

The Present Status of *Penaeus vannamei* and Other Exotic Shrimp Culture in Indonesia

Agus A. Budhiman

Tatie Sri Paryanti

Anto Sunaryanto

Directorate General of Aquaculture
Ministry of Marine Affairs and Fisheries



P. vannamei culture in East Java

I. INTRODUCTION

1.1. Background

Shrimp culture is playing an important role in the contribution of foreign exchange earnings in Indonesia. However, for two decades, particularly in 1985 to 1994 the production of shrimp (*P. monodon*) had drastically decreased from 180,000 mt in 1984 to 35,058 mt in 1994, although total production of shrimp from both capture and aquaculture increased in the next 10 years, obtaining annual growth rate of 3.50%, from 170,563 mt in 1993 up to 477,332 mt in 2003 (Table 1). Production from aquaculture itself has merely grown to 2.80%. This was due to disease problem caused mainly by viral diseases called *Monodon Baculovirus* (MBV) and White Spot Syndrome Virus (WSSV), which started in 2000.

Table 1. Production of Shrimp, 1993-2003 (in Metric Tons)

Production	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Aquaculture	13,786	135,058	146,608	151,759	167,445	118,111	140,946	143,721	149,168	159,597	168,662
Capture	156,777	177,734	181,954	187,269	213,252	222,550	238,865	249,032	263,037	241,485	308,670
Total	170,563	312,792	328,562	339,028	380,697	340,661	379,811	392,753	412,205	401,082	477,332

The total shrimp export showed a significant increase in ten years for both volume and value, with growth rate of 4.91% for volume and 0.78% for value, gaining 98,569 mt worth US \$ 867,703 in 1993 to 137,636 metric tonnes worth US \$ 850,222 in 2003 (Table 2).

Table 2. Total Shrimp Export, 1993-2003

Quantity & Value	Year										
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Quantity (ton)	98,569	99,523	94,551	100,230	93,043	142,689	109,650	116,188	128,830	124,765	137,636
Value (US\$)	876,703	1,009,738	1,307,006	1,017,89	1,011,467	1,001,467	888,982	1,002,124	934,989	836,563	850,222

Taking into account that shrimp culture is one of the prime commodities, potential to increase foreign exchange earnings, the Government has made some efforts to cope with disease problems besetting the industry. In this regard, the Director General of Aquaculture, Ministry of Marine Affairs and Fisheries (DGA-MOMAF) is considering other shrimp culture species as alternative. In 2000, DGA made a business breakthrough by giving license to the private sectors to import broodstock and post larvae of *P. vannamei* into the country. Since then, the *P. vannamei* culture has been practiced in potential provinces in Indonesia.

The success story of *P. vannamei* culture has encouraged many farmers who used to culture *P. monodon*, to try the new shrimp species. This increased shrimp aquaculture production, contributing 37.11% to national production in 1999 and 41.2% in 2003.

1.2. The story of *P. vannamei* and *P. stylirostris* in Indonesia



P. vannamei (60-70 tails/kg)



P. Stylirostris (40-50 tails/kg)

After being given the license, the private sectors (PT Central Pertiwi Bahari, and PT Surya Adikumala Abadi) imported 2,000 *P. vannamei* brood stock and 5.1 million PL from Hawaii and Taiwan to Indonesia, while only one license given to PT Udang Super Indonesia to import 2,000 PL *P. stylirostris*. In line with the policy on species introduction to the private companies, The Gondol Research Institute for Mariculture in Bali (GRIM) has conducted experiments on *P. vannamei* culture. This paved the way for the official release of *P. vannamei*. Held in Banyuwangi District of East Java Province, the *P. vannamei* was released by the Minister of Marine Affairs and Fisheries as one of the commodities having advantages to support and generate shrimp farming industries. The Ministerial Decree Number: KEP. 41/MEN/2001 concerning Releasing Vannamei Shrimp as the Superior Variety of Shrimp controls production and distribution of the species. To protect and conserve fishery resources in Indonesia, the Ministry of Marine Affairs and Fisheries has taken action to regulate the introduction of exotic fish/shrimp to Indonesia, through the following procedures:

- Determine port of entry
- Risk analysis approach

- Empower Fish Quarantine System in the Port of Entry
- Seed testing to ensure better growth, free from disease, ecological test and socio-economic feasibility, mainly for new species.

