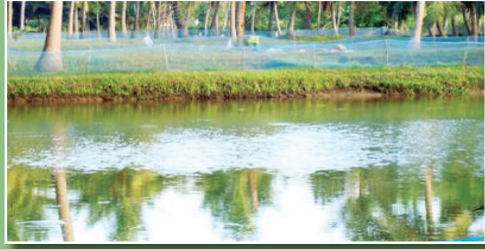


HAND BOOK ON BIOSECURITY MEASURES FOR SHRIMP FARMING



CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
(Indian Council of Agricultural Research)

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केन्द्रीय खारा जलजीव पालन अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद्)

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1. Reservoir pond

2 & 3. Crab fencing

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Handbook on Biosecurity Measures for Shrimp Farming

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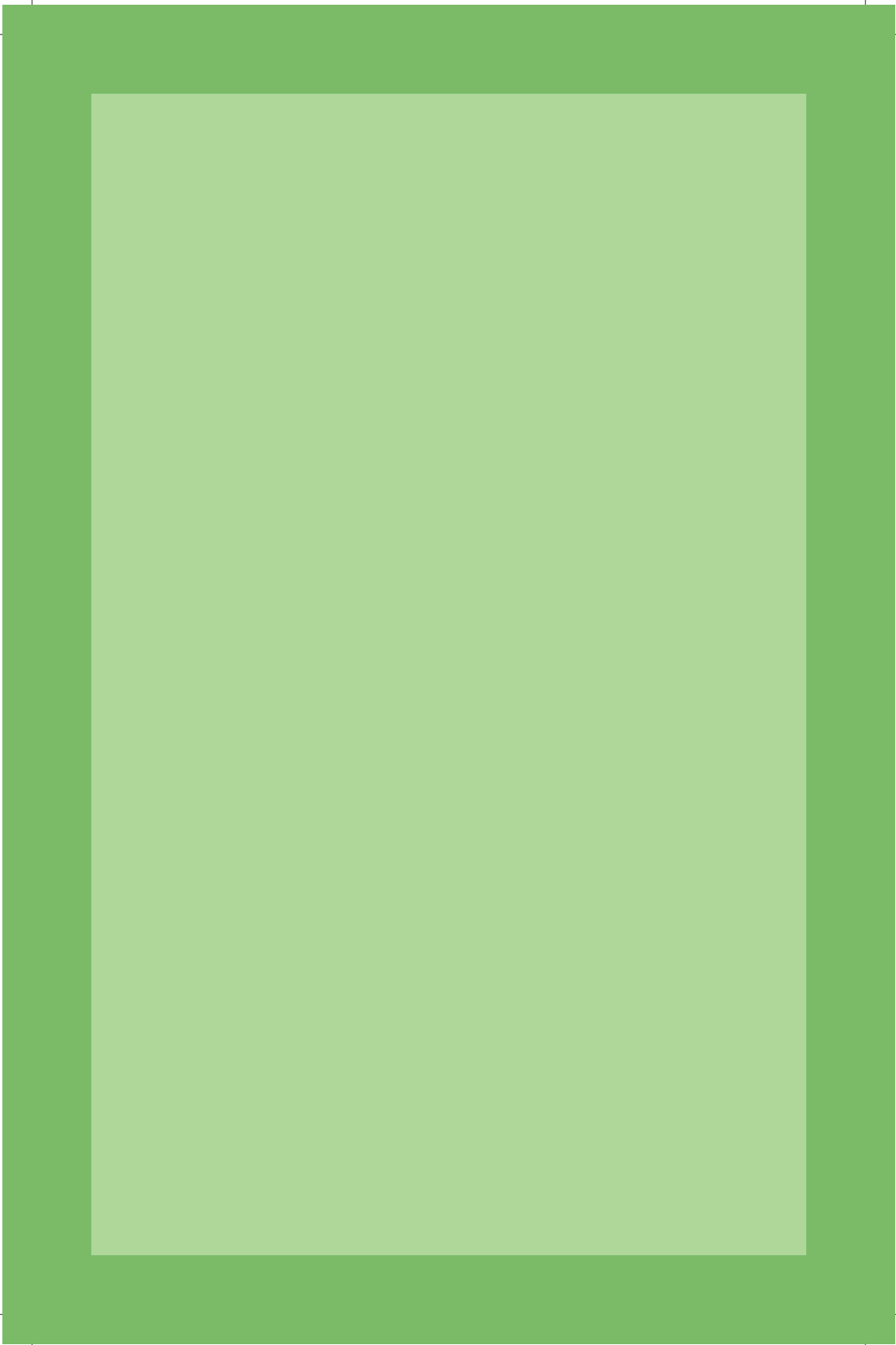
PREFACE

