Report of Aquatic Animal Diseases in Thailand During January – June 2019

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Abstract

Aquaculture is an important industry in Thailand which has been established more than two decades ago. The cultured species are divided into two main groups; shrimp and finfish farming. The major cultured shrimp species are *Penaeus vannamei* (Pacific white shrimp), *P. monodon* (black tiger shrimp) and *Macrobrachium rosenbergii* (giant freshwater prawn), whereas the finfish are *Oreochromis* sp., *Lates calcarifer* and *Epinephelus* sp. Also, ornamental fish such as *Cyprinus carpio* (Koi carp), *Carassius* spp. (goldfish), and *Betta splendens* (fighting fish or betta). Disease outbreaks are the key factor that affect Thailand's aquaculture production and resulting in economic losses. The infectious diseases in aquaculture are mainly caused by viral and bacterial pathogens. In 2018, the reported shrimp pathogens are white spot syndrome virus (WSSV), yellow head virus (YHV) genotype 1, Taura syndrome virus (TSV), infectious hypodermal and haematopoietic necrosis virus (IHHNV), *Vibrio parahaemolyticus* causing acute hepatopancreatic necrosis disease (VP_{AHPND}), and microsporidian *Enterocytozoon hepatopenaei* (EHP). On the other hand, the reported pathogens in finfish are Betanodavirus causing viral nervous necrosis (VNN), Tilapia lake virus (TiLV) and *Streptococcus* sp. etc. In Thailand, the Department of Fisheries (DOF) is the competent authority for various aspects of aquatic animals including aquatic animal health.

Strategies to prevent and control diseases in aquatic animals include issuance of legislations/regulations, implementation of biosecurity measures, disease surveillance programs, capacity building, cooperation with international and national organizations.

Moreover, DOF has developed contingency plan in dealing with aquatic animal disease emergencies through the provincial fisheries officer. The provincial fisheries officer acts as director of emergency aquatic animal disease control center in each province, while Aquatic Animal Health Research and Development Division (AAHRDD) and Songkhla Aquatic Animal Health Research and Development Center (SAAHRC) serve as disease diagnosis and laboratory testing centers. Because of the above actions, we are capable of preventing and controlling disease outbreaks in the country. But during the occurrence of some diseases, we have no treatment to support and completely solve the problem. Example are viral diseases, unlike bacterial diseases which can be treated by using chemical or drug. Furthermore, there are a few researches that could be applied in farm level. Especially shrimp which has no adaptive immunity, so it is difficult to develop vaccine compare to fish. Therefore, DOF mostly recommended farmers to follow the good management practices on aquatic animal health for promoting sustainable aquaculture.

Introduction

Aquaculture is an important industry in Thailand and has been established more than two decades. The cultured species are divided into two main groups, shrimp and finfish farming. The major cultured shrimp species in Thailand are *Penaeus vannamei* (Pacific white shrimp), *P. monodon* (black tiger shrimp) and *Macrobrachium rosenbergii* (giant freshwater prawn), whereas the finfish species are *Oreochromis* sp., *Lates calcarifer* and *Epinephelus* sp. Also, ornamental fish such as *Cyprinus carpio* (Koi carp), *Carassius* spp. (goldfish), and *Betta splendens* (fighting fish or betta).

To raise the aquatic animal production to meet the global demand, the aquaculture industry has dramatically developed. However, development without good good aquaculture practices (GAqP) could be a negative factor that may reduce the ability of immune system or increase the susceptibility to diseases. Example is the higher stocking density in shrimp farms that led to the infection with yellowhead virus (YHV) in 1992 and white spot syndrome virus (WSSV) in 1994 (Briggs *et al*., 2004).

The infectious diseases in aquaculture are mainly caused by viral and bacterial pathogens. In 2018, the reported shrimp pathogens in Thailand are white spot syndrome virus (WSSV), yellow head virus (YHV), Taura syndrome virus (TSV), infectious hypodermal and haematopoietic necrosis virus (IHHNV), *Vibrio parahaemolyticus* causing acute hepatopancreatic necrosis disease (Vp_{AHPND}), and microsporidian *Enterocytozoon hepatopenaei* (EHP). On the other hand, the reported pathogens in finfish are *Betanodavirus* causing viral encephalopathy and retinopathy (VER) also known as viral nervous necrosis (VNN), Tilapia lake virus (TiLV) and *Streptococcus* sp. etc. Aquatic animal diseases are the key factor that affect Thailand's aquaculture production and resulting in economic losses. Therefore, it is important to prevent and control the occurring and emerging diseases in aquatic animal.

