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Fresh Water Prawn Hatchery Operation
Feed the Future Aquaculture
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Introduction

Prawn and Shrimp are high value export commodities that mostly go to Europe & USA. It is the second largest export item of Bangladesh. Along with valuable foreign currency earning, it offers great opportunity in employment generation and poverty alleviation.



A Prawn Hatchery



A Part of Hatchery

Background

- The shortage of wild PL and their high prices, has stimulated the expansion of the hatchery industry rapidly during 2007-2008.
- Although increasing number of hatcheries and also demand of hatchery produced PL but most of the hatcheries were unable to produce PL in satisfactory level from the beginning.
- Further, most of the Prawn hatcheries currently facing big problems of mass mortality of prawn larvae from last three years (2011 to 2013)

Status of Prawn Farming

Prawn farming gher : 179,000 nos

Area covered : 60,000 ha

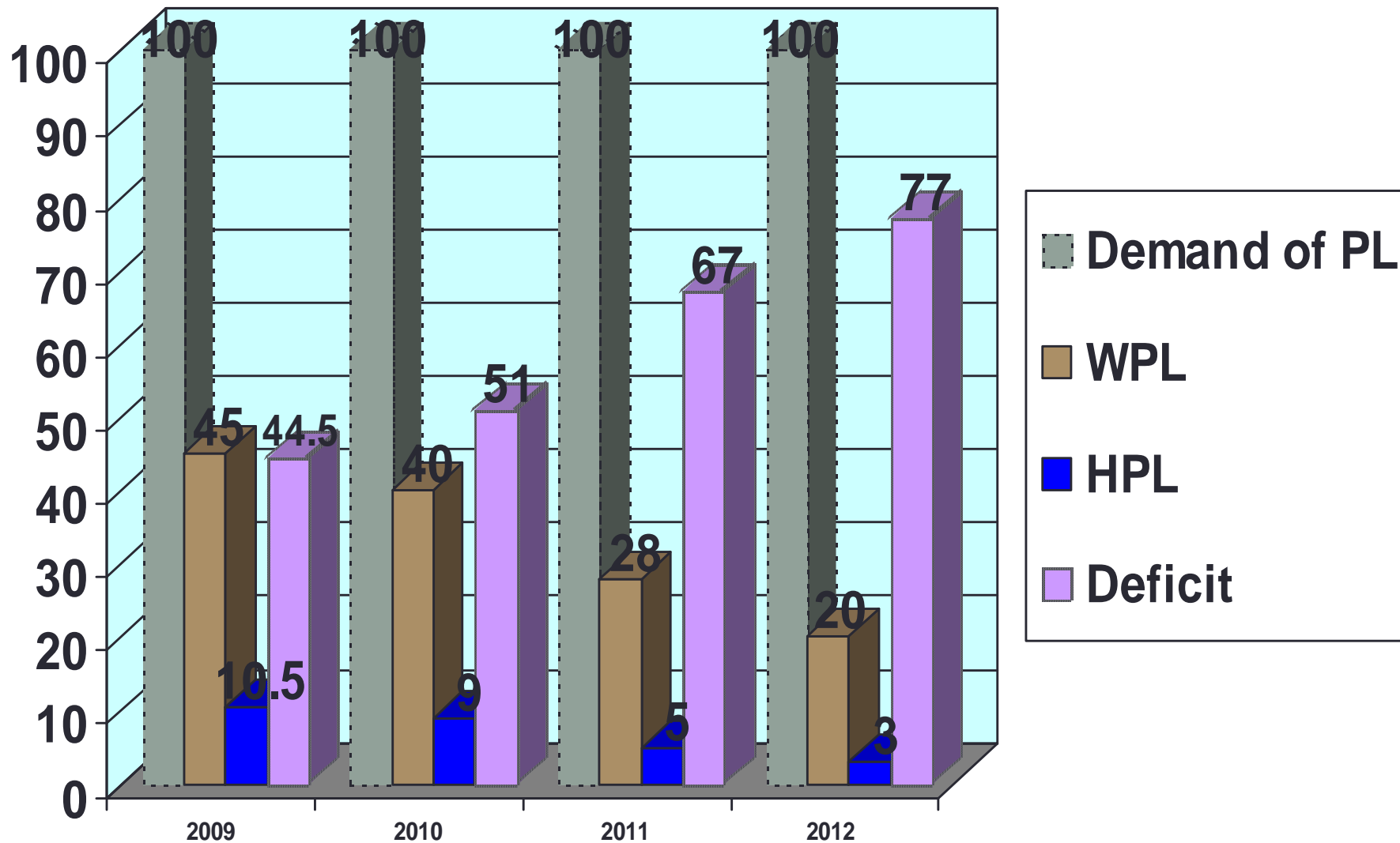


A Prawn Culture Gher



A Prawn Culture Gher

Demand & Supply of PL – 2009 to 2012 (in crore)





FtF Initiative

In this backdrop, USAID funded Feed the Future Aquaculture, WorldFish, Bangladesh took the initiative to find out the causes of the obstacles of smooth prawn seed production in hatcheries and also for ensuring sustainable quality prawn seed (PL) production.

