

Emerging threat in the Asian Shrimp Industry: Early Mortality Syndrome (EMS)/Acute Hepatopancreatic Necrosis Syndrome (AHPNS)

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A new/emerging shrimp disease known as early mortality syndrome (EMS) or acute hepatopancreatic necrosis syndrome (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.

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

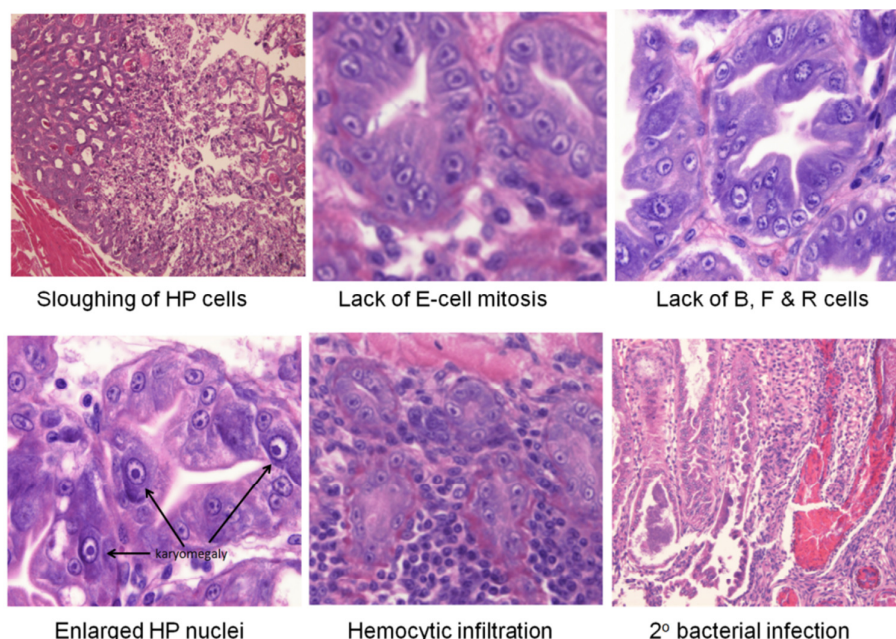


Figure 1. Histopathology of *Penaeus vannamei* hepatopancreas from Thailand affected by EMS/AHPNS. Photos courtesy of T.W. Flegel.

countries in Asia have so far been false (Senapin et al., 2011). 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.

In lieu on this emerging threat, NACA has released a Disease Advisory which was widely circulated among member countries, regional and international organisations, as well as the private sectors. The disease advisory is available for free download at NACA website (<http://library.enaca.org/Health/DiseaseLibrary/disease-advisory-ems-ahpns.pdf>).

An Emergency Regional Consultation is also being organized by NACA with support from the Australian Department of Agriculture, Fisheries and Forestry (DAFF). This will be held on 9-10 August 2012 in Bangkok, Thailand with the following objectives:

- a) Provide an overview of the current disease and its spread, with emphasis on the threat that it poses in the shrimp industry of the region;
- b) Assess the economic effects of the disease: outbreaks in China, Vietnam, Malaysia and Thailand;
- c) Identify any similar occurrences in other countries in the region;
- d) Develop a field level disease card and case definition as easy reference in monitoring the occurrence of the disease;
- e) Formulate a regional action plan – improved disease surveillance and reporting, and contingency measures to contain and prevent further spread of the disease;
- f) Develop or plan collaborative research on EMS/AHPNS, inter-regionally and internationally, to identify the primary causative agent, develop preventive measures, etc.; and,
- g) Formulate other regulatory measures for overall management of the disease.

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 and 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.
- NACA-FAO 2011. Quarterly Aquatic Animal Disease report (Asia and Pacific Region), 2011/2, April-June 2011. NACA, Bangkok, Thailand.
- 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)
- 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

‘Scale Drop Syndrome’ (SDS) of Asian seabass, *Lates calcarifer* Bloch (or barramundi)

‘Scale drop syndrome’ (SDS) was first reported in *Lates calcarifer* Bloch by farmers in Penang, Malaysia in 1992. Cases with similar gross lesions and clinical presentations were observed in 100–300 g *L. calcarifer* in sea cages in Singapore in 2002, 2006 and 2009.

Fish were usually reported as eating well with no signs of disease until onset of SDS. The disease appeared to progress within a few index cages and spread onto surrounding cages. The disease did not affect other fish species stocked in the same farm or vicinity. Daily mortality of 1–2%, and average cumulative losses of 40–50% of stocked fish were observed. Severely affected fish stopped schooling and occasionally showed abnormal nervous behaviour characterized by spiral swimming, darkened bodies, and scale loss over extensive areas. Scale loss is a non-specific clinical sign, and this must be accompanied by histopathological examination of other tissues to diagnose SDS. The cause of SDS is unknown, but it appears to be infectious.

