Current Status of Transboundary Fish Diseases in Brunei Darussalam: Occurrence, Surveillance, Research and Training

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I. Current Status of Koi Herpesvirus (KHV) in the Production of Common Carp and Koi

I-1. Production of Common Carp and Koi

Culture of common carp and koi has been established in Brunei Darussalam since the freshwater fisheries sector started. Breeding and rearing of fry and fingerlings were limited and confined to the Department of Fisheries at the beginning, but towards the early part of the 21st century breeding and rearing technology of these two varieties was transferred to the private sector successfully. Production from common carp for the last five years is in Table 1.

Common carp comprises a significant percentage (60%) of freshwater fish production by private operators in Brunei Darussalam. Other freshwater fish produced are tilapias (30%), which includes red tilapia commonly called Kromis locally, and other local and exotic species (10%). The common carp is not found in wild habitats and the source of spawners was Malaysia. At

Table 1. Production of common carp and koi from 1999-2003

Production(kg)	1999	2000	2001	2002	2003
Common carp	23,617	15, 862	17,279	31,543	53,708
Koi carp	28,225	60,000	54,000	72,040	48,700

Data source: Production data files Freshwater & Ornamental Fish Research and Development (FOFRaD)

present, there is no export of common carp and its demand locally is on the same level as other freshwater fish. The production from koi for the last five years is summarized in Table 1.

Koi is produced for two different purposes: first for ornamental purposes and second as food fish for other carnivorous species like Arowana (*Scleropages* sp.). Demand for the latter is higher and producers are more inclined towards production of koi carp for this purpose than for production as ornamental fish. Koi that are used as food fish (or "feeder koi") are cultured for 45 days to 2 months, while ornamental koi has to be grown for 6 months to a year to get the desired coloration and patterns. The process of selection for ornamental koi takes time and yields fish that is only about 10% of the total production. The feeder koi can be harvested 5-6 times a year at lesser cost because of cheaper feeds and less maintenance.

The sources of the spawners are Malaysia, Japan and Singapore. Koi is mainly kept in ponds for landscaping purposes and the fish are mostly imported.

I-2. Koi Herpesvirus Disease (KHVD) of Common Carp and Koi

Brunei Darussalam has no record of outbreaks of KHVD of common carp and koi.

II. Current Status of Viral Diseases and in the Production of Shrimps and Prawn

II-1. Production of Shrimps

a. Production of Ttiger Shrimp (*Penaeus monodon*)

Penaeus monodon broodstock and spawners are mainly obtained from the waters of Brunei Darussalam that are caught by trawlers and almost all postlarvae are produced in local hatcheries in Brunei Darussalam. In 2001, since there was a breakthrough in blue shrimp, *Litopenaeus stylirostris,* broodstock development, the production of *P. monodon* decreased due to the lower demand by the industry from that year on. Nevertheless, grow-out culture of *P. monodon* continued, but the local hatchery did not proceed with postlarvae production. This resulted in the importation of postlarvae from East Malaysia.

The production of shrimps in the last five years is summarized in Table 2. Of the values shown in the table from year 2001 to 2003, almost 90% was contributed by *L. stylirostris* and only 10% was production of *P. monodon*. Table 3 shows the combined volume of export and value of *P. monodon* and *L. stylirostris* produced in Brunei Darussalam. The shrimps are mainly exported to the USA, Japan and other ASEAN countries. Tables 4 and 5 give the comparative production in the hatchery of *P. monodon* and *L. stylirostris.*

Table 2. The production of *Penaeus monodon* and *Litopenaeus stylirostris* from 1999-2003

Production Metric Tons (MT)	1999	2000	2001	2002	2003
Shrimps	45.0	66.0	271.0	296.0	445.18

Source: Aquaculture Research Division (AQRD)

Table 3. The export figure of marketable-size shrimps from 1999-2003

Production (MT)	1999	2000	2001	2002	2003
Shrimps	10.09	58.75	128.15	100.0	97.68
Value B$	$121,150.00	$705,000.00	$1,485,50.00	$1,156,738.00	$1,023,450.80

Source: Information Section

Table 4. The production record of postlarvae of *Penaeus monodon* from local hatcheries from 1999-2003

Production (million)	1999	2000	2001	2002	2003
Penaeus monodon	24.0	15.0	Nil	Nil	Nil

Table 5. The production record of postlarvae of *L. stylirostris* from local hatcheries from 1999-2003

