Prevalence and risk factors of Early Mortality Syndrome (EMS) in shrimp farms in Rayong and Chantaburi provinces, Thailand

J. Kasornchandra[1], V. Boonyawiwat[2], S. Yaemkasem[3], and T. Chaweepak[4]

[1]Department of Fisheries, Chatuchak, Bangkok 10900 Thailand
[2]Dept. of Farm Resources and Production Medicine, Faculty of Veterinary Medicine, Kasetsart University Kamphang-saen campus, Nakorn-pathom, 73140, Thailand
[3]Rayong Coastal Aquaculture Research and Development Center, Tapong, Mueang, Rayong 21000 Thailand
[4]Chantaburi Coastal Aquaculture Research and Development Center, Bang kra-ja, Mueang, Chataburi 22000 Thailand

Introduction:

The EMS/AHPND disease was first observed in the east coast of Thailand in late 2011 and it was confirmed in early 2012. The area that had serious losses was in Klang, Rayong and Na-Yai Am Chantaburi provinces. The disease continues to affect to shrimp ponds all over the country. Production of shrimp, *Litopenaeus vannamei* dropped from 500,000 tonnes in 2011 to 450,000 tonnes in 2012 (Thai Frozen Food Association, 2012). In 2013, the production of shrimp dropped dramatically to 250,000 tonnes (Department of Fisheries, 2014). As the EMS/AHPND disease has direct economic repercussions on shrimp production and direct consequences to processing plant and global market, therefore it is so important to know the prevalence rate of the disease and its risk factors which are essential to define an effective control strategy.

Materials and methods:

Study design

The cross-sectional study was carried out to investigate the prevalence and risk factors related to EMS/AHPND in shrimp pond during Jan 1st to Dec 31st 2012 in Rayong and Chantaburi provinces, Thailand (fig. 1).

Fig. 1 *Location of studied area*

The sample size was calculated using two stages random sampling in which shrimp farm was selected by probability proportional to size sampling where as shrimp farm was selected by simple random sampling at 95% confidence interval based on 30% expected prevalence of EMS/AHPND (Carmeron, 2002). Base on these criteria, a number of 100 shrimp farms and 233 shrimp ponds in Klang, Rayong and Na-Yai Am, Chantaburi provinces were selected.

Data collection and Statistical analysis

The retrospective data concerned management practices such as pond preparation, bottom pond cleaning, feeding management, water quality practices including seed supply and seed quality were collected.

The pond level case definition used in this study were as follows: mortality of diseased shrimp reaching 40% within 5-7 days during the first 35 days after stocking shrimp into the pond and the affected shrimp had shrunken (atrophy) hepatopancreas (fig. 2). At farm level, shrimp farm that considered being EMS/AHPND if at least one pond showed characteristic of disease as previously

Fig. 2 *Clinical sign of shrimp as case definition of EMS/AHPND in this study*

The prevalence of EMS/AHPND and logistic regression were analyzed by STATA 8.2 software program. Univariate and multivariate logistic regression analysis were used to identify risk factors of EMS/AHPND with significant level at P-value < 0.05. Relationship between outcome of interested and potential risk factors were tested with lowess smoother plot. The categorical variable was created to improve the fitness of the model. Pairwise correlation among potential risk factors were performed for avoid the multicollineality problem (Dohoo, et al. 2012).

Results:

The prevalence of EMS/AHPND of studied samples were 33.4% (95% CI=26.9-40.9%). Using disinfectant for pretreatment water before adding to the culture pond and the occurrence of EMS/AHPND outbreak in nearby farm(s) were two risk factors of farm level showed the significant associated with occurring of EMS from the Univariate analysis. Additional for pond level analysis, applied teaseed cake to water during pond preparation, stocking postlarvae supplied from some specific hatchery, higher stock density (shrimp/rai), increasing the feeding rate during first month after stocking (kg/100,000 shrimp) were significant increased the prevalence of EMS. On the other hand, delay to feed shrimp with commercial pellet (day after stocking) and increasing in number of water adding time were found to have protective effect for shrimp. After study the relationship among EMS outbreak pond and the potential risk factors, the factor of total feed in one month old shrimp/100,000 pl were categorized to 1 if more than 120 kg and 0 if less than 120 kg (fig. 3)

Only two pond level factors showed significantly associated to increase risk of EMS/AHPND after finish the multivariate analysis.

Fig 3. *Lowess smoother plot of Total feed in one month old shrimp/100,000 pl (kg) VS EMS outbreak*

Those two factors consist of stocking the post larva from specific hatcheries and the increasing of total feed within 1 month period per 100,000 PLs after releasing PLs into the pond.

In addition, the occurrence of EMS/AHPND outbreak in nearby farm(s) was the farm level factor that increased more risk of disease in shrimp farm (table 1). This finding might indicate the water borne is a potential transmission route of the pathogen.

Table 1. *Risk factors associated to EMS/AHPND outbreak.*

Factor	Odds Ratio	95% CI	P>z
Pond level risk factors			
Source of postlarvae	2.36	1.04 - 5.39	0.040
Total feed in one month old shrimp/100,000 pl if more than 120 kg	2.46	1.16 - 5.24	0.019
Farm level risk factors			
Occurrence of EMS outbreak in nearby farm(s)	6.30	1.74 - 22.85	0.005

Conclusion:

This cross-sectional study is the first EMS/AHPND survey on shrimp farm in Thailand. Our study identified two risk factors for EMS/AHPND in shrimp pond and also caution for possible of water transmission of EMS/AHPND pathogen. The risk factors associated to EMS/AHPND outbreak could minimize by improving husbandry management both in hatchery and farm through the controlling EMS/AHPND bacteria from reaching high densities in culture systems and the avoidance of EMS/AHPND bacteria contamination in larvae and shrimp. Moreover, proper use of disinfectant (i.e. kind of agent, dosage) in the outbreak experience area was recommended.

Acknowledgements:

The project was supported financially by the Agriculture Research Development Agency (Public Organization).

Reference:

Cameron, A. 2002. Survey Toolbox for Aquatic Animal Diseases. A Practical Manual and Software Package. ACIAR Monograph No. 94, 375p.

Dohoo, I., Martin, W. and Stryhn H. 2012. Veterinary Epidemiologic Research. AVC Inc., 890p.