EXPERIENCES . . .

OPERATIONAL MANAGEMENT OF PRAWN HATCHERY

Preparatory Work of the Hatchery:

1. Disinfection:

❑ Hatchery Building: all space inside the PRODUCTION UNIT and all TANKS, FLOOR, DRAIN, etc. should be disinfected with bleaching powder @ 100-200ppm active ingredient for 24-36 hours. Hatchery walls should also be disinfected with **TIMSEN @ 50ppm** and if possible it shall be done two times for proper disinfection of the production unit

- ❑ **Equipment:** all equipment including – ARTEMIA JAR, SUBMERSIBLE PUMP, HOSE PIPE, AIR STONE, AIR VALVE, LIDS etc. all the things should be disinfected with 100-200 ppm Iodine solution or formalin solution before use.
- ❑ **Utensils:** all types of materials should be disinfected with iodine solution at the rate of 150-200ppm
- ❑ **Filter Materials:** disinfect STONE, SHELL, SAND, CHARCOAL etc. with bleaching powder @ 100ppm active ingredient and wash with fresh water and dry in sun
- ❑ **Aeration Line:** Fumigation of the aeration line should be done very well with iodine solution @ 150-200ppm for 1-2 hour and second time with formalin solution @ 200-250ppm for same duration

Brine Collection, Cleaning and Storage

Brine should be collected at early season (Jan.-March) and should be first filtered with sand or cartridge filters to remove suspended solids, then disinfected with 10-15 ppm of active ingredient bleaching powder for 24 hours with aeration and then store settled clean brine in another tank for use

Filter Preparation: pressure filter, cartridge filter, sand filter etc. should be cleaned with 10% HCl for 1-2 hours to disinfect, then rinsed with freshwater prior to use.

UV: It is a very effective and necessary water purification or sanitization equipment for prawn hatchery. It kills all types of germ when water pass through it. However, water must be passed first through 1-5 micron cartridge filters to remove suspended solids before passing through UV.

Different Type of Facilities

Tanks:

- ❖ Brood stock tank
- ❖ Hatching tank
- ❖ Brine storage tank
- ❖ 12 ppt water treatment tank
- ❖ 12 ppt water reserve tank
- ❖ Larvae rearing tank(LRT)
- ❖ PL(post larvae) holding tank
- ❖ Artemia hatching tank



Figure: Larvae rearing tank

Different Type of Facilities cont...

Machineries:

- ❖ Blower or Aerator Machine
- ❖ Submergible pump
- ❖ Jet pump
- ❖ Heater(2-3KW)
- ❖ Thermostat
- ❖ Refractometer
- ❖ Generator



Figure: Blower Machine

Fresh Water

Fresh water & its source is very important for hatchery operation-

- Fresh water source may be pond, river connected canal, river etc.
- Fresh water must be organic substances free and clean.
- Fresh water should be filtered with 1-5 micron filter bag
- water shall pass through pressure filter or cartridge filter for cleaning
- Fresh water must be cleaned before mixing with brine

Water Treatment protocol

- Mix well filtered freshwater and brine by vigorous aeration
- After this preparation, 12‰ water should be treated with 10-12 ppm active ingredient bleaching powder for 10-15 minutes with aeration
- Stop aeration and keep it for 24 hours
- After 24 hours, aerate this water vigorously to remove chlorine
- After 12-15 hours of aeration, check chlorine by test kit & aeration should to be continued until neutralization of chlorine is complete
- Stop aeration after removing chlorine & keep it 20-24 hours to settle
- Clean treated 12‰ water through cartridge or pressure filter (sand filter) & store it to use in LRT

Brood Collection, Treatment & Stock in hatching Tank

- ✓ Collect brood from suitable sources
- ✓ Brood should be healthy, disease free
- ✓ Should have weight range of 80 -100g
- ✓ Egg color should preferably be light gray to shiny gray
- ✓ Try to minimize the handling of brood
- ✓ A low density should be maintained during brood collection
- ✓ Treat brood with 200-250ppm formalin for 30 minutes or with 100-150ppm iodine for 30 minutes after reaching to hatchery
- ✓ After treatment transfer brood in the brood tank
- ✓ Density should be of range of 4-5 /square meter



A Berried Female

Brood Stock Management in Hatchery

- Feeding of brood (less affinity to feed)
- Salinity should be raised gradually up to 7 to 8 ppt
- Brood should be segregated as per color of egg
- Gray and shiny gray color of egg transfer to the hatching tank
- Temperature should be maintained 30 -31° C
- Water depth should have a range of 30-35cm
- Brood tank must be clean & exchange water daily as routine work
- Treatment of brood with (OTC + formalin for 24 hours @ (5ppm+20ppm)
- Only formalin for half an hour @ 200-250ppm



Figure: A Berried Female

Larvae collection, acclimatization & Release in LRT

- Collect Larvae by scoop net (120 micron) & put in to bowl with aeration
- Siphon to remove the sediment waste product
- Raise salinity gradually up to 12 ppt.
- Fill LRT with 12 ppt treated water
- Treat Larvae with formalin @100ppm for 1-2 minutes & with iodine @ 50ppm for 1-2 minutes
- Release Larvae with bowl in LRT water for acclimatization
- Larval density should be maintained at <100 nos/Ltr.