Histopathological changes and the presence of enveloped hexagonal virions in the absence of other consistent causal agents support the possibility of a viral aetiology. Attempts at viral isolation or PCR using published primers have not been successful. The case definition for SDS is proposed as ‘a systemic vasculitis in *L. calcarifer* associated with tissue necrosis in all major organs including the skin, with apparent targeting of cells of epithelial origin’. There is a need to increase recognition of this serious disease to prevent inadvertent spread to new areas, in an *L. calcarifer* aquaculture industry of increasing importance.

For full article, please refer to: Gibson-Kueh S, Chee D, Chen J, Wang YH, Tay S, Leong LN, Ng ML, Jones JB, Nicholls PK, Ferguson HW (2011). The pathology of ‘scale drop syndrome’ in Asian seabass, *Lates calcarifer* Bloch, a first description. *Journal of Fish Diseases* 2012, 35, 19–27.



Fish Health Section

Asian Fisheries Society

Poster & Travel awards for 8th Triennial Symposium on Diseases in Asian Aquaculture organized by the Fish Health Section of the Asian Fisheries Society and College of Fisheries Mangalore on 21-25 November, 2011 at Milagres Hall Complex, Mangalore, India.

The theme of the symposium was "Fish for food security". In addition to oral presentations, 170 posters were presented from various areas of aquatic animal health. The Poster awards were sponsored by FAO of United Nations, Rome Italy. The following is a summary of the poster awards under the different categories.

Aquatic Animal Diseases

1st: Emerging disease problems in Indian bivalve mariculture. *Sanil N.Karayi, Suja G, Lijo j, Ashokan P.K and Vijayan K.K* (India)

2nd: Prevalence, epidemiology and histopathology of tumour (Odontoma) in *Sphyræna obtusata*, South East coast of India. *Gopalakrishnan A.* (India)

Health Management, Probiotics, Immunostimulants, Phages

1st (shared): Phage therapy against *Pseudomonas* infection of cultured ayu on site. *Yashuhiko Kawato, Kentaro Takegami, Takahiro Nagai and Toshihiro Nakai* (Japan)

Application of lytic phages for controlling of *Vibrio parahaemolyticus* in aquaculture systems. *Dechamma M.M, S.A Mohan and I. Karunasagar* (India)

2nd (shared): Specific pathogen free Red Tilapia broodstock development: establishing a list of current significant pathogens for screening. *Sakranmanee Krajangwong, Kim D. Thompson, Boonsirm Withyachumnarnkul,*

Matthijs Metselaar, Tharangani Herath, David J. Penman, Warren Turner, Dave Little and Alexandra Adams (UK)

Anti White Spot Syndrome Virus activity of a mangrove plant. *Ceriops tagal*. *N.S Sudheer, Rosamma Philip, and I.S Bright Singh* (India)

Diagnostics treatment issues, Cell lines

1st: Comparative evaluation of latency-associated genes of white spot syndrome virus (WSSV) for developing PCR test to detect latent infection. *Reshma K. J., ReenaYadav, M. Makesh, C. S. Purushothaman, and K. V. Rajendran* (India)

2nd (shared):

Anti-quorum sensing potential of malonic acid in preventing *Vibrio harveyi* infection. *Syed Musthafa Khadar, Issac Sybiya Vasantha Packiavathy, Angusamy Annapoorani, Shunmugiah Karutha Pandian and Arumugam Veera Ravi* (India)

Antibacterial effect of feeding *Artemia* enriched with fucoidan of *Sargassum wightii* on *Vibrio parahaemolyticus* resistance in *Penaeus monodon* postlarvae. *Arunachalam Palavesam, Madasamy Sivagnanavelmurugan, Thangapandi Marudhupandi and Grasian Immanuel* (India)

Crustacean viruses and immunity

1st :

Using liquid chromatography-electrospray ionization-mass spectrometry as a systemwide metabolomic platform to monitor the perturbation in shrimp hemocyte metabolites induced by white spot syndrome virus infection. *I-Tung Chen, Der-Yen Lee, Geen-Dong Chang, KC Han-Ching Wang, and Chu-Fang Lo* (Taiwan)



Fish Health Section

Asian Fisheries Society

2nd (shared): ProPO-system mediated innate response in shrimp immunity. Walaiporn Charoensapsri Piti Amparyup, Ikuo Hirono, Takashi Aoki, and Anchalee Tassanakajon (Thailand)

Assessment of infectivity potential of Indian white spot syndrome virus isolates. Rosalind George M, Riji John K, Mohamed Mansoor, M J Prince Jeyaseelan (India)