Each importer should be provided with Documents of Import, consisting of:

- License of being aquaculture enterprise
- Official letter from Fishery District Office to support and allow import of new species to be cultured in particular district area,
- Recommendation letter from Director General of Aquaculture
- Certificate of Health and Certificate of Origin from The Country of Origin. Certificate of Health concerns to information status of epidemiology and information of pest and disease in the country of origin during the last two years, signed by authorized institution. Certificate of origin covering description species and or variety, biological character, genetic and ecological, as well as level of generation (F1, F2 or F3), signed by the authorized institution.
- Work Plan for production and distribution,
- Compliance with regulation on Fish Quarantine System, Import and Distribution of Seed and Brood-stock System

Development of shrimp culture varies from one province to another. In East Java, development of shrimp culture is relatively faster than the others as indicated by the faster growth in the number of hatcheries as well as grow out activities in brackishwater pond. To some extent, this province is currently the main source of broodstock. Despite occurrence of diseases, particularly of TSV (Taura Syndrome Virus) in November 2001, most of shrimp farmers are still interested to develop their business.

The success of *P. vannamei* culture in Banyuwangi (East Java) has encouraged other shrimp farmers in the region particularly in the provinces of Bali, Lampung, West Java, Central Java, South Sumatera, North Sumatera, Bangka Belitung, Riau, West Kalimantan, East Kalimantan and West Nusatenggara and Bengkulu to go into *P. vannamei* culture. However, the Monitoring Surveillance and Evaluation Team of the DGA, found some constraints in the development of the culture industry – and one of those is disease problem.

II. REGULATORY AND POLICY SUPPORT

2.1. Seed Regulations

- Ministerial Decree No. 26, 1998: Guideline for National Seed Development
- Ministerial Decree No. 810/KPTS/IK.210/7/1999: Testing, Evaluation, and Release on Fish Species and or Fish Variety;
- Ministerial Decree. No. 811/KPTS/IK.450/7/1999: Assignment of TIUs of DGA as 7 Certification Institutes on Seed Quality Control Management and Testing Laboratory.
- Ministerial Decree No. 812/KPTS/IK.110/1999: Forming Evaluation Team and Release on Fish Species and or Fish Variety.
- Ministerial Decree No. 41/2001 dan No. 15/2002): Release of *Litopenaeus vannamei* dan *P. stylirostris* as prime commodities.
- Decree of DGA: No. 6375/D/DPB.1110.D1/XII/03: NBADP–Jepara as National Shrimp Brood-stock Center and RBADP–Sitobondo, RBADP Takalar, RBADP Ujung Bate (Heavily Damage due to Tsunami) as The Regional Shrimp Broodstock Center.

2.2. Live Movement Regulations

- Ministerial Decree: 08/MEN/2004: Procedure to Introduce New species and New Variety of Fish to Indonesia Territory.
- SE DGA No. 213/DPB4/PB.420.D4/1/04: Live Shrimp Movement Free from TSV and wssv.

2.3. Feeds

- Ministerial Decree. No. 45/MEN/2004: Provision and Distribution of Fish Feed
- Strengthening Testing Laboratories of Technical Implementing Units (TIUs)

2.4. Drugs

- Ministerial Decree. No. 20/MEN/2002: Fish Drug Classification.
- Ministerial Decree. No. 26/MEN/2002: Provision, Distribution, Utilization and Surveillance for Fish Drugs.
- Ministerial Decree No. 27/MEN/2002 Forming Commission of Fish Drugs;
- Decree of DGA. No. 548/DPB4/TU.110.D4/II/03: Forming Evaluation Committee on Fish Drugs;

2.5. Program Implementation

- Shrimp Intensification Program
 - Ministerial Decree No. 09/MEN/2002: Intensification Program;
 - DGA Decree No. 1022/DPB.3/PB.320.D3/III/2003 Guideline of Intensification Program;
- Implementation of Shrimp Culture Guideline (Ministerial Decree No 28/MEN/2004)
- Principle of Shrimp Culture Certification (DGA Decree No. 2951/DPB.3/PB.140.D3/VII 2004: Shrimp Culture Certification.

