INTERNATIONAL CONFERENCE ON SHRIMP AQUACULTURE

# PROBLEM SOLVING IN PRACTICAL SHRIMP FARMING

**Nyan Taw**

**Hang Tuah University,**
**Surabaya – INDONESIA**
**October 28-29, 2010**

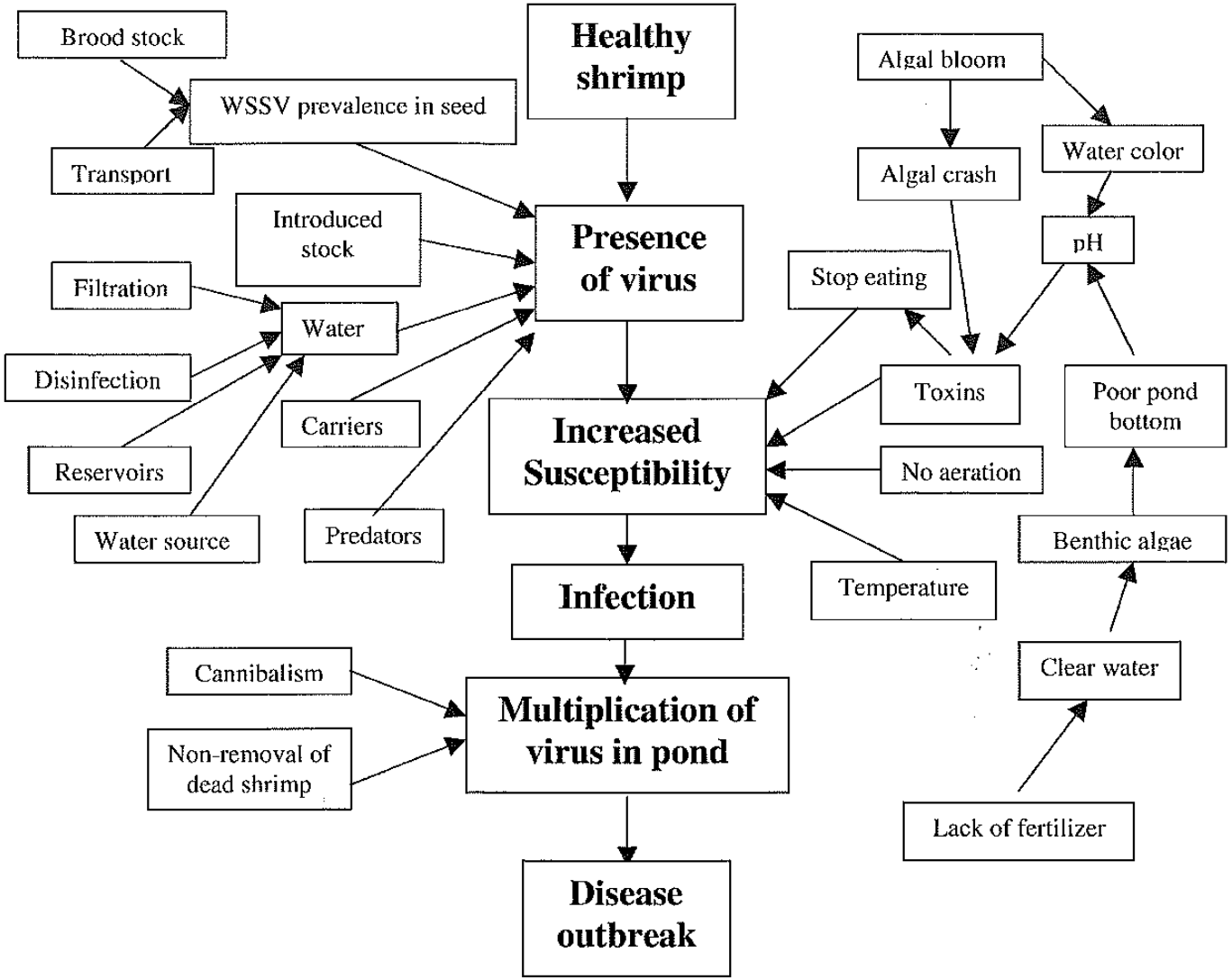
# Introduction

**The success or failure in shrimp aquaculture is how successful one can prevent and control the problems before problematic situation begins.**

