

# Current Status, Issues and Gaps of Aquatic Emergency Preparedness and Response Systems Practiced in Brunei Darussalam

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## Abstract

Importation of live fish to Brunei Darussalam have incurred a major biosecurity risk to the aquaculture industry. Preventing disease incursions through quarantine, legislation and education is currently the most cost-effective management approach in Brunei. Once an incursion has occurred, national emergency response system arrangements are implemented to facilitate immediate response actions for containment and eradication. Brunei Darussalam has a list of legislation and policies to aid in the immediate response of disease outbreak. However, fisheries staff lack basic emergency response training and there are few skilled staff and resources available. Simulation exercise to review the effectiveness of the AEPR system needs to be addressed.

**Keywords:** aquatic emergency, surveillance, disease

## Introduction

The fisheries industry in Brunei Darussalam has grown rapidly over the years with aquaculture being one of the sectors that has the potential to contribute to the country's revenue through export market. At present, aquaculture industry contributes 10% of the total fisheries output and is expected to be the main contributor by 2020, generating 60% of total estimated value of production. In 2017, the aquaculture industry produced 1,600 metric tons, growing at a rate of 18% since 2015.

However, with the increase in importation of live fish and in addition to neighboring countries being infected with diseases causing mass mortality, strengthening biosecurity measures and AEPR system have been implemented to avoid situations that could undermine the aquaculture industry in Brunei.

The Aquatic Emergency Preparedness and Response System (AEPRS) that is currently being practiced in Brunei Darussalam is composed of the following: (1) legislation and policy; (2) disease surveillance, monitoring and control systems; (3) diagnostic laboratory; and (4) national action plan to control disease outbreak.

## The aquaculture industry

Aquaculture production in Brunei records modest growth over the last five years contributing to a revenue of BND5.43 million in 2013 up to BND16.7 million in 2017. The total aquaculture production in 2017 was reported 1,600 metric tons. The main aquaculture products are *Litopenaeus stylirostris*, marine fish such as *Trachinotus blochii*, *Epinephelus* spp., *Lates calcarifer* and red tilapia. Black tiger shrimp (*Penaeus monodon*) and giant freshwater prawn (*Macrobrachium rosenbergii*) were also produced from 2012 to 2015.

The development of marine fish culture in floating cages started in 1980's using timber structure with cage capacity ranged from 27 m<sup>3</sup> to 50 m<sup>3</sup>. The initial stocking density is about 405 fish/cage up to 560 fish/cage giving production of 227 kg/cage. With the introduction of *Lates calcarifer*, later domesticated and produced locally, the marine finfish culture in floating cages has developed rapidly from four farmers in 1988 up to 48 farmers in 2015 with 3,285

cages. Offshore cages culture using composite iron was introduced in 2003 and the use of HDPE cages in 2009. Besides Asian sea bass, the marine finfish species cultured are *Epinephelus* spp. such as mouse grouper, tiger grouper, hybrid grouper (dragon grouper), and *Carangidae* spp. such as golden pompano *Trachinotus auratus*, red tilapia and cobia including other local marine finfish such as red snapper and trevally.

Shrimp culture is one of the fastest developing aquaculture activities in the Asian region including Brunei Darussalam. Black tiger shrimps (*Penaeus monodon*) was firstly produced locally from 1986 up to 1998 with production of 45 metric tons. Since the introduction of Mexican Blue Shrimp (*Penaeus stylirostris*) in late 1999, the shrimp industry has rapidly developed from 230 hectares in 1990 up to 300 hectares of shrimp farm areas in 2000's. At present, Mexican Blue Shrimp (*Penaeus stylirostris*) becomes the main species being cultured and constituted about 100% of the shrimp production in Brunei with production of 787 metric tons in 2015. Most shrimp farmers practices the intensive culture system with initial stocking density of 70-150/m<sup>2</sup> for rostris and semi-intensive culture for black tiger shrimp at stocking density of 20-40/m<sup>2</sup>. Both shrimp has achieved a good farm productivity of 23 mt/ha/cycle for rostris culture and black tiger shrimp achieved 6.0 mt/ha/cycle at harvested weight of 40 gram using disease-free postlarvae produced locally.

To date, the aquaculture industry in Brunei Darussalam are free of diseases listed in the national disease list and the World Organization for Animal Health (OIE). Strict biosecurity measures are in place in hatchery and farms by the implementation of Brunei Good Aquaculture Practice (BGAqp).

## Diagnostic Laboratory: Aquatic Animal Health Services Centre

The Aquatic Animal Health Services Centre (AAHSC) of the Department of Fisheries is responsible for providing diagnostic services to the growing aquaculture industry in Brunei Darussalam. The Centre plays a key role in aquatic animal disease prevention and control through providing diagnostic services. AAHSC uses the OIE standards to perform diagnostic testing on the aquatic animals in Brunei Darussalam.

The Centre currently provides five services; PCR, histology, microbiology, parasitology and water quality analysis for the aquaculture industry in Brunei Darussalam. The table below shows the list of diseases that are diagnosed in the laboratory and is economically important to the aquaculture industry in Brunei Darussalam.