III. IMPLEMENTATION AND DEVELOPMENT OF *P. vannamei* CULTURE

3.1. Hatchery



Success story of the culture of *P. vannamei* in many regions has resulted to high demand of seeds and consequently, broodstocks. In some areas, farmers have been attempting to produce their own broodstock taken from ponds, and sell to shrimp hatcheries. Some shrimp hatchery operators prefer local broodstock because they are much cheaper compared to imported ones unaware that they maybe are potential disease carriers. At present the price for brood stock varies from one site to another, ranging from 25,000 to 40,000 rupiahs while imported brood stocks, ranging from US \$ 22 - US \$ 32 (US \$ 1 equals to

9,200 rupiahs). On the other hand, the price of marketable size of *P. vannamei* (size 60 shrimps/kg) is 50,000 to 60,000 rupiahs per kg.

The low price of broodstock will subsequently result to cheaper post larva, but may ignore the Best Management Practice of Shrimp Culture, which DGA has been promoting to farmer groups in potential areas. Previously the price of PL is very cheap, ranging from 15-17 rupiahs, while from imported broodstock was 33-35 rupiahs. There are only 13 large scale hatcheries producing good quality larvae, with some maintaining their business by importing broodstock.

Table 3 on next page shows the licensed importer shrimp hatcheries during the year 2004, Table 4 gives an illustration on how activities on hatcheries of *P. vannamei* development was growing since the past 4 years.



Table 3. List of Licensed Importer Shrimp Hatcheries, January–December 2004

No	Shrimp Hatcheries	Species	Country of Origin	Male/ Female	Amount Recommended	Total import
					Female and Male	Female and Male
1	PT. Biru Laut Khatulistiwa	<i>Penaeus vannamei</i> , broodstock	Hawaii-USA	Male and Female	10,000	1,022
			Hawaii-USA	Female Male	4,133 3,978	867
2	PT. Tirta Mutiara Makmur	<i>Penaeus vannamei</i> , broodstock	Hawaii-USA	Male and Female	1,000	420
			Florida-USA	Male and Female	530	424
3	BBAP Situbondo	<i>Penaeus vannamei</i> , broodstock	Hawaii-USA	Male and Female	1,000	
4	PT. Surya Windu Pertiwi	<i>Penaeus vannamei</i> , broodstock	Hawaii/Florida-USA	Male	2,500	1,725
				Female	2,500	
				Male	4,000	
				Female	4,000	
5	PT. Central Pertiwi Bahari	<i>Penaeus vannamei</i> , broodstock	Hawaii-USA Hawaii/Florida-USA	Male	7,500	6,715
				Female	7,500	6,743
				Male	10,000	-
				Female	10,000	-
6	PT. Alamanda Tjandra	<i>Penaeus vannamei</i> , broodstock	Hawaii-USA	Male and Female	2,000	-
7	PT. Suri Tani Pemuka	<i>Penaeus vannamei</i> , broodstock	SIS Florida-USA	Male and Female	3,000	400
						400
8	CV. Sumber Niaga Sejahtera	<i>P. vannamei</i> broodstock	Florida/Hawaii-USA	Male and Female	5,000	-
9	PT. Maju Tambak Sumur	<i>Penaeus vannamei</i> , broodstock	Florida/Hawaii-USA	Male and Female	3,000	
					3,000	
Total					84,641	20,454

Table 4. Development stage and Productivity of *P. vannamei* within the period 2001-2004