**The problems are due to mainly two factors – technology and human management. Technology begins with farm design and followed with appropriate operation system. Technology includes BAP and strict bio-security implementation to prevent and control viral outbreaks. Technology and bio-security information are available but man power management is the critical factor.**

**Present presentation provides on how to prevent and overcome in practical shrimp farming on common issues faced by shrimp farmers**

# Web of White Spot Disease Causation





**Bamboo Shrimp Syndrome - recent**




**Table 1**. Estimated economic losses since the emergence of certain diseases in penaeid shrimp aquaculture.

| Virus | Year of emergence to 2001 | Product loss (US dollars) |
|---|---|---|
| White Spot Syndrome Virus-Asia | 1992 | $4-6 billion |
| White Spot Syndrome Virus-Americas | 1999 | >$1 billion |
| Taura Syndrome Virus | 1991-1992 | $1-2 billion |
| Yellow Head Virus | 1991 | $0.1-0.5 billion |
| Infectious Hypodermal and Hematopoietic Necrosis Virus | 1981 | $0.5-1.0 billion (includes Gulf of California fishery losses for 1989-1994) |

Source: Lightner (2003, p. 85)

# No data is better than wrong data

**Recommended holding times for water samples**

| Variable | Time (hours) |
|---|---|
| pH | Analyze on site |
| Dissolved oxygen | Analyze on site |
| Total phosphorus | 12 |
| Total nitrogen | 12 |
| Nitrate nitrogen | 12 |
| 5-day biochemical oxygen demand | 12 |
| Total ammonia nitrogen | 24 |
| Soluble reactive phosphorus | 48 |
| Chloride | 72 |
| Total suspended solids | 72 |
| Turbidity | 72 |
| Total alkalinity | 72 |
| Total hardness | 72 |

**Orawan S. & Boyd, C, 2006**

# Calibration of laboratory equipment is essential

**Solubility of dissolved oxygen at saturationin waters of different temperatures and salinities.**

| | Salinity (ppt) | | | | | |
|---|---|---|---|---|---|---|
| Temp ($^{o}$C) | 0 | 5 | 10 | 20 | 30 | 35 |
| 20 | 9.08 | 8.81 | 8.56 | 8.06 | 7.60 | 7.38 |
| 25 | 8.24 | 8.01 | 7.79 | 7.36 | 6.95 | 6.75 |
| 30 | 7.54 | 7.33 | 7.14 | 6.75 | 6.39 | 6.22 |
| 35 | 6.93 | 6.75 | 6.58 | 6.24 | 5.91 | 5.61 |

**Boyd C. 2001**

# Farming with appropriate technology is one way to success

## Production Performance Characteristics

**Table 2. Characteristics of various shrimp culture technologies used in Indonesia.**

| System | Objective | Achievements (Source) |
|---|---|---|
| *L. vannamei*<br>Monoculture<br>Normal stocking density 60-80/m²/16-20 hp energy<br>High stocking density 100-150/m²/24-34 hp energy | Sustainable production<br>Increase pond productivity with increased energy input (aerators or air diffusers) | 8.0-10.0 mt/ha, 16-20 g sizes<br>14.0-30.0 mt/ha, 14-18 g sizes<br>(Java, Bali, Lombok, CPB) |
| Monoculture partial harvest<br>Stocking density 200-260/m²/28-30 hp energy | Increase pond productivity | 25.0-35.0 mt/ha. 12-20 g sizes<br>(Lampung, CPB trials) |
| * Bacterial floc (zero water exchange)<br>Stocking density 130-150/m²/30-32 hp energy | Increase biosecurity, productivity, and efficiency | 20-24 mt/ha, 16-20 g sizes<br>Record: 49.7 mt/ha after stocking at 280/m2 (CPB) |
| *L. vannamei* **and** *P. monodon*<br>Two-step culture | High survival through nursery phase | Higher survival (CPB) |
| Minimum water exchange | Increase biosecurity | Higher biosecurity (CPB) |
| Polyculture (*L. vannamei* and *P. monodon*)<br>Stocking density 70/m² (40-50 *vannamei*, 20-30 *monodon* | Utilize 100% of pond water column and bottom area to increase pond productivity | 7.5 *vannamei*, 3.5 *monodon* mt/ha<br>(Lampung, CPB trials) |