Disease outbreaks are being increasingly recognized as a significant challenge and constraint to sustainable aquaculture production. In shrimp farming, viral disease outbreaks have caused billions of dollars loss and in Southeast Asia the White Spot Syndrome Virus is the major cause for this loss. Viral pathogens are transmitted both vertically and horizontally. Though farmers ensure pathogen free status of the shrimp seed, they are not aware of the dangers of horizontal transmission from pond to pond, farm to farm and country to country. At this juncture, there is an urgent need for adoption of farm biosecurity measures to cut down the risks of horizontal transmission of the viral pathogens. This assumes a greater importance with the availability of 'Specific Pathogen Free' shrimp seed in the country. Applying biosecurity practices in small-scale, extensive, open farming systems could be difficult. However with the advent of 'zero water exchange' farming practices, it is possible to incorporate biosecurity protocols into shrimp farming even by small scale farmers. This Handbook gives a comprehensive and updated account of the possible routes of entry of viral pathogens in to the culture system and the methods to prevent such entries and is expected to bring greater awareness among farmers.

I would like to place on record my appreciation of the efforts made by Dr.(Mrs) D.Deboral Vimala, Dr.P.Ravichandran and Dr.C.Gopal for bringing out this important publication. I hope that this Handbook will be useful to the farmers, NGOs, Government and other developmental agencies involved in shrimp farming.

23.08.2010
Chennai -28

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VERTICAL TRANSMISSION



Brooder shrimp



Shrimp postlarvae

INTRODUCTION

Shrimp farmers lose millions of rupees in revenue annually due to the outbreak of viral diseases. There is no treatment for viral diseases and use of ‘vaccines’ is not a feasible approach in shrimp culture, since till date the specific immune memory system is known to be non-existent in shrimp. The solution lies in the prevention of entry of disease causing pathogens into the culture system and also by providing a stress free environment to the cultured shrimps. This may be achieved by following Better Management Practices (BMPs) which emphasize on the biosecurity measures.

Two common ways of disease transmission are:

- **Vertical transmission** - from mother shrimp to the postlarvae in hatchery systems
- **Horizontal transmission** - from one affected shrimp to the other in farming systems.

Prevention of the horizontal transmission of the viral pathogens requires certain basic infrastructure, management of farm implements/ water intake and control in the entry of personnel. These requirements are collectively referred as ‘Biosecurity’ measures since they secure the culture system from the entry of viral pathogens. This Handbook explains the possible routes of entry of the White Spot Syndrome Virus (WSSV) into shrimp culture system and the protocols that should be adopted to eliminate such routes of entry.

HORIZONTAL TRANSMISSION



Shrimp affected by WSSV



Healthy shrimp

The purpose of this Handbook is to educate and sensitize farmers to the need for adopting biosecurity protocols in shrimp farming practices to prevent WSSV. It gives an overview on the following: points of pathogen entry, horizontal transmission of pathogens, biological/mechanical carriers and summary of the Standard Operating Procedures (SOPs) on biosecurity protocols.