Production (million)	1999	2000	2001	2002	2003
Litopenaeus stylirostris	Nil	Nil	18.0	28.8	41.7

b. Production of Blue Shrimp (*Litopenaeus stylirostris*)

The introduction of *L. stylirostris* revolutionized the shrimp industry of the country by increasing the productivity and sustainability of shrimp farms.

c. Production of Freshwater Prawn (*Macrobrachium rosenbergii*)

Spawners of freshwater prawn are mainly collected from one of the main rivers of Brunei Darussalam, the Brunei River. Hatchery production of *Macrobrachium rosenbergii* started way back in 1983, but only at a small scale. When culture of *P. monodon* started in 1988, freshwater prawn culture was completely stopped. Not until in 2001 when hatchery operations for freshwater prawn was again revived (Table 6). The demand for marketable prawn in the local market is considered still good, but the supply from the

Table 6. The production record of postlarvae of *Macrobrachium rosenbergii* from the local hatchery from 1999-2003

Production (million)	1999	2000	2001	2002	2003
Fresh water prawn fry	Nil	Nil	43,5200	45,2020	52,1250

wild is decreasing maybe due to either resource depletion or habitat disturbances.

II-2. White Spot Syndrome Virus (WSSV)

Brunei Darussalam has no recorded outbreaks of WSSV in cultured shrimps.

II-3. Taura Syndrome Virus (TSV)

Brunei Darussalam has no recorded outbreaks of TSV in cultured shrimps.

II-4. Significant and Emerging Viral Diseases of *Macrobrachium rosenbergii*

Brunei Darussalam has no record for significant and emerging viral diseases of *M. rosenbergii.*

III. Surveillance, Monitoring and Diagnosis of Diseases of Aquatic Animals

III-1. Responsible Facility and Personnel

The responsible facility for surveillance, monitoring and diagnosis of diseases of aquaculture species is the Quality Assurance Section of the Department of Fisheries with an email contact address at fiqc@fisheries.gov.bn. Diagnosis and inspection services are being done by both Fisheries Officer and Fisheries Assistants. Surveillance and monitoring for diseases of aquatic animals are conducted once a month by taking water and fish samples from both cage and pond culture systems.

Altogether there are 33 cage culture operators, 14 shrimp pond operators, and 2 Department of Fisheries facilities with hatchery, nursery and grow-out ponds. The cages and ponds are located in three different districts in Brunei Darussalam.

There are only two Fisheries Assistants to do this surveillance and monitoring work at present. The other activities that they are doing include red tide monitoring. If there are disease outbreaks, the Quality Assurance Section also receives direct reports from cage and pond operators, as well as from concerned citizens in their respective areas. The Quality Assurance Section has prepared a standard reporting procedure for any fish mortalities, which is caused by disease outbreaks.

III-2. Diagnostic Capabilities and Major Diseases of Aquatic Animals

The capability and contact numbers of the Quality Assurance Laboratory are in the following box. There are no serious diseases being reported. However, in most shrimp culture runs, there are reports of soft-shelled and broken sized shrimp obtained upon harvest.

Fish health laboratory	Level I	Level II	Level III	Contact Information
Quality Assurance Laboratory (Government owned)	Ẽ		Ẽ	E-mail: fiqc@fisheries.gov.bn Tel: (673)-2-772230/ 770236 Fax: (673)-2-770237/382069

IV. Quarantine Services to Prevent Entry of Diseases of Aquatic Animals

IV-1. Responsible Agency and Personnel

At present there is no quarantine or disease screening procedure for imported and exported fish in Brunei Darussalam, but a health certificate from the country of origin is required.

In Brunei Darussalam, the Quality Assurance Section of the Department of Fisheries is responsible for quarantine of aquatic animals. The quarantine area is still in the planning stage and it will be located at the nearest point of entry to the country such as the airport and at the immigration border points. The Department of Fisheries has existing facilities such as holding tanks and a fish disease laboratory to carry out quarantine.

The responsible person who will conduct quarantine and inspection services will be under the supervision of the Quarantine Officer with the assistance of two Junior Fisheries Assistants. The level of diagnosis to be used at quarantine stations will be only at Level 1.