Stage of Culture	2001	2002	2003	2004
Broodstock	Imported Without tested by PCR	Imported Local broodstocks are initially produced Without tested by PCR	Imported Local broodstocks are started to be used Without tested by PCR	Imported Local broodstocks are commonly used Imported broodstocks are tested by PCR
Post Larva	Price, 25 Rp/PL Without tested by PCR	Price, 17 Rp/PL Price up to 20 Rp/PL Without tested by PCR	Price, 5-10 Rp/PL Seed are started to test by PCR	Price, 18-25 Rp/PL Seed are started to test by PCR
Productivity	Fecundity, 50,000 SR: 20 %	Fecundity: 75-100.000 SR: 20-30 %	Fecundity: 75-100.000 SR: 20-30 %	Fecundity: 75-100.000 SR: 20-30 %
Disease: White Spot TSV	Not detected Indicated	Not detected Found in broodstock at only one hatchery	Not detected Not detected	Not detected Not detected

3.2. Grow-out

Within less than one year of development, *P. vannamei* shrimp, culture could seemingly overtake the tiger shrimp. Intensification of tiger shrimp culture has slowed down with farmers considering shifting to new species. The farmers have a lot of experiences in producing white shrimp, and advantages of this species over others, include fast growth, shorter culture period, more resistant to disease and environment change, and more efficient feed conversion rate. Besides, culture practices of *P. vannamei* are also similar to that of tiger shrimp, although it is necessary to often maintain water circulation in the pond. Ease in management and to some extent promising good harvest, are encouraging more farmers to culture white shrimp rather than tiger shrimp. It was proven within the period of three years that production of white shrimp has increased significantly from 29.3 % in 2002 to 47.6 % in 2004, and expected to be 66,7 % in 2005, where production of white shrimp will be two-thirds of the national aquaculture shrimp production (Table 5).

Table 5. Production of Tiger Shrimp and *P. vannamei* from Aquaculture (in Metric Tons)

Species	2002	2003	2004*	2005**
Tiger Shrimp (<i>P. monodon</i>)	112,840 (70,7%)	119,249 (70,7%)	127.119 (52,4%)	100 (33,3%)
Others (<i>P. Indicus, P. vanammei</i>)	46,757 (29,3%)	49,413 (29,3%)	115,441 (47,6%)	200 (66,7%)
Total	159,597	168,662	115,568	300

* Estimated ** Projected

Although the culture of white shrimp is very promising, it does not mean that all business is fully successful. In Bali and East Java, harvest failures happened recently, and it was presumably due to viral diseases.

Table 6. Four Year Development Stage of *P. vannamei* Culture (Grow-out)

Items	2001	2002	2003	2004
Source of PL	imported broodstock	imported broodstock	imported broodstock	Imported broodstock
		Started to use PL from local broodstock	PL from local broodstock is much used	PL from local broodstock is much more used
Stocking Density	35–70 PL/m ²	40–100 PL/m ²	40–100 PL/m ² and more	70–100 PL/m ² and more
Culture period	2½–3 months	2½–3½ months	3–4 months	3–4 months
FCR	1,4–1,5	1,4–2,0	—	—
SR	> 90 %	80–90 %	80–90 %	80–90 %
Productivity	8–12 ton/ha/year	8–15 ton/ha/year	10–20 ton/ha/year and more	15–20 ton/ha/year and more
Harvested size	60–70/kg	60–80/kg	60–80/kg	60–80/kg
Price of marketable size	Rp 70,000/kg	Rp 27,000–Rp 35,000	Rp 27,000–Rp 35,000	Rp 35,000–Rp 50,000
Disease:				
White Spot	Not found	Not found	Not found	Not found
TSV	Found in Situbondo District, East Java	Not detected	Detected on February and March in Gresik District, East Java	Not detected

IV. PROBLEMS AND CONSTRAINTS

Within four years of development, some problems and constraints occurred to the industry, among others are:

a. Limited quantity and quality of broodstock

Imported *P. vannamei* broodstocks are better compared with those taken from ponds. The imported broodstock produce better quality post larvae. However, imported broodstock is costly and time consuming, and in certain period of time is not available. Obtaining broodstock from grow-out ponds is a viable alternative, but may be of high risk. Maintaining and encouraging breeders to use PCR-tested broodstock is also time consuming, and their understanding about PCR test is very limited. This is also true to hatchery operators who have limited working capital. Fortunately, in recent months most shrimp farmers are starting to understand the procedure to produce PL, prior to stocking their grow-out ponds. Most farmers have recently selected PCR-tested PL and started to purchase from certified hatcheries even if the price of PL is higher.