In Thailand, aquaculture and fisheries are under the responsibility of the Department of Fisheries (DoF). The strategies for controlling aquatic animal diseases (Polchana, 2019) are:

1. Development of related legislations and regulations under the Animal Epidemic Act B.E. 2558 (2015),

2. Disease prevention and control system following the concept of biosecurity,

3. Disease surveillance programs,

4. Training program and seminar for DOF officers and farmers about diagnostic methods, disease knowledge etc.,

5. Cooperation with international and national organizations. Moreover, DOF has developed contingency plan for dealing with aquatic animal disease emergencies by the provincial fisheries officer in the responsible area.

Shrimp diseases

Country update on diseases affecting Shrimp

Epidemiology

Prevalence of the disease

Severity and economic impact**.** During January to June 2019, the highest prevalence of shrimp disease was EHP,

(Table 1) which has been found in shrimp farms, including hatcheries, nurseries and grow-out farms. It causes growth retardation and increased size variability instead of mortality. On the other hand, EHP may be a cause of white feces syndrome (WFS).

MrNV was the second in disease prevalence but there was no report on its impact that affect the production. Moreover, the most of MrNV-positive animals did not show any clinical sign.

Species affected

- WSSV: Black tiger prawn (*Penaeus monodon*), Pacific white shrimp (*Penaeus vannamei*) and crayfish
- TSV: *L. vannamei*, *Macrobrachium lanchesteri* and some crab species
- YHV, EHP, and Vp_{AHPND} : *P. monodon* and *P. vannamei*
- *Mr*NV : *M. rosenbergii* and *M. lanchesteri*

Stages affected. Juvenile stage and small shrimp.

Risk factors associated with the different shrimp diseases are presented in Table 2.

History of occurrence

YHV, WSSV, *Mr*NV and TSV were found in Thailand more than 15 years ago and became endemic disease (Ganjoor, 2015). Presently, only WSSV has been reported as the cause of disease outbreak in specific area, whereas no report for others. Vp_{AHPND} occurred since 2012 and causing the big economic losses on shrimp farming during 2014-2015. In 2004, EHP was reported as new shrimp pathogen in *P. monodon* and the prevalence increase after Vp_{AHPND} outbreak (Putth and Polchana, 2016).

Table 1. Prevalence of shrimp diseases in Thailand (January–June 2019)

Diseases pathogens	Prevalence (total specimen)
1. Taura syndrome virus (TSV)	0.71 % (4,514)
2. White spot syndrome virus (WSSV)	1.20 % (5,258)
3. Yellow head virus (YHV)	1.36 % (1,760)
4. Infectious hypodermal and hematopoietic necrosis virus (IHHNV)	1.03 % (4,359)
5. Enterocytozoon hepatopenaei (EHP)	22.38 % (3,602)
6. Acute hepatopancreatic necrosis disease caused by *Vibrio parahaemolyticus* (Vp_{AHPND})	2.46 % (4,806)
7. *Macrobrachium rosenbergii* nodavirus (MrNV)	10.14 % (148)

Table 2. Risk factors of shrimp diseases

Diseases pathogens	Risk factors
1. TSV	salinity, vertical/horizontal transmission
2. WSSV	season change, water temperature, vertical/horizontal transmission
3. YHV	water quality, vertical/horizontal transmission
4. IHHNV	vertical/horizontal transmission
5. EHP	high organic matter, horizontal transmission
6. Vp_{AHPND}	high organic matter, temperature, horizontal transmission, salinity
7. MrNV	vertical/horizontal transmission

Diagnosis

Disease signs

Diagnostic methods employed. Observing the gross signs and detection by molecular technique using real-time PCR or conventional PCR.

Table 3. Clinical signs of shrimp diseases

Disease pathogens	Clinical signs
1. TSV	tail fan and pleopods distinctly red, multifocal melanized lesions on the cuticle
2. WSSV	white spots embedded within the exoskeleton, decreased or absent feed consumption and abnormal swimming behavior
3. YHV	yellow hepatopancreas, mass mortality in early to late juvenile stages
4. IHHNV	a deformed rostrum bent to the left or right, a marked reduction in food consumption
5. EHP	growth retardation, soft shells, lethargy, reduced feed intake and empty midgut
6. Vp_{AHPND}	pale-to-white hepatopancreas, empty gut
7. MrNV	whitish discoloration in the abdominal segment

Prevention and control

Approaches (chemical, biological): successful and failed approaches

- GAqP (i.e. pond and water preparations, water quality, stock density, feed control and quality)
- Probiotic application in farm

Fish diseases

Country update on diseases affecting Fish (FW/BW/MW)

Epidemiology

Prevalence of the disease

Species affected

- VER: Asian Sea bass (*Lates calcarifer*)
- TiLV: Tilapia (*Oreochromis* spp.)