Parasitic Diseases

1st (shared): Investigations on *Perkinsus* spp. infections in bivalve populations along the Indian coasts. Suja Gangadharan, Sanil N.K., Asokan.P.K and Vijayan K.K. (India)

Diseases of cultured mullet (*Argyrosomus japonicus*) in Western Australia. Dina Zilberg, Galit Sharon, Pulak Ranjan Nath and Noah Isakov (Israel)

Distribution of zoonotic trematodes in snails in ponds at integrated agriculture/aquaculture farms. Annette S. Boerlage, Elisabeth A.M. Graat, Johan A. Verreth, Mart C.M. de Jong (Netherlands)

2nd: Effectiveness of freshwater bath on marine leech *Zeylanicobdella argumensis*, a parasite of marine cultured fish. Beng Chu Kua, Muhd. Naim Abd. Malek and Horng Chung Kok (Malaysia)

Fish Vaccination and Immunity

1st (shared): Cloning, sequencing and expression analysis of hepcidin gene of *Labeo rohita* to *Aeromonas hydrophila* infection. Amruta Mohapatra, M. Mishra, Sweta Das, A. Das, M. Biswas, P.K. Sahoo (India)

The immune response against bacterial antigens in Atlantic cod (*Gadus morhua* L.) using microarray analysis. Anita Müller, Marije Booman, Tiago Hori, Tim Kahlke, Marit Seppola, Helene Mikkelsen, Matthew Rise, Roy Dalmo (Norway)

2nd: Evaluation of biofilm of *Aeromonas hydrophila* for oral vaccination of *Channa striatus* (blotch) Prabhugouda Siriyappagouda, Shankar K.M., Naveen Kumar B.T. Omkar V. Byadgi, Adil B., Shilpa S.R. and Iqbal Ahmed (India)

Molecular Biology, Genomics and Bioinformatics

1st (shared): Culture conditions effecting *ompK* gene expression in *V. anguillarum* suggest a role for this protein in iron uptake and resistance to bile salt. Mohammed Abdullatif Hamod and Indrani Karunasagar (India)

Molecular cloning, mRNA variants and NO generation of the Nitric oxide Synthase gene, *MjNOS*, in Kuruma shrimp *Marsupenaeus japonicus*. Mari Inada, Junichi Nishi, Maki Yoshimine, Keisuke Kihara, Tomoya Kono, Raja Sudhakaran, Terutoyo Yoshida, Masahiro Sakai and Toshiaki Itami (Japan)

2nd (shared): Bioinformatics based Protein-Interaction-Network study of the predicted Type III secreted repeat toxin of *Vibrio vulnificus*. Rama Adiga and I. Karunasagar (India)

Identification of the splice variants of RdRP and CP genes in betanodavirus. Tohru Mekata, Jun Satoh, Hiroshi Sako and Toshiaki Itami (Japan)

Identification of novel molluscan IκB protein from Manila clam: gene expression analysis against *Vibrio tapetis* Youngdeuk Lee, Sukkyoung Lee, Saranya Revathy, K and Jehee Le (Korea)

In silico identification and characterization of potential binding sites on the surface of thermostable direct hemolysin of *Vibrio parahaemolyticus*. Malathi Shekar and Indrani Karunasagar (India)

Announcements:

Conferences

25-29 August 2013

Perth Convention Exhibition Centre
Western Australia



24th International Conference of the World Association
for the Advancement of Veterinary Parasitology



European Association of Fish Pathologists

1st Announcement: 16th International
Conference on Diseases and Shellfish,
Tampere Finland, 2nd - 6th Sept 2013

Fish Histology Workshop 2012

Dates: 27-29 Nov 2012

**Venue: University of Tasmania,
National Centre for Marine
Conservation and Resource
Sustainability AMC, Launceston**

For further information and application
forms please contact Karine Cadoret at
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Barbara Nowak at B.Nowak@utas.edu.au

Next Issue of the FHS Newsletter

Feature articles on aquatic animal
health activities in Asia

Please send in articles for newsletter
to the editor:

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Email: S.Kueh@murdoch.edu.au or
Susan.Kueh@gmail.com

People news

If you would like to let your fellow
researchers know of your new
adventures and whereabouts, drop me
a line or two with your new contact
details. Ed.

Travel Awards:

'DAA8 Travel Awards' of USD1000
each sponsored by FAO, Rome, Italy
was given to 5 young scientists for
excellence in research:

- Benedict Maralit (Philippines)
- Leaw Yoon Yau (Malaysia)
- Muhd Faizul. H. A. H. (Malaysia)
- Satheesha Avunje (South Korea)
- Sharanya Revathy (South Korea)