BIOSECURITYY PROTOCOLS TO CONTROL/PREVENT HORIZONTAL TRANSMISSION OF WSSV

Adherence to biosecurity protocols to prevent horizontal transmission of pathogens is critical for successful shrimp farming, but more importantly, stocking of pathogen free seed is the foremost requirement since most of the wild caught broodstock and spawners are infected with the virus. Screening of broodstock and larvae at various levels for the pathogens and stocking only disease free postlarvae should be followed in shrimp culture to prevent the vertical transmission of the virus. But the success of this procedure is entirely dependent on the sampling followed and the efficiency of the laboratory technician. It is always advisable to purchase shrimp seed from a Coastal Aquaculture Authority (CAA)/Marine Products Export Development Authority (MPEDA) certified hatcheries which certify that they have the necessary infrastructure to produce healthy postlarvae and have followed SOPs/biosecurity protocols strictly .

In the recent years, the introduction of certified Specific Pathogen Free (SPF) seed is one of the options available to achieve



Prevention of human entry



Shrimp farm

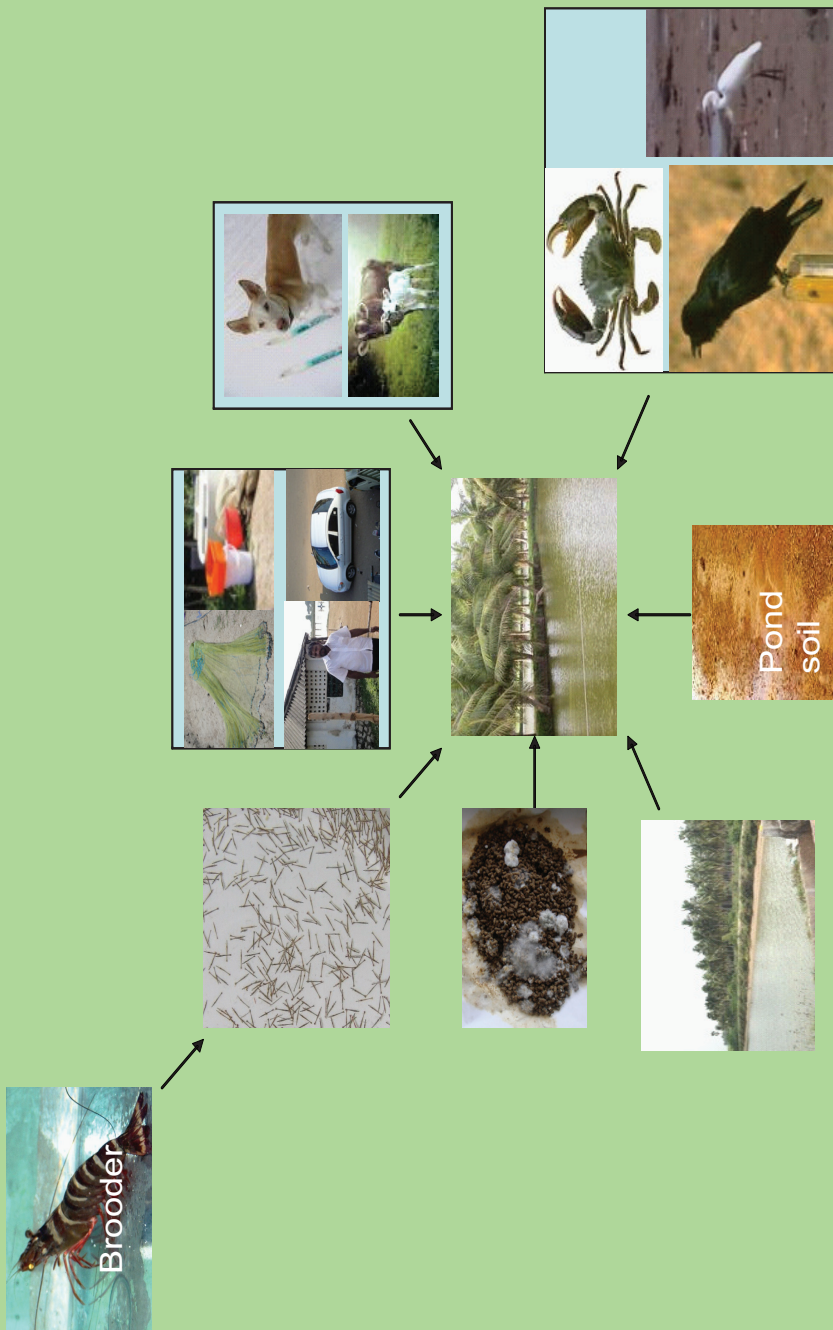
this. The quantum leap in the production of *Litopenaeus vannamei* in the Asian countries was only due to the availability of SPF broodstock from US Marine Shrimp Farming Program (USMSFP), Hawaii. However, stocking pathogen free postlarvae alone doesn't guarantee a disease free culture since the pathogens could still enter the culture environment horizontally and infect the shrimp any time during the culture.