*Bio Floc

Nyan Taw, Shrimp Farming
Indo GAA 2005

# Program stocking with weather condition seem one way to avoid failures

**WSSV dominant months (unstable weather – rain & cold), Indonesia, Thailand & Malaysia**

| | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lampung | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Java & Sumbawa | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Thailand | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Malaysia | | | | | | | | | | | | | | | | | |

# Making sure of following protocols and on time will reduce problems

## CHECK LIST BIOSECURITY

**Pond Address :**

| | Module Base | Pond Base | Extensive Plus |
|---|---|---|---|
| **I. Ready for operation (Siap operasi ), All Bio measures in place / ready before filling of water** | | | |
| 1. Cek konstruksi tambak ( Reservoir tambak culture, perlengkapan peralatan budidaya ) | | | |
| 2. Clean liness ( Rumput, benda benda yang tidak dibutuhkan untuk budidaya, sampah ) | | | |
| 3. Cek kelistrikan ( kincir, pompa, panel, kabel ) | | | |
| 4. Screen ( micron ) : Jumlah, kondisi, pemasangan | | | |
| 5. Bird Scare Line ( BSD ) : Jumlah, rumbai, posisi. | | | |
| 6. Crab Device ( CPD ) : Posisi, kondisi, pemasangan. Possible crab entry points. | | | |
| | | | |
| **II. Ready for stocking ( Siap tebar ), Already filled up with water, treated, age.** | | | |
| 1. Paddle wheel number and position | | | |
| 2. Water level | | | |
| 3. Treated water | | | |
| 4. Length of time for water preparation. | | | |
| | | | |
| **III. In Operation** | | | |
| 1. Cek konstruksi tambak ( Reservoir tambak culture, perlengkapan peralatan budidaya ) | | | |
| 2. Clean liness ( Rumput, benda benda yang tidak dibutuhkan untuk budidaya, sampah ) | | | |
| 3. Cek kelistrikan ( kincir, pompa, panel, kabel ) | | | |
| 4. Screen ( micron ) : Jumlah, kondisi, pemasangan | | | |
| 5. Bird Scare Line ( BSD ) : Jumlah, rumbai, posisi. | | | |
| 6. Crab Device ( CPD ) : Posisi, kondisi, pemasangan. Possible crab entry points. | | | |
| 7. Paddle wheel number and position | | | |
| 8. Water level | | | |

# Biosecurity breaches – Farm design

(Prevent disease spreading/outbreaks)