b. Stocking Density

Culture of *P. vannamei* will enable farmers to produce large volume of shrimps because of its potential to stock in a high density. As an example, an experience of a farmer in Lampung province, who stocked his ponds up to 4,000,000 PL per ha, could produce 40–50 tonnes of shrimp per crop. The tendency to stock in high density on culture practices, indeed will be able to produce high yield, but it is harmful due to waste product accumulating in rearing pond as well as in drain canal and to some extent also polluting source of water. The practice of stocking in high densities by tiger shrimp farmers exacerbated

the environmental condition surrounding the brackishwater ponds. Thus, causing mass mortalities of stocks and therefore, loss of investments. It is reasonable to maintain optimum stocking density, at a maximum of 150 PL *P. vannamei* per m².

V. STRATEGIES FOR DEVELOPMENT

As a shrimp producing country, Indonesia has developed strategies for the shrimp industry, and will be having an important role in ASEAN region as well as other parts of Asia. By having 419,282 hectares of brackishwater ponds, and potential areas of 913,000 ha (DGA, 2000), Indonesia could be one of the biggest shrimp producers and exporters of the world. Thus, foreign exchange earnings derived from aquaculture sector certainly increase revenues for the country. The new species is a viable option for culture, but the native species such as tiger shrimp as well other penaeid shrimps remain promising for development.

5.1. Short Term Strategies

- a. Import broodstock from reputable sources mainly from Hawaii and Florida. DGA will not allow any opportunity to import *P. vannamei* and *P. stylirostris* from anywhere other than USA. This is to obtain traceability measure for the animal being cultured. The broodstock will then be developed in good and certified hatcheries. However, only certain hatcheries having special license to import broodstock are allowed. Importing broodstock is important, since the need of PL for 2005 is more than 16.5 billion, equivalent to the need of around 110,000 imported broodstock.
- b. Develop Crash Program for Production of *P. vannamei* post larvae at Technical Implementing Unit (TIU) of DGA and Provincial Fisheries Office. More than 9 DGA's TIU and 4 Government Shrimp Hatcheries in West, Central, East Java and Bali will take part in producing PL of *P. vannamei*. Although their production will only be 100 million PL per annum, but at least contribute to development of shrimp industry.
- c. Implement Biosecurity on shrimp hatcheries followed by certification program. DGA has developed certain kind of certification for hatcheries based on ISO 9000 and HACCP approach. Five *P. vannamei* hatcheries among 13 producers have been certified in 2004 by Quality Control Management System developed by Technical Implementing Unit of DGA in cooperation with The Agency for National Standardization.
- d. Develop extension program to strengthen the implementation of Best Management Practice in many areas, particularly in area of Intensification Program;
- e. Establish PCR laboratories in targeted area, followed by development of shrimp culture monitoring system. DGA has assigned special staffs for monitoring and surveillance of seed quality and fish disease.
- f. Empower Shrimp Importer/Hatcheries Association

5.2. Middle and Long-term Strategy

- a. Produce SPF and SPR shrimp broodstock, by developing The National Shrimp Broodstock Centers in Jepara, Situbondo, Takalar and Ujung Batee (Aceh), but since the physical facility was damaged by Tsunami in Aceh, only three NBC continue to do the work on SPF/SPR Broodstock. All facilities in those NBC are set up to produce broodstock of *P. monodon*, *P. merguensis/indicus*, *P. vannamei* and *P. stylirostris*. Many hatcheries are now asking for broodstock from NBC Jepara, since the first generation of *P. stylirostris* was tested at private hatcheries in Lampung province and yielding better quality PL.
- b. Continue to promote shrimp intensification program
- c. Promote Best Hatchery Management Practices aimed to produce good quality PL.
- d. Revitalize brackishwater ponds and canal realignment as well as zoning improvement.
- e. Develop Technical Implementing Units with a specific task to produce high quality shrimp seeds.