**TABLE 1.** List of diseases diagnosed in the Aquatic Animal Health Services Centre

Species	Diseases
FISH	<ul style="list-style-type: none"> <li>• Koi herpes virus (KHV)</li> <li>• Spring viraemia of carp (SVC)</li> <li>• Red sea bream iridovirus (RSIV)</li> <li>• Epizootic ulcerative syndrome (EUS)</li> <li>• Viral nervous necrosis (VNN)</li> <li>• Irido megalocytivirus (Irido-M)</li> </ul>
CRUSTACEANS	<ul style="list-style-type: none"> <li>• Infection with white spot syndrome virus (WSSV)</li> <li>• Infection with infectious myonecrosis virus (IMNV)</li> <li>• Infection with infectious hypodermal and haematopoietic necrosis virus (IHHNV)</li> <li>• Infection with Taura syndrome virus (TSV)</li> <li>• Infection with yellow head virus genotype-1 (YHV)</li> <li>• Infection with <i>Macrobrachium rosenbergii</i> nodavirus (MrNV)</li> <li>• Acute hepatopancreatic necrosis disease (AHPND)</li> <li>• <i>Enterocytozoon hepatopenaei</i> (EHP)</li> </ul>

The PCR laboratory is also involved in two proficiency testing programs with the OIE reference laboratory for crustacean viruses, the University of Arizona and the Asia-Pacific Laboratory Proficiency Testing Program by Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia. These proficiency testing programs evaluates the laboratory capability to conduct diagnostic tests for infectious diseases and the quality of animals and animal products for international movement.

In 2010, Brunei declared itself free from four crustacean viruses and diagnostic testing were done using OIE standards.

AAHSC is currently practicing ISO/IEC 17025 in the laboratories and aims to obtain accreditation in 2019.

## Legislation and policy in relation to aquatic animal health in Brunei Darussalam

There are a number of legislations and policies to support the implementation of aquatic animal health strategies in Brunei Darussalam. These include: (1) Fisheries Order 2009; (2) National pathogen list for aquatic animal diseases; (3) Manual of Brunei Darussalam on Good Aquaculture Practices For Shrimp Farms; (4) Manual of Brunei Darussalam on Good Aquaculture Practices For Fish; (5) Manual of Brunei Darussalam on Official Controls for Exported Fishery Products; and (6) Department of Fisheries Action Plan for Disease Occurrence.

Prior to importation, import risk analysis is carried out for any introduction of new species into Brunei’s aquatic ecosystem. Health certification issued by the Competent Authority of the exporting country is analyzed and imported fish will be screened for target diseases upon arrival in the country.

For live fish movement within the country including stocking into farms, farmers are advised to request a ‘Laboratory Analysis Report’ from the hatchery to prevent the spread of diseases.

Farmers must also comply to the BGAqP as stated in the license conditions. BGAqP provides fundamental guides on codes of conduct and farm specification to ensure efficient and responsible aquaculture production and expansion. Among the benefits of BGAqP includes: (1) prevention or minimize risk on the food safety, environment, health, welfare of workers and the quality of products; and (2) to provide assurance to importing country on the safety and quality of local aquaculture products.

### Early warning system

A national monitoring system has been implemented to demonstrate disease free status of Brunei farms in accordance with the OIE Aquatic Animal Health Code. From this monthly surveillance program, aquatic animal health information system is established and is used for national reporting as well as to international bodies including the OIE and Network of Aquaculture Centres in Asia Pacific (NACA). Annual OIE report and the Quarterly

Aquatic Animal Diseases report is submitted to the OIE through Brunei Darussalam's delegate to the OIE.

Active surveillance program is carried out in the shrimp industry screening for all shrimp diseases listed in the national disease list and OIE. On the other hand, passive surveillance program is carried out in the fish industry.

Through the surveillance program, Brunei Darussalam has declared disease free status for white spot syndrome virus, taura syndrome virus, infectious myonecrosis virus and yellow head virus in 2010. However, the country was hit with a white spot syndrome virus outbreak in 2012 and is currently gathering epidemiological data to apply to the OIE for self-declaration of recovery of disease freedom from White spot syndrome virus.

### **Early detection system**

The Department of Fisheries has conducted training courses and on-ground awareness building for farmers and fisheries staff from the Mobile Technical Unit (MTU) and AAHSC on recognizing signs of the listed diseases, emerging disease or unexplained mortality. Pamphlets and posters on diseases related to the farmer's cultured commodities have been distributed to help recognize signs of diseases in their farms. To build national expertise on aquatic animal diseases, ongoing training courses on laboratory diagnostics are conducted annually.

### **Importation**

When imported fish are detected positive for diseases, Competent Authority of the exporting country will be notified to initiate investigation. Disease action plan is immediately implemented to prevent disease spread in the country.

### **Farm**

Once a suspicious report is received from the farm, immediate site visit by the MTU is done to start investigation. The ponds are quarantined, information are gathered and samples collected and sent to AAHSC for confirmation. When a positive is detected by the laboratory, disease action plan is implemented.

### **Early response system**

When a disease is detected, farms are declared as infected zone and disease action plan is implemented. Containment, mitigation, and eradication of disease is exercised. Routine monitoring of the farm is done until the area is declared safe for a new cycle start up, with a condition of a proof that the area is free from diseases.

### **Issues and gaps**

Brunei Darussalam already has an AEPR system in place with appropriate legislation and policies in relation to the aquatic animal health. However, the effectiveness of the EPR system needs to be reviewed through simulation exercises. Financial support plans and intensive training on individual roles and responsibilities of officers and personal involved in the disease action plan is required to strengthen the AEPR system.

### **Reference**

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