The entry of WSSV into the culture environment can be through the following means and a better understanding of these can help to prevent its horizontal transmission.

- Contaminated soil from the previous crop
- Intake water
- Aquatic vectors introduced through intake water, by crabs and other animals.

Besides the above mentioned carriers, viral particles can also enter the farming system by mechanical carriers like:

- Contaminated land animals and birds
- Contaminated farm inputs – through live feed, semi-moist feed
- Contaminated farm implements, nets, vehicles etc.,
- Contaminated personnel



Points of pathogen entry

a. PREVENTION OF HORIZONTAL TRANSMISSION OF PATHOGENS

PROTOCOL 1. ELIMINATION OF VIRAL PARTICLES FROM SOIL

The sludge left in the pond, which might have had a viral disease outbreak during the previous culture, may contain high organic load, bacteria, viral particles and DNA as well as many other viral carriers. These can be removed to prevent the outbreak of viral disease. This could be achieved by the application of burnt lime (CaO) @100 ppm, followed by exposure of the pond bottom to sunlight until it dries and cracks and removal of the top soil or by ploughing the pond bottom followed by further liming.

PROTOCOL 2. ELIMINATION OF FREE LIVING VIRUS IN WATER

White spot virus has been reported to survive as a free living form in water up to seven days. Therefore direct use of creek or sea water carries the risk of introducing the virus into the system. Water should be taken to reservoir ponds and treated with active chlorine as bleaching powder (Calcium hypochlorite) @ 30 ppm and aged up to seven days, to eliminate the viral pathogens. Farmers should ensure that only treated water is used in the culture ponds.



Ploughing



Liming

PROTOCOL 3. ELIMINATION AND PREVENTION OF THE ENTRY OF VECTORS

Most of the aquatic crustaceans including the planktonic forms are reported to be carriers of WSSV virus. A number of other aquatic organisms could be mechanical carriers because of their filter-feeding habit. There is a need to eliminate these before letting water in to culture ponds. Use of filter nets of 60 micron mesh/cm² in the delivery pipes/ inlet sluice should be strictly followed. Further, the planktonic forms should be eliminated by treating the water with 60 ppm bleaching powder (Calcium hypochlorite) in reservoir ponds. It is prudent to allot 30% of the total farm area for reservoir purposes.

Crabs are one of the carriers of viral pathogens and providing crab fencing in shrimp farms is considered as one of the important biosecurity requirements. Carriers like crabs could also move from pond to pond over land barriers. To prevent the movements of crabs across the ponds, fencing made of 0.5 m plastic sheet/nylon mesh should be erected around the culture pond.

b. PREVENTION OF ENTRY OF VIRAL PATHOGENS THROUGH MECHANICAL CARRIERS

The virus could be transmitted from pond to pond or farm to farm through mechanical carriers like feed, birds, land animals, human beings, vehicles and farm implements.