Wrong screen net condom


# Shrimp Farm

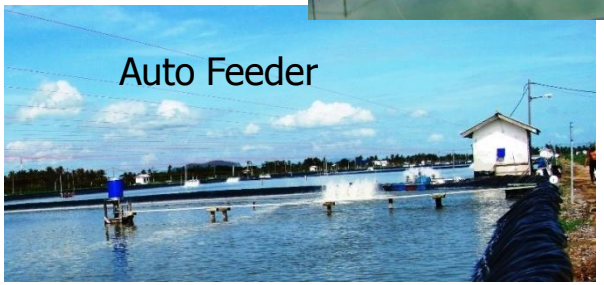
## Bio-secure module system



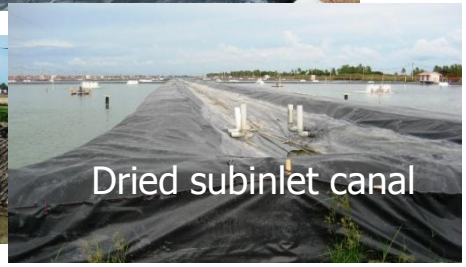




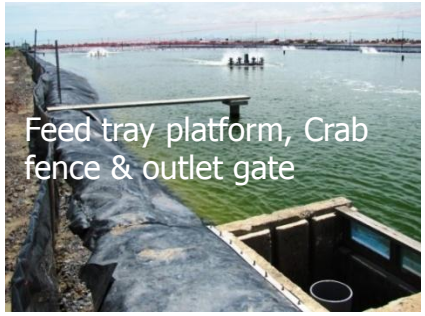








# Farm Biosecurity - Implementation

1. Use SPF post larvae (PL)
2. Use reservoir module system- water treatment system, operate as SOP
3. Balanced - stocking density, energy input, pond construction & system.
4. Use crab fence – all in place
5. Use bird scare lines - all in place
6. Control workers' movement – farm/farm; module/module, row/row
7. No handling (touching) unnecessary – only person responsible can handle.
8. Minimize workers – minimum worker team: stocking, harvest, sampling.
9. Use chemical (sun drying) to disinfect all equipment– screen net, cast net, etc.
10. All equipment in operation – eg. PWAs, water pumps, siphon equipment, etc.
11. Educate people on biosecurity
12. Environmental cleanliness – Car dip, pond, water, housing, etc.
13. Control Human traffic– guest, workers, technicians, Management personal, etc.

# Steps to be taken when WSSV (Viral) out-break is suspected.

1. **When viral out-break is suspected you need to quarantine the suspected pond. At the same time you need to implement the following:**
    a. **Stop all traffic – people, trucks, cars, motorcycles passing across the pond**
    b. **Stop sampling - cast nets for shrimp size, environmental data (DO, Temp, etc).**
    c. **Make the remaining ponds increase the carrying capacity – increase DO by operating longer or more numbers to maximum capacity.**
    d. **You could start with ponds near-by or ponds stocked from same hatchery.**
    e. **For WSSV or viral – pay more attention to young ponds.**
    f. **Check biosecurity system for biosecurity breaches- correct if necessary.**
    g. **Do not wait for PCR result.**

2. **Quarantine the suspected pond. (for DOC <45)**
    a. **Assign a person to be stationed at pond site (24 hours).**
    b. **Fence off the pond – put signs (do not enter)**
    c. **Make sure all inlet and discharge gates are secured – no leakages.**
    d. **Cull the pond with chlorine – keep paddle wheel aerators running for mixing.**
    e. **After shrimps are killed, stop the paddle wheel aerators. Do not take paddle wheels out of the pond.**
    f. **Leave the pond with water for at least 7 days – until the dead shrimps become red.**
    g. **Pick up dead shrimps and burn or bury.**
    h. **Water level will drop.**
    i. **Leave for another few days – 2 or 3 days.**
    j. **Now pick up red shrimps and can discharge the water. Could use chlorine again before draining water out and use chlorinated water to clean PWAs within pond.**
    k. **Leave the pond and paddle wheel aerators in the pond to dry for a week or so.**

3. **Make sure all people and equipment involved in the quarantine process to follow the biosecurity protocol.**

# What to do when problems observed

## (Prevention is better than cure)

- If mass mortality observed it is possibly due to viral infection. Then use quarantine protocol to prevent from spreading to other ponds or farms
- If some mortality seen in feed trays it is possibly due to bacterial or environmental or viral . If the pond is already mature (DOC > 90 or 16 grams) for harvest then harvest as soon as possible.
- If some mortality seen in feed trays and ponds not yet mature for harvest then the first thing one should do is increase carrying capacity of the ponds. The best is to increase aeration either by number or hours. This need to be done without delay. Once you know the reason then take action with appropriate solution.
- The actions should be based on reputable source eg. Boyd C. in GAA published series on environment and Lightner D., Univ of Arizona on diseases.
- One could increase pond carrying capacity is by exchanging more water. This action need to be careful as more water you fill in there is a risk of introducing viral particles at the same time.
- Siphoning sludge out of the pond is another way to increase pond carrying capacity.
- Take extra care in using chemicals, probiotics, etc. as these may have negative effects on pond carrying capacity. Probiotisc are as yet to be proven to be effective in culture ponds with complex ecological web.

# Acknowledgements

**The author would like to give sincere thank to Dr. Shahridan Faiez (CEO) and Mr. Christopher Lim (COO), Blue Archipelago for their interest and continued support .**

**The staff and members of Blue Archipelago, Malaysia for their diligence and hard work to make this presentation possible.**

BlueArchipelago

Quality | Safety | Ecology

***THANK YOU***