Stages affected. VER and TiLV were mostly detected in young fish.

Table 4. Prevalence of fish diseases in Thailand (January–June 2019)

Disease pathogens	Prevalence (total specimen)
1. Viral encephalopathy and retinopathy (VER)	4.62 % (520)
2. Tilapia lake virus (TiLV)	17.65 % (221)

Risk factors

History of occurrence

The TiLV was found in Thailand during 2015-2016.

Diagnosis

Disease signs

VER: darkened skin, deformation of the backbone, abdominal distension, skin lesions, and fin erosion (Toffan, 2017)

TiLV: abnormal swimming, severe anemia, bilateral exophthalmia, skin erosion and congestion, scale protrusion, and abdominal swelling (Jansen & Mohan, 2017)

Diagnostic methods employed

Cell culture and molecular techniques

Table 5. Risk factor of fish diseases

Disease pathogens	Prevalence (total specimen)
1. VER	water temperature, salinity, ammonia level, vertical/horizontal transmission
2. TiLV	water temperature, salinity, vertical/horizontal transmission

Prevention and control

Chemical and biological approaches

Disease screening in broodstock and monitoring in fish/shrimp farms.

Scientific research done

Scientific studies conducted/ongoing

Country implementation of Aquatic Emergency Preparedness and Response Systems for effective management of aquatic animals

Monitoring system/mechanism on emerging/ existing transboundary diseases (especially the OIE-listed) in the region

Thailand has developed the Import and export regulations.

Entry level (importation)

- Requirement of health certificate from origin

  - Marine shrimp: Free of WSSV, IHHNV, YHV, TSV, IMNV, Vp_{AHPND}, EHP, SHIV

- Quarantine process and disease diagnoses at arrival

- Disease surveillance for targeted fresh/frozen products such as marine shrimp and asian sea bass

Exit level (exportation)

Regulation on registration of aquaculture establishment for exportation of aquatic animals. Under this regulation, the aquaculture establishment need to be registered and monitored the targeted diseases, which is based on the OIE-listed diseases.

Personnel competencies on recognition/ diagnostic capability / capacity and reporting of a disease emergency

There are several organizations of DoF involved in aquatic animal health, such as Aquatic Animal Health Research and Development Division, Inland Aquaculture Research and Development Division, Coastal Aquaculture Research and Development Division and Fisheries Provincial offices. The related staffs (i.e. Fisheries Biologists, Fisheries Provincial officers) have been trained for primary diagnosis of diseases and some staffs are the specialists in aquatic animal diseases.

For diagnostic laboratory, there are twenty laboratories which belonging to DoF, including two national reference laboratories and nineteen regional laboratories. These laboratories are located in different regions around the country. On the other hand, there are private and university laboratories that are capable of aquatic animal disease diagnosis. Moreover, DoF has developed contingency plan for dealing with aquatic animal disease emergencies by the provincial fisheries officer in the responsible area. The provincial fisheries officer acts as director of emergency aquatic animal disease control center in each province, while Aquatic Animal Health Research and Development Division (AAHRDD) and Songkhla Aquatic Animal Health Research and Development Center (SAAHRC) act for disease diagnosis and laboratory testing.

In addition, DoF staff are responsible to report the disease emergency in their area.

Also, fish farmers regularly report disease outbreak to the DoF staff.

Surveillance systems

There are two surveillance programs: passive and active. Passive surveillance programs are for targeted and non-targeted diseases; while active surveillance programs are for targeted diseases only. The disease surveillance system is an action plan of DoF to control aquatic animal diseases in the country. The surveillance system consists of active and passive surveillance programs.

Active surveillance program

- To declare country free status : IMNV, CMNV, NHPB etc.
- National surveillance to obtain disease status: WSSV, IHHNV, YHV, TSV, IMNV, VpAHPND, EHP, NHPB, KHV, SVCV, TiLV etc.
- Diseases farms should be from:

  -Exportation farm list : WSSV, IHHNV, YHV, TSV, IMNV, Vp_{AHPND}, EHP, MrNV/XSV, crayfish plague, TiLV, VNN, KHV, SVCV etc.

  -Hatchery farms of *P. vannamei*: WSSV, IHHNV, YHV, TSV, IMNV, Vp_{AHPND}, EHP
- Listed *P. monodon* hatchery and grow-out farms in cluster : WSSV, IHHNV, VpAHPND, EHP, YHV

Passive surveillance program

For targeted and non-targeted diseases. The samples are the aquatic animals which are suspected of having disease.

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