

## Biosecurity in Aquaculture

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### Introduction

Aquaculture loses millions of dollars in revenue-aquatic animal diseases. Most disease threats - unregulated movement of live aquatic animals and associated introductions and transfers of Pathogens. In response stakeholders in aquaculture, from the individual farmer to policy makers, are promoting and implementing Biosecurity programs to combat the diseases responsible for these losses. It means preventing the introduction, establishment and spread of unwanted biological organisms or agents. "Cumulative steps taken to keep disease from a farm and to prevent the transmission of disease within an infected farm to neighboring farms". (defined by the US poultry industry). "An essential group of tools for the prevention, control and eradication of infectious disease and the prevention of human, animal, and environmental health".

### Biosecurity Principles

#### a. Identify Hazards

- Understand disease transmission
- What are the risk factors identified in the farm?

#### b. Assess Risks

- Impacts of the farm

#### c. biosecurity measures needed

- Prioritize

### Biosecurity Plans

#### 1. No "one-size-fits-all" solution

- Varies with type of operation, species, life stage reared.

## 2. Range

### ➤ Simple and quickly implemented

- Foot dips; disinfection; signs

### ➤ Others economic investment or effort

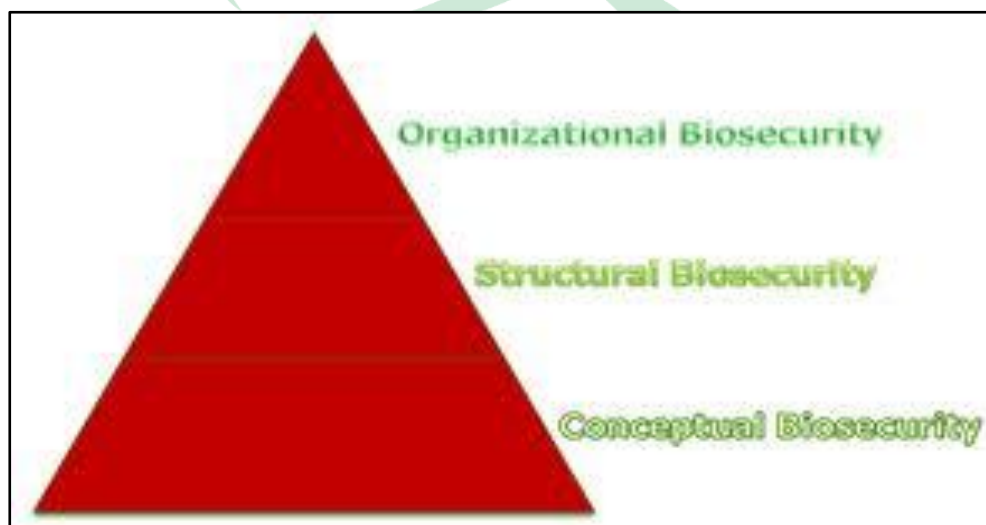
- Dedicated quarantine equipment or facilities

## 3. Cost benefit

### Different Levels of Biosecurity:

- Different levels of biosecurity will be applicable depending upon:
- The purpose of the system and the species
- Stocking densities
- Frequency of movement of animals and farm/hatchery
- Workers/visitors
- Owners into or out of the system
- The economics involved
- The potential impact of pathogens

In the production facility, introduction of a virus, bacterium, parasite or fungus, not already present on the facility, will have greater impact. If these vectors are properly disinfected at defined critical control points, then exposure to disease causing organisms will be greatly reduced.



## BIOSECURITY



### Principle Pathways of Cross Infection and Cross Contamination

#### Biosecurity in aquaculture

Physical, Chemical, Biological precautionary measures

#### Physical measures

- Aimed at preventing the intrusion of disease carrying vectors,
- Water treatment,
- Quarantine,
- Increased aeration,
- Controlled temperature,
- Improved feeding regime,
- Removal of sludge and organic matter and Treatment of waste water.

#### Chemical measures

- Used to treat materials before they enter the facility.
- Chlorination and ionization are often used to treat incoming water, and iodine and chlorine are used to treat other potential vectors such as tools, footwear, and clothing
- Effect chemical measures including control P<sup>H</sup> and salinity, reduction of ammonia, and nitrite, and application of antibiotics, if required.

#### Biological measures

Biological measures consisting mainly of the use of probiotics containing a mix of bacterial species to establish beneficial microbial communities under culture conditions include the use of SPF shrimp. a second line of defense for the shrimp industry is to use SPF.

Common immunostimulants such as beta 1-3glucan, lipopolysaccharides and peptidoglycans can be used.

### **Biosecurity in shrimp aquaculture**

Involves applying sets of targeted, science based procedures to eliminate or reduce the risk of a particular pathogen

- a. Entering the farm, and
- b. spreading within a pond, between ponds, to other farms, or to the wider environments

Farm level Biosecurity programs in many countries typically target very serious pathogens such as WSSV, YHD, TSV, IHHNV.

#### **A. Exclusion**

- Quarantine and SPF certified stocks
- Restricting imports of live and frozen shrimp
- Excluding vectors and external sources of contamination
- Preventing internal cross contamination

#### **B. Elimination**

- Effective Biosecurity measures should prevent the complete loss of the crop and the spread of disease to other ponds.
- Approach to eliminating pathogens at the stock level and partial disinfection at the facility level.
- Affected tanks and ponds should be depopulated, disinfected, and restocked with SPF shrimp, it may be necessary to depopulate.