Reservoir pond



Chlorination in reservoir pond

PROTOCOL 4. PREVENTION OF VIRAL PATHOGENS IN FEED

Feed ingredients of aquatic origin used in aquaculture can be a source of pathogens (viruses, bacteria and parasites) to shrimp species. Pathogens in feed can infect the animals directly by means of consumption of feed or indirectly via environmental sources. Live feed and moist feed are more likely to contain pathogens because their ingredients are either in a raw state or subject to insufficient processing. Hence well dried scientifically produced pelleted feed alone is to be used for shrimp culture. Feeds should not be stored for a long time at the farm store.

PROTOCOL 5. PREVENTION OF VIRAL PATHOGENS THROUGH BIRDS AND ANIMALS

Birds such as crow/water crow pick up the dead and moribund shrimp affected with viral disease from ponds and may drop in unaffected ponds, thereby transmitting the virus mechanically. This could be avoided by using bird scares and bird fencing over the pond.

Similarly land animals like dogs, cats and cattle can mechanically carry the virus from one pond to another. Preventing entry of stray animals and unauthorized personnel into the farming area through fencing is the only way to address this problem

Use of tyre bath with disinfecting solution of Calcium hypochlorite (200 ppm) and foot bath/ hand wash for the disinfection of farm personnel is essentially required to avoid contamination.



**Intake of treated water into
grow out ponds**



Bird netting

Pond to pond transmission of virus within a farm could easily occur through the use of farm implements and farm workers. Providing an independent set of implements for each pond will be the best solution. Routine disinfection of the implements before every use should also be made a part of the SOP so that it becomes the routine practice with farm personnel. Similarly disinfection of hands and feet of the farm personnel before entry into any pond should be made mandatory.

Workers move from pond to pond attending their work. So, restriction on the movement of farm workers from pond to pond is necessary. Personal disinfection has to be instituted among the farm workers before they enter the pond and also after they come out of the pond.

SUMMARY OF STANDARD OPERATING PROCEDURES FOR SHRIMP FARM BIOSECURITY

The following SOPs should be strictly followed to prevent the horizontal transmission of viruses in the culture ponds:

- Pond soil should be dried and disinfected to eliminate all the carriers/pathogens.
- Water should never be taken directly from the creek/ sea. Only filtered and treated water from the reservoir should be used.
- Entry of stray animals, birds, crabs and unauthorized personnel should be prevented by proper fencing/netting.



Crab fencing



Fencing near sluice gate

- Strict sanitary protocols should be followed by all farm workers. Disinfection of the feet and hands of the farm workers is mandatory before entering any pond.
- All the pond implements should be disinfected before use in the pond.
- High level of paddle wheel aerators may result in fine spray of water and result in spreading of the virus. Submerged aerators should be used instead of paddle wheel aerators.
- No fresh feed or farm made semi-moist feed should be used. Fresh fish and shrimp head waste should be avoided in such feeds. Use only scientifically produced balanced pelleted feed.
- In case, disease outbreak is noticed during the early stages of culture, the pond water should be disinfected with bleaching powder and retained in the pond for more than seven days before release.
- During the later stage of culture, emergency harvesting may be resorted to through netting only. Draining of the ponds should be avoided.
- After the harvest, remaining water should be disinfected and retained in pond for more than seven days before release. Information regarding the disease outbreak should be given to all the farms located in the same creek.



Hand wash



Foot dip

COLLECTIVE ACTION BY FARMERS

Adoption of biosecurity measures by individual farmers who are resource poor and own only one or two ponds will not be a feasible proposition. In such cases, adoption of these measures as a group activity by the farmers in a cluster will be the best option. Use of common reservoir and common fencing will help in reducing the initial investment required. This kind of co-operation or group effort among farmers will help in preventing disease transmission and will certainly ensure sustainable aquaculture.



Adoption of biosecurity protocols



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