

COMMERCIAL PRODUCTION OF SPF *Penaeus monodon* BROOD STOCK IN MALAYSIA

K.SUBRAMANIAM
DoF



COLLABORATIVE PROGRAM BETWEEN

DEPARTMENT OF FISHERIES

&

BLACK TIGER AQUACULTURE S/B

DoF



BTA



Aquaculture Production Target 2010

662,00mt

Cluster	Commodity	Quantity (mt / tails)	Value (RM mil)
1.	Aqua - Shrimp	180,000	3,750
2.	Aqua - Marine Fish	122,000	2,274
3.	Aqua- Bivalves	130,000	127
4.	Aqua – Fresh Water	230,000	465
	TOTAL	662,000	6,616
	Aquarium Fish	800 mil tails	190
	Seaweed	123,000	380

Shrimp Production Target 2010

180,000mt

RM 3.750 billion

Aquaculture Production (Shrimp) in Malaysia

Year	Shrimp Production (mt)	Increase in production with respect to previous year
1995	6,779	
1996	7,748	969
1997	10,385	2,637
2000	17,231	6,846
2002	24,832	7,601
2003	26,179	1,347
2004	30,839	4,660
2005	35,142	4,303
2006	38,264	3,122
2007	60,000	Estimate (80% white shrimp)
2010*	180,000	

* projected figure based on NAP3 (1998-2010) NA

Shrimp PL requirement (180,000mt)

- Shrimp PL requirement - **12.0 billion** high health PL

Shrimp Brood Stock requirement

- Approximately **120,000 pieces** of clean stock
- But wild stock - about 70% are infected or carriers
- Stringent disease screening is required
- About 50% of the balance stock (30%) face mortality
- Leaving behind only 15%
- Actual no. required - increase six fold (**720,000 pieces**)

Shrimp Culture in Malaysia

- Started in Johor in the **1930s** with trapping pond system
- Late 1960s hatchery production of tiger shrimp PL
- Modern pond system in **1970s**
- Extensive, semi-intensive & Intensive
- Late **1990s** extensive system phased out & some farms even went for heavy stocking using super-intensive system
- **WSSV disease out break - 1999**

What's the major issue in Black Tiger Shrimp Culture?

- WSSV Disease outbreak in 1999 causing mass mortality & economic losses



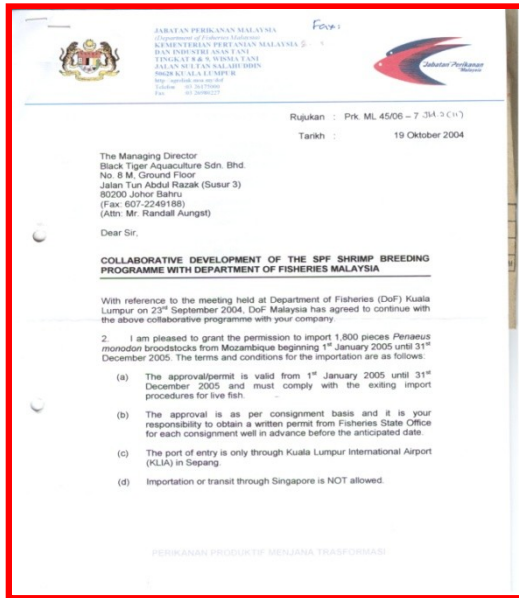
mass mortality



Action Taken For Development of Shrimp Industry

- Application of best management practices
- Development of sustainable production system
- Introduction of Pacific White Shrimp
- Production of SPF brood stock and disease free post larvae for black tiger shrimp – the forward

Collaborative Program on SPF *P. monodon* Brood Stock



INITIATED
IN
OCTOBER,
2003



Hatchery Facilities

BTA HATCHERY, TG. RESANG, MERSING





***P. monodon* Brood Stock Domestication and selective breeding programme**



Early History of BTA Breeding Program

- **2002-2003 Use a portion of the production hatchery for primary and secondary quarantine of Sabah, Terengganu and Penang brood stock in an attempt to produce SPF stock.**
- **High mortality from virus and insignificant number of offspring were produced. (First Phase)**
- **Realized the necessity of stocks with low incidence of disease, more bio-secure facilities, and more rapid diagnostic capability.**
- **2002 and 2003 Mozambique animals were imported to Singapore and tested for 5 viruses, and confirmed to be disease free.**
- **October 2003 –started the collaborative program with DOF and using Mozambique brood stock. (Second Phase)**

History of Brood stock procurement

Batch	Month
1 st	October 2003
2 nd	November 2003
3 rd	December 2003
4 th	January 2004
5 th	May 2004
6 th	June 2004
7 th	August 2004
8 th	October 2004

Over **RM 500,000** were invested in the purchase of wild brood stocks from African Continent

Phase 1 of SPF Program (2001-2003)

- **146 wild stock from Terengganu, Penang & Sabah were used**
- **Only 32.95 were clean stock**
- **Program terminated because of high cost of disease screening to get the required number of clean stock for SPF program**

Phase 2 of SPF Programme (Oct. 2003 – Present)

- **Imported shrimp brood stock from African continent**
- **Followed the quarantine procedures strictly with the supervision of Fisheries staff**
- **Followed the viral screening process for 7 different viruses (WSSV, IHHNV, YHV, TSV, GAV, MBV, & HPV)**

