

# Loose Shell Syndrome – A silent killer of farmed black tiger shrimp in India

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The loose shell syndrome (LSS) has been reported among the farmed *Penaeus monodon* since 1998 in India. The reports on LSS incidence have been increasing year after year. LSS is a slow progressive disease of farmed black tiger shrimp in India, which is characterized by flaccid spongy abdomen due to muscular dystrophy. The exoskeleton forms a sort of a loose covering over the abdominal musculature, with a space in between. The feed conversion efficiency of the shrimp reduces substantially leading to a poor meat quality, and affected ponds suffer from low-level progressive mortalities, which mislead the farmers in biomass calculation. By the time the farmer realizes the LSS, 40% of his shrimps would have been affected. The transmission mode of this disease within the pond is mainly due to cannibalism (horizontal transmission).

Till recently, LSS was prevalent on the east coast states of the Indian subcontinent viz., Tamil Nadu, Andhra Pradesh, Orissa and West Bengal. During 1998-1999 the incidence of LSS was reported in about 23% and 14% shrimp farms around the Vellar estuary in Tamil Nadu, during summer and winter crops respectively. In Andhra Pradesh, West Godavari district (improved traditional shrimp farms with average stocking density of 3 shrimp m<sup>-2</sup>) and Nellore (average stocking density of about 8 shrimp m<sup>-2</sup>), incidence of LSS was reported in about 27% and 5% of the farms respectively by MPEDA/NACA, in 2003. The incidence of LSS has been recorded in more than 50% of the farms (> 1100 ha) in coastal Andhra Pradesh. Farms affected by LSS resulted in the reduction of average daily growth rate, average body weight and





poor survival of shrimp leading to reduction in biomass production. Since 2005, LSS has also been reported from Gujarat, Maharashtra, Karnataka and Kerala on the west coast of India. A conservative estimate of loss due to LSS in India has been found to be Rs. 190 crores in farm income and a loss of 9057 metric tones in production annually as per the study undertaken to assess the loss due to diseases at CIBA. The shrimp farming community in India, considering its serious economic consequences, regards LSS as the most devastating disease syndrome next to WSSV.

The MPEDA/NACA in 2003 suggested the cause of LSS as chronic bacterial infections and toxic pond bottom conditions. The clinical signs of necrotizing hepatopancreatitis (NHP) such as discoloration, atrophy and necrosis of hepatopancreas, reduced feed intake, soft shells and flaccid muscle reported in farmed *Litopenaeus vannamei* from the Americas has close resemblance with LSS. Society of Aquaculture Professionals suggested possible involvement of algal toxin(s), NHP or a new pathogen, as the causative agent of LSS.

The occurrence of LSS is geographically localized to India with slow mortality pattern. However, only a few reports have been published on the pathology and no information exists on its etiology. Hence an attempt was made to investigate the causative factor of Loose Shell Syndrome in black tiger shrimp, *Penaeus monodon*.

The infectious nature of LSS was tested by feeding healthy shrimps with minced muscle meat preparations and hepatopancreas homogenate of LSS affected animals. The LSS signs were first noticed on fifth day and sixth day after challenge respectively. Thus, suggesting the infectious nature of the LSS. If this is infectious, the causative agent could be

either bacterial or viral. This was again investigated by isolating the dominant pathogenic *Vibrio* from haemolymph of LSS affected shrimps and challenging the healthy shrimps. There were no signs of LSS among the shrimps challenged with the pathogenic *Vibrio*, suggesting that LSS is not due to bacteria. This might be a secondary infection in LSS affected shrimp.

The viral aetiology was then investigated. The suspected viral agent was purified from the hepatopancreas of the LSS affected shrimp and was injected intramuscularly to healthy shrimps. LSS signs were observed among the challenged healthy shrimps. The histological studies revealed general atrophy and inflammation of hepatopancreatic tubules, nodulation and haemocytic infiltration, low levels of lipid reserves in R cells, hypertrophied nucleus (enlarged nucleus) and necrotic hepatocytes were common. These signs were similar to that of naturally affected shrimps. The electron microscopic observations of suspected agent were similar to that of viral agent observed in challenged shrimps. This suggests the involvement of viral like agent in LSS among the farmed shrimp.

Further studies are required to characterize the suspected infectious viral like agent so that good control measures could be derived and diagnostic techniques could be developed.

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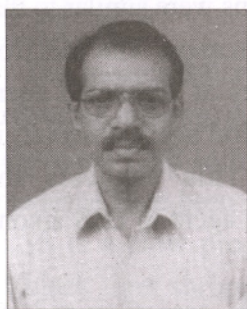






LSS affected shrimp showing shrunken muscle (arrow) and shrunken hepatopancreas (arrow), LSS affected shrimps observed at the pond peripherals.

## **BIOTECHNOLOGY PROJECT GRANTED TO FISHERIES SCIENTIST, DR. KALEEMUR RAHMAN**



Millennium Exports is a Chennai based Marine Biotech company. The company was granted a project in 2007 from Department of Biotechnology (DBT) under

Small Business Innovation Research Initiative (SBIRI). The total project cost is Rs.1.28 crores. DBT has contributed 30% of the project cost. The project is for marine biotechnology research leading to commercial industrial project. Millennium Exports under the leadership of Dr.Kaleemur Rahman (Managing Director) was engaged in the development of Fish Leather in India. The project's main objective is to make

the fish leather as a commercial viable product.

There are two marine biotech research component in the project. They are processing of fish skin into a commercially viable finished Fish Leather and the other objective is to utilize the marine waste such as the fish bone, fish fins, fish skin and fish tail into pet animal food. The company has made significant progress in the past couple of years. The dog chews and treats developed utilize fish offal, viscera of fish. The product will be soon released into Indian market as Ocean Chew.

Tanning of fish skin to convert it into leather is done in a tannery in Ambur and research on pet animal food is done in a new factory near Chennai.

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