IV-2. Procedures and Requirements for Importation

When importers want to bring live aquatic animals into Brunei Darussalam, the following requirements should be fulfilled:

Arriving Live Aquatic Animals at Port of Entry

1. The applicant submits an application form with an attached Business Registration Certificate. This is based on Section 16 and 17 of the Fisheries Operation Document issued by the Attorney General Chambers of Brunei Darussalam. A copy of the applicant's identification card is also required.
2. The applicant must be a citizen of Brunei Darussalam with a permanent resident status.
3. The applicant undergoes an interview for more data gathering.
4. The applicant's facilities and equipment will be inspected.
5. Upon endorsement, application for export permit will be issued under the following conditions:
   - Payment of Licence fee of B$ 20.00 per consignment;
   - The importer agrees with the conditions for importing of live fish; and
   - The applicant agrees and signs the rules and regulations with regards for importing live fish.

The following activities will be done randomly upon arrival of the consignment of imported fish (mainly aquarium fishes):

1. The quarantine officer conducts a preliminary visual inspection of the shipment for any sign of abnormalities and to observe fish behavior at the port of entry. He obtains 10% of fish or a maximum of 30 fish from each shipment of live fish and brings the sample for further laboratory examinations for bacteria and parasites;
2. After inspection, the quarantine officer prepares a report and release of the fish consignment depends upon the technical findings; and
3. If the quarantine officer is not satisfied with the health status of the consignment, all the fish will be transferred to the holding tanks at the quarantine facilities for further observations. Depending on the result, the shipment or consignment can be further treated or destroyed.

The Fisheries Act Chapter 61 (Paragraph 5, Fisheries Regulations) states that anybody found guilty of violating import regulations will be given three consecutive warnings. When the offenses reach the fourth time, the applicant will be then referred to the court action and will be charged accordingly.

The above documents are required before importation of any fish, either for consumption or aquarium purposes, into the country. For importation of aquarium fishes, and shrimps broodstock and postlarvae, a health certificate is required from the country of origin. While for fishes for consumption purposes, permits are the only requirements.

IV-3. List of Quarantinable Diseases of Aquatic Animals in Brunei Darussalam

Table 7 lists the quarantinable diseases and related information on period of holding and treatment, where necessary.

V. Research and Training of Fish Health Staff for Quarantine, Diagnosis, and Surveillance of Diseases of Aquatic Animals

There are no research activities, but there is a program to produce and maintain Specific Pathogen Free (SPF) broodstock for *L. stylirostris*. At present the Department of Fisheries is the only agency conducting a minor fish disease research in Brunei Darussalam.

There is only one report on the prevention and control of diseases in cage culture systems in Brunei Darussalam in English published in 1999 for the Department of Fisheries by Dr. L.K.S.W. Balasuriya, Fish Disease Pathologist from Sri Lanka.

As for training, the Quality Assurance Section of the Department of Fisheries is the only agency conducting training on Fish Diseases. At present, there is no training for quarantine, diagnosis and surveillance of aquatic animals in the country, but we do have related seminars from time to time

Table 7. Quarantinable fish diseases

Fish Diseases	Disease or Disease Agent	Quarantine Period	Treatment
a. Protozoan	*Piscioodinium* Trichodiniasis Apiosoniasis *Ichthyophthirius* Chilodonelliasis	10-14 days	Malachite green (<1 ppm) Methylene blue (5ppm) Formalin (10-15%) Salt
b. Bacterial	*Aeromonas* sp. *Vibrio* sp. Tail rot	3 consecutive treatments for 3 days	Oxytetracycline (5-25 ppm)
c. Fungal	Saprolegniasis	5-10 days	Formalin (10-15%) Malachite green (<1 ppm)
d. Parasitic	*Argulus* sp. *Lernaea* sp. Dactylogyrosis Gyrodactylogyrosis	3 days	Dipterex (0.5-3 ppm)
e. Viral	Lymphocystis	–	No treatment, but 5-10% formalin, or methelyne blue (2 ppm) may be used during quarantine

conducted by outside consultants, such as from Malaysia. The recent training was done in March 2004, which involved both the Department of Fisheries Personnel and fish and shrimp operators. The topic covered was related to both cage and pond management.

The country needs training of more staff who will support the needs for surveillance, monitoring and diagnosis, especially to enhance activities in Level I, II and III diagnoses.

Reference

Balasuriya LKSW. 1999. Prevention and Control of Diseases in Cage Culture Systems in Brunei Darussalam. Department of Fisheries, Brunei Darussalam.