### **Biosecurity programs**

Pathogens can be introduced to, or transmitted between, ponds or farms in several ways-

- a. Introduction of diseased - apparently normal, but infected, carrier
- b. Entry of wild carrier animals such as shrimp or crabs.
- c. Improper disposal of dead prawns
- d. Contact with contaminated objects, contaminated water such as drainage water from other farms, contaminated feeds or aerosols from infected ponds

### **Effective biosecurity strategy**

- Stock only PL that have acceptable test results in terms of pathogen prevalence and load
- Do not exceed optimal stocking densities
- Eliminate or reduce risk from potential vectors (infection carrier agents)
- Use water management practices that prevent or reduce contamination by the pathogen
- Reduce the risk of spreading infection between ponds by restricting movements of people, equipment and other possible agents

### **Biosecurity checklist**

- Start with health certified post larvae or juveniles
- Monitor and manage the hygiene of new arrivals
- Identify and keep batches of PL/juveniles separate
- Record survival rates and production
- Record mortality and disease events
- Regularly test prawns, health in the early, mid and later stages of the grow out cycle
- Cull poorly performing or diseased animals if possible
- Check and manage pond to pond and carrier factors
- Maintain pond hygiene and disinfection between production runs or prawn batches, or in a mortality event
- Manage movements of people
- Report diseases or unusual mortalities to authorities

### **Aquaculture biosecurity policies**

Aquaculture biosecurity policies vary from farm level to the international level, and between areas at each of these levels

### **Common characteristics**

- Science based decision making
- Economical and sociopolitical rationale
- Standardized and uniform methods
- Relative ease of application
- Wide recognition
- Vertical and horizontal integration, application, and agreement

- Consistent enforcement
- Private focus on prevention, but with contingencies in place for control and management, or eradication

### **Advantages of Following Biosecurity**

- Healthier fish stock, Higher Productivity.
- Higher Profits, by Reduced Losses.
- Controlled Pathogen Level in the Farm.
- Losses due to Potential Epidemics Prevented.
- Safety to Public Health.
- Important for Procuring International Certifications.

### **Efforts of NBFGR on Biosecurity at National Level**

NBFGR monitoring the introduction of exotics in Indian waters. In the regard of exotics & fish quarantine sections NBFGR has prepared important documents. National strategic plan for aquatic exotics and quarantine Aquatic exotics and quarantine guidelines. The ministry of agriculture has approved the plan and the guidelines for the regulation of the fish trade in our country. NBFGR -All the import proposals for aquatic fin fishes, ornamental fishes, crustaceans are directed to NBFGR by the ministry of agriculture for evaluation. NBFGR has developed a diagnostic capability for a number of OIE listed pathogens based on molecular techniques

### **Major instruments for dealing with biosecurity at the global level**

**WTO** Agreement on the application of Sanitary and Phytosanitary Measures (SPS Agreement) –is to safeguard world trade by publishing health standards for international trade in animals and animal products.

FAO of the United Nations Codex Alimentations and Codes OF Conduct.

International council for the Exploration of the Seas (ICES) code of practice an introduction and transfer of marine organisms. The primary focus is on enhancing or protecting trade through biosecurity

Issues regarding aquatic animal health –the office international des epizootics. Key elements of the OIE Code in terms of biosecurity of aquatic animals include:

- The general provisions
- The lists of diseases

- The section on health control and hygiene

#### **The general provisions include**

- General definitions, a section on import risk analysis, and import/export procedures
- Lists of diseases of finfish, mollusks, and crustaceans are prioritized according to their significance because of their potential rapid spread, serious public health consequences, or importance in trade
- The health control and hygiene section includes procedures, for disinfection of fish farms, mollusk farms, crustacean farms and of fish eggs.
- To be effective, aquaculture biosecurity needs to establish an integrated approach between the farms and government to exclude and combat aquatic animal diseases.
- Approaches being integrated and implemented at the International (World Organization for Animal Health(OIE) and the Food and Agriculture Organization of the United nations(FAO)and the regional level
- The OIE with a membership of 166 countries in march 2004, publishes the aquatic animal health code and manual of diagnostic tests for aquatic animals and updates annually.
- The FAO has developed codes of conduct and best management practices throughout the world that result in increased profitability.
- NACA works in conjunction with the OIE and FAO to formulate biosecurity policy, with programs that focus on reducing the risk of disease transmission

#### **Biosecurity programme in Australia**

Comprehensive biosecurity program (AQUAPLAN)that provides an overall management strategy for aquatic animal health. This program applies integrated management strategies from the borders to individual farms or specific areas, withinternational linkages to OIE guidelines that have helped Australia to gain a trustworthy tradereputation. The Australian quarantine and inspection service and biosecurity Australia manage AQUAPLANs quarantine program. Biosecurity Australia has an Import Risk Analysis Handbook, details the process of import risk analysis, which is pivotal to every program within AQUAPLAN.

#### **AQUAPLAN (Australia's National Strategic Plan for Aquatic Animal Health):**

AQUAPLAN is a very conservative approach to quarantine risk that is a very low acceptable risk for imported aquatic animals. Its success can be measured in improved

aquatic animal health management in Australia, increased productivity and improved sustainability of its aquaculture, improved market access, and better protection for Australian aquatic ecosystems.

### **Key elements in biosecurity**

- Reliable sources of stock
- Adequate diagnostic and detection methods for excludable diseases
- Disinfection and pathogen eradication methods
- Best management practices
- Practical and acceptable legislation

### **Conclusion**

Biosecurity can be applied to aquaculture production systems through a variety of management strategies and by following internationally agreed upon policies and guidelines. In addition, there are a variety of risk assessments that can be used for aquatic animal diseases of fin-fishes, mollusks, and crustaceans. Disease challenge by viruses, bacteria, fungi and toxic algae presents a major threat to profitable aquaculture production.

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