak, it is continued until the end of the season for harvesting the fishes. Despite the repeated losses in shrimp production from traditional shrimp farms due to WSSV outbreaks, farmers still consider the operation as profitable venture. Majority of the farmers consider traditional prawn filtration fields as a subsistence activity. It was also observed that 23% of the farmers have left the farms due to uncertainties in production owing to disease outbreaks.

#### **Risk factors affecting traditional shrimp farming**

Several risk factors listed after consultation with the farmers were presented to them separately ranking each risk factor on a five point scale (Annexure 1). Water quality was identified by farmers as the most important risk factor determining the production in traditional shrimp farms. All the farmers considered water quality as 'high' to 'very high' risk factor 90% of the farmers considered disease outbreaks, especially WSSV as a moderate to high risk factor during the farming operation. A considerable number of farmers (37%) rated bacterial diseases as a moderate to very high risk factor. Uncertainty in yields was considered as moderate risk factor by 25% of the farmers. Stocking of infected seed was considered as a low risk factor by majority of the farmers (75%). Poaching and marketability of the harvest were also rated as low risk factors by the farmers. Outbreak of diseases other than WSSV was minimal in traditional shrimp culture ponds. All the common disease occurring in shrimp farms in India other than WSSV were of moderate to very low incidence in these farms.

#### **Discussion**

In India soon after commercial farms started facing losses due to outbreak of white spot syndrome in early 90's (Mohan and Basavarajappa, 2006), the traditional farms were also affected by WSSV, which might have found entry through infected seed and infected farm effluents released into natural water bodies. As the traditional culture technology is dependent on tidal fluctuations to enable water exchange, the horizontal transmission of WSSV became inevitable. Outbreaks of white spot syndrome has repeatedly affected the traditional farms in a ritualistic way year after year, despite it being a very low density culture system with minimal inputs. Production data for traditional shrimp farms over the years is not available as the ownership of leased farms changes frequently. The production from traditional farms comprises mostly of shrimps, fetching maximum price among all the groups harvested followed by several brackishwater fin fishes. The survey points to a reduction in the average income of farmers. Similar observations were made by Alam *et al.* (2007) who studied the impact of diseases on the economic returns from extensive brackishwater farms of Bangladesh and reported an average production of *P. monodon* as low as 146.39 kg/ha resulting in negative returns against production cost.

In an open system like a traditional shrimp farm, the entry of endemic pathogenic organisms into the farm cannot be restricted without considerable increase in operational cost. The stocking with uninfected seed into an aquaculture system without biosecurity may not yield desired production. Focus should be on reduction of stress for the cultured animals. The international principles of responsible shrimp farming (FAO/NACA/UNEP/WB/WWF, 2006) also emphasizes the reduction of stress to shrimp in the farm and measures for disease prevention rather than treatment. The survey indicated that stress to the cultured animals due to variations in the quality of incoming tidal water as the most important risk factor. The Ernakulam district has a number of industrial units located on the banks of the same water body and possible release of chemicals occasionally into the water and their role as a stressor need to be studied separately. The



absence of bacterial and fungal diseases indicate that general quality of the farms are good and outbreaks of white spot syndrome may be due to external stressors affecting the health of shrimp and providing a chance for the virus already present in the body of the shrimps to cause disease, however, this needs to be corroborated by real time PCR assay.

It shows that the reduction in income has come mainly due to crop failures and not because of the rise in cost of production. The increase in labor cost and the general price in the state has also has a considerable impact on the profitability. Aquacultured shrimp in India generally caters only to export market, however, only 11% of the traditional farmers harvested their crop exclusively for processing factories. This indicates the smaller sizes at harvest in majority of the cases, forcing the farmers to sell the shrimps at a lower price in local markets. The survey indicated that farmers used management measures like reduced water exchange in the farms, which is usually practiced in semi-intensive shrimp farms. Closing the infected ponds and disinfection with chlorination is also practiced. These practices may be responsible for reduced outbreak of white spot syndrome to neighboring farms. however, the movements of carrier organisms like crabs between ponds cannot be controlled here.

It is alarming to note that the impact of disease has led to job losses in the sector. Farmers have started leaving the sector, which has been a life provider for centuries, and sought alternative occupations. The employment potential coupled with the ecosystem services offered by these wetlands makes this sector an important component of coastal ecosystem. The socio-economic impacts of diseases in shrimp aquaculture has been reviewed in detail by Bondad-Reantaso and Subasinghe (2005). The authors have stressed the need for the application of epidemiological studies to improve health management, risk analysis and disease control in the shrimp aquaculture sector in the Asian countries. A comprehensive study on the changing water quality regimen in these areas and the potential entry of industrial pollutants and their impact on cultured organisms also need to be pondered. There is also a dire need to develop an appropriate disease management model

specifically for traditional shrimp farming sector in the country.

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