Current Approach

- **Develop SPF lines for Breeding Program per protocols developed by Prof Donald Lightner.**
- **Family selection in combination with individual selection for Breeding Program.**
- **Mass Selection in combination with Family Selection for Production Hatchery.**



SPF Facilities



Primary & Secondary Quarantine And Water Discharge Treatment Facility



SPF Procedures

Virus Screening in Primary Quarantine

- **WSSV, YHV, GAV AND TSV** were screened 3 times at two weeks interval
- **MBV and HPV** were screened 5 times in the same period
- **Stocks positive to any one of these viruses are destroyed**
- **Stocks with negative results for these viruses are selected in the third screening and sent to secondary quarantine for post larvae production.**



Screening for Infectious Viruses

Primary Quarantine



Secondary Quarantine

- **Stocks with negative results for these viruses are selected in the third screening and sent to secondary quarantine.**
- **Stocks are tagged using eye tag bands**
- **Released into 10 ton tanks and given ESA treatment**

Spawning & Egg collection

- **Matured shrimps ready for spawning are collected and placed in spawning tank.**
- **Spawns are collected and placed in hatching tanks**
- **Shrimp nauplii from a single spawn considered a family and raised to PL to constitute a family (founder stock- 100families)**



Primary & Secondary Quarantine And Water Discharge Treatment Facility



PL rearing production in the secondary quarantine to produce Founder stock (F1 brood stock)



Outdoor Brood Stock Rearing Facilities

Where PL were stocked and raised to brood size





Shrimp Brood Stock Selection



Production of F2 Generation

- Selected brood stock from grow-out ponds were brought to primary quarantine
- Virus screening was strictly followed
- Brood stock cleared third screening process sent to secondary quarantine
- Second generation of PL were produced through the mass selection process (**marked using elastomer dye for family selection**)
- PL were sent to out door grow-out ponds to produce F2 brood stock

Production of F3 and subsequent Generations

- **Selected brood stock from grow-out ponds were brought to primary quarantine**
- **Virus screening was strictly followed**
- **Brood stock passed the third screening process sent to secondary quarantine but strictly using family pairing method**
- **Third and subsequent generations of PL were produced through the family selection process**
- **PL were sent for grow-out purpose in the indoor breeding tanks and others to the out door grow-out ponds.**

Indoor Brood Stock Rearing Facilities (For Family Selection F3 ~ F5)



Indoor Brood Stock Rearing Tanks



Results & Discussion

Brood Stock Maturation

(Mozambique stock)

Generation	Duration for Maturation	Mating %
F1 Brood stock	12 – 13 months	1.8 per day
F2 Brood stock	11 – 12 months	1.8 per day
F3 & F4 Brood stock	10 – 9 months	3.3 % per day

**Facilities for
Commercial
Production of SPF
Post-larvae**

Commercial Production of SPF PL



Water Treatment Tanks



Seawater Reservoir 520 tons

WATER STORAGE AND TREATMENT FACILITIES



U.V. Treatment



Sand Filter & Foam Fractionator



Hatchery New Spawning & Hatching Facilities





Larval Rearing & Nursery Facilities



Performance of Larvae Culture

Generation	Spawning & No of eggs/spawn	Survival Rate (Nauplii to PL)	PL size
Wild Stock	Maximum 3 times	35%	PL 18
F1 Brood stock	Max. 10 times (250,000 pieces)	30 – 40%	PL 18
F2 to F4 Brood stock	Max. 10 times (200,000 pieces)	57.0%	PL15

**Performance in
Commercial Grow-out
Culture of SPF
Pos-larvae**

Stocking SPF PL for commercial shrimp production





Harvesting of SPF Shrimp from commercial operation



Grow-out Culture

Generation	DOC for 25 g	Survival Rate	FCR
PL from F1 Brood stock	135 days	63 %	1.89
PL from F2 Brood stock	116 days	66%	1.7
PL - F5 generation	100 days	Culture in progress	

Grow-out Culture

- Farms with good farming practices did not performed well without any disease incidence using BTA –SPF-PL
- MBV & HPV detected at early stage in F1 & F2 but totally eliminated in the subsequent generations
- IHHNV was detected but proven to be an integrated virus (part of the genome of African stock) and not an infectious type- PCR primers are available now to differentiate the two.

Benefits of Genetic Improvement

- Direct and speed the process of domestication
- Genetic gain of 10-15% per generation for growth
- Healthier animals
- Product quality (**No tail rot, no soft shell, no blue color, good texture and color**)
- Increased production efficiency
- Sustainability and growth of aquaculture industry

Uniqueness of SPF stock



Tip of the uropod is reddish



Basal region of the pleopod is white in color

Uniqueness of SPF stock



Local stock



SPF stock

Uniqueness of SPF stock



Conclusion

Success Story

- Though WSSV is widespread in the country, black tiger shrimp culture is possible to continue with SPF stock as a result of the collaboration between DoF & BTA
- Non of the farms with good farming practices using SPF PL has reported any WSSV, YHV, GAV & MBV disease outbreak
- More farmers will get back to black tiger shrimp culture
- Many shrimp processors in the region could not penetrate the Australian market due to its stringent quarantine measures against pathogenic virus in raw and semi cooked product. **SPF products from Malaysia has been accepted successfully**



THANK YOU