



## **DISEASE ADVISORY**



Asia Regional Aquatic Animal  
Health Programme

### **Early Mortality Syndrome (EMS)/Acute Hepatopancreatic Necrosis Syndrome (AHPNS): An emerging threat in the Asian shrimp industry**

*Eduardo M. Leñaño and C.V. Mohan  
NACA, Bangkok, Thailand*

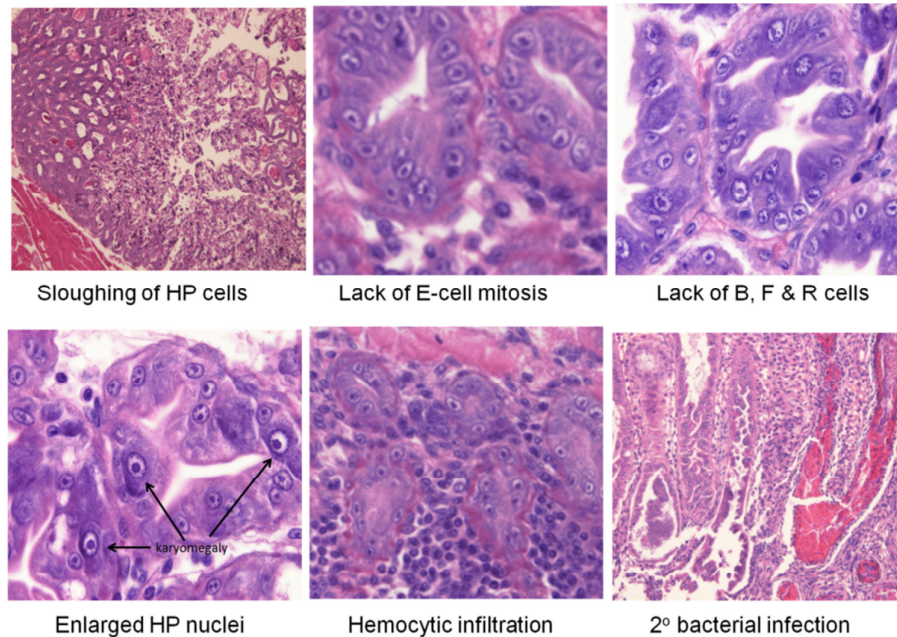
The Asia-Pacific region, being the top producer of aquaculture products in the world, is continuously beset by emerging aquatic animal disease problems causing high mortalities and economic losses among small farmers as well as commercial producers. Over the last couple of decades, several diseases (e.g. luminous vibriosis, white spot syndrome, yellowhead disease, Taura syndrome) have caused significant devastation in the shrimp aquaculture of the region, causing the collapse of some industries (e.g. *Penaeus monodon*). Recently, a new/emerging disease known as early mortality syndrome (EMS) in shrimp (also termed acute hepatopancreatic necrosis syndrome or AHPNS) has been reported to cause significant losses among shrimp farmers in China (2009), Vietnam (2010) and Malaysia (2011). It was also reported to affect shrimp in the eastern Gulf of Thailand (Flegel, 2012).

The disease affects both *P. monodon* and *P. vannamei* and is characterized by mass mortalities (reaching up to 100% in some cases) during the first 20-30 days of culture (post-stocking in grow-out ponds). Clinical signs observed include slow growth, corkscrew swimming, loose shells, as well as pale coloration. Affected shrimp also consistently show an abnormal hepatopancreas (shrunken, small, swollen or discoloured). The primary pathogen (considering the disease is infectious) has not been identified, while the presence of some microbes including *Vibrio*, microsporidians and nematode has been observed in some samples. Lightner et al. (2012) described the pathological and etiological details of this disease. Histological examination showed that the effects of EMS in both *P. monodon* and *P. vannamei* appear to be limited to the hepatopancreas (HP) and show the following pathology:

- 1) Lack of mitotic activity in generative E cells of the HP;
- 2) Dysfunction of central hepatopancreatic B, F and R cells;
- 3) Prominent karyomegaly and massive sloughing of central HP tubule epithelial cells;
- 4) Terminal stages including massive intertubular hemocytic aggregation followed by secondary bacterial infections.

Similar histopathological results were obtained by Prachumwat et al. (2012) on Thai samples of *P. vannamei* collected from Chantaburi and Rayong provinces in late 2011 and early 2012 (Figure 1). The progressive dysfunction of the HP results from lesions that reflect degeneration and dysfunction of the tubule epithelial cells that progress from proximal to distal ends of HP tubules. This degenerative pathology of HP is highly suggestive of a toxic etiology, but anecdotal information suggests that disease spread patterns may be consistent with an infectious agent.

In China, the occurrence of EMS in 2009 was initially ignored by most farmers. But in 2011, outbreaks became more serious especially in farms with culture history of more than 5 years and those closer to the sea using very saline water of 20 (Panakorn, 2012). Shrimp farming in Hainan, Guangdong, Fujian and Guangxi suffered during the first half of 2011 with almost 80% losses



**Figure 1.** Histopathology of *Penaeus vannamei* hepatopancreas from Thailand affected by EMS/AHPNS. Photos courtesy of T.W. Flegel.

In Vietnam, the disease has been observed since 2010 but the most widespread devastation due to EMS has only been reported since March 2011 in the Mekong Delta (South Vietnam). It affects the main shrimp production areas of Tien Giang, Ben Tre, Kien Giang, Soc Trang, Bac Lieu and Ca Mau provinces with a total shrimp pond area of around 98,000 hectares. In June 2011, unprecedented losses in *P. monodon* were reported in 11,000 ha of shrimp farms in Bac Lieu, 6,200 ha in Tra Vinh (total of 330 million shrimp have died causing a loss of over VND12 billion), and 20,000 ha in Soc Trang (causing VND1.5 trillion in losses) (Mooney, 2012).

In Malaysia, EMS was first reported in mid-2010 in the east coast of peninsular states of Pahang and Johor. The outbreaks of EMS resulted in the significant drop in *P. vannamei* production, from 70,000 mt in 2010 to 40,000 mt in 2011. Production for 2012 (up to May) is only 30,000 mt and worse is expected to come as unconfirmed reports on EMS outbreaks in the states of Sabah and Sarawak came in April 2012.

So far no potential causative pathogen has been found and possible etiologies include toxins (biotic or abiotic), bacteria and viruses (NACA-FAO 2011). Nonetheless, the spread of the disease and its devastating effect in the shrimp industry of the countries affected so far, will require proper contingency planning in other countries in the region, especially in *P. vannamei* culture which is commonly cultivated at present in many Southeast Asian countries. Added to this is the standing threat of infections myonecrosis (IMN) on *P. vannamei* culture, which is now somehow contained within Indonesia. Rumors of disease outbreaks caused by IMNV from other countries in Asia have so far been false (Senapin et al., 2011). With Vietnam suffering the greatest loss due to EMS outbreak, the Food and Agriculture Organization of the United Nations (FAO) undertook an emergency mission in 2011 to assess the disease situation in the country, in collaboration with national as well as international shrimp health experts. As a follow-up on this emergency mission, FAO also developed a national TCP on emergency assistance to control the spread of this shrimp disease. Implementation of the national TCP in Vietnam has commenced in April 2012.

Identifying the primary cause of the disease is necessary, but while this information is still not yet available, increased disease awareness and preparedness should be implemented by every shrimp-producing country in the region. Considering the great economic loss that EMS will cause in the region's shrimp industry, ways of preventing the spread and/or occurrence of this disease should be formulated by

concerned experts, officials and other regulatory bodies. Farmers, on the other hand, should also properly cooperate with the concerned agencies by promptly reporting any suspected mortalities among cultured shrimp that appear to be similar to the clinical description of EMS/AHPNS. It is important that histological examination be carried out to confirm that suspected occurrences fit the AHPNS case definition devised by Dr. Lightner.

The purpose of this short communication is to inform all NACA members of the emerging threat and request respective Competent Authorities (CA) and concerned stakeholders to increase surveillance and reporting efforts. Only through surveillance, early response, contingency planning and disease preparedness, can countries minimize the impact of the impending threat. NACA Secretariat will approach the CA of the four member governments currently affected by EMS to put up a multi-disciplinary team of experts to understand more about the disease and develop contingency measures to prevent its further spread in the region.

NACA will greatly appreciate receiving any relevant information pertaining to EMS/AHPNS from all member countries in the region. Information can be sent by e-mail to the authors at [eduardo@enaca.org](mailto:eduardo@enaca.org) and [mohan@enaca.org](mailto:mohan@enaca.org).

**References:**

- Flegel, T.W. 2012. Historic emergence, impact and current status of shrimp pathogens in Asia. *Journal of Invertebrate Pathology* 110:166-173.
- Lightner, DV, Redman, RM, Pantoja, CR, Noble, BI, Tran, L. 2012. Early mortality syndrome affects shrimp in Asia. *Global Aquaculture Advocate*, January/February 2012:40.
- Mooney, A. 2012. An emerging shrimp disease in Vietnam, microsporidiosis or liver disease? Available at: <http://aquatichealth.net/issue/38607>.
- NACA-FAO 2011. Quarterly Aquatic Animal Disease report (Asia and Pacific Region), 2011/2, April-June 2011. NACA, Bangkok, Thailand.
- Panakorn, S. 2012. Opinion article: more on early mortality syndrome in shrimp. *Aqua Culture Asia Pacific*, Volume 8 No. 1: 8-10.
- Anuparp Prachumwat, A., Thitamadee, S., Sriurairatana, S., Chuchird, N., Limsuwan, C. Jantratit, W., Chaiyapechara, S., Flegel, T.W. 2012. Shotgun sequencing of bacteria from AHPNS, a new shrimp disease threat for Thailand. Poster, National Institute for Aquaculture Biotechnology, Mahidol University, Bangkok, Thailand (Poster available for free download at [www.enaca.org](http://www.enaca.org))
- Senapin, S., Phiwsaiya, K., Gangnonngiw, W., Flegel, T.W. 2011. False rumours of disease outbreaks caused by infectious myonecrosis virus (IMNV) in the whiteleg shrimp in Asia. *Journal of Negative Results in BioMedicine*. 10: 10