Figure: Larvae in LRT

Apply Artemia Nauplii as per age or stage of larvae

| Age of Larvae | Larval Stage | Number of Artemia nauplii/larvae/day |
|---------------|--------------|--------------------------------------|
| 03 | II-III | 5 |
| 04 | II-III | 10 |
| 5-6 | III-IV | 15 |
| 7-8 | IV-V | 20 |
| 09 | IV-VI | 30 |
| 10-11 | V-VII | 35 |
| 12 | VI-VII | 40 |
| 13-14 | VI-VIII | 45 |
| 15-24 | VII-PL | 50 |
| 25-30 | VIII-PL | 40 |
| 31-35 | IX-PL | 30 |

Ingredients of Custard Feed/Kg

| Ingredients | Quantity (gm) | Preparation Process |
|----------------------------|---------------|---|
| Milk Powder | 300 | Mix ingredients with a specific amount and grind with blender. After mixing boil it with steam heat to make a cake. Cool the steamed cake and again grind with a specific grinder and then the piece of custard retained by specific mesh sieve ready for larval feeding. |
| Corn Flour | 100 | |
| Egg | 350 | |
| Fish Flesh (prawn/shrimp) | 200 | |
| Cod Liver Oil | 20 | |
| Agar Powder | 20 | |
| Vitamin Premix | 10 | |
| | 1000 | |

Feed & Feeding Time

| Age (day) | Stage | Feeding Time | | | | | | | |
|--------------|--------|--------------|--------|---------|--------|--------|-------------|--------|---------|
| | | 7:00am | 9:00am | 11:00am | 1:00pm | 2:00pm | 3:00-5:00pm | 6:00pm | 10:00pm |
| 02-08 | II-V | AN | - | - | - | - | Siphoning | AN | - |
| 09-11 | VI-VII | AN | - | PF1 | PF1 | PF1 | Siphoning | AN | - |
| 12-19 | VIII-X | PF2 | AN | PF2 | PF2 | PF2 | Siphoning | AN | AN |
| 20-35 | XI-PL | PF3 | AN | PF3 | PF3 | PF3 | Siphoning | AN | AN |

Note: AN=Artemia Nauplii

PF1=Prepared Feed retained on 230 micron sieve

PF2=Prepared Feed retained on 350 micron sieve

PF3=Prepared Feed retained on 600 micron sieve

Water Quality of LRT

| Water Parameter | Optimum Range |
|-------------------|---------------|
| ▪ Salinity | 12ppt ± 2 |
| ▪ Temperature | 28-31 °C |
| ▪ pH | 7- 8.5 |
| ▪ Nitrate(NO3) | <20ppm |
| ▪ Nitrite(NO2) | <0.1ppm |
| ▪ Chlorine (Cl) | 0.0ppm |
| ▪ Iron (Fe) | <2.0ppm |
| ▪ Dissolve Oxygen | >5.0ppm |

PL Packing and Transport

- Water of PL tank and PL transport bags temperature must be same
- Count the PL using volumetric techniques
- Make sure water used for packing is clean and sterilized
- Each PL packing bag should contain two poly bag
- Poly bag preferably 35 X 80cm of size
- Fill Poly bag with 7-8 liters water from PL tank
- Fill 1/3 volume of poly bag with Oxygen
- PL nos. in a poly bag depends on distance and mode of transport

Bio-security

- Bio-security protocols helps to minimize the infection contaminating or spreading in the hatchery
- Bio-security protocols should be maintained in every stage of production
- Adopted Bio-security measures helps to secure a disease free environment in all production phases for improved quality
- Training on bio-security maintenance should be an important component of the hatchery operation

Record Keeping /Traceability

- All records must be kept to improve hatchery practices and assist maintenance of separate lots of prawn for traceability purpose
- All records must be kept in files with computerized back up
- All procedures used in the hatchery from source of brood stock up to sale of PL should be recorded
- Each larvae rearing tank must maintain the following records:

Record Keeping /Traceability

Each bag of PL should maintain the following records for traceability purpose:

- ❖ Name and address of the hatchery and license no.
- ❖ Age of PL
- ❖ Quantity of PL
- ❖ Salinity of water
- ❖ Temperature of water
- ❖ Batch no/lot no.

Recommendations:

- Freshwater source must be fresh and cleaned by using different filters
- Brine should be cleaned and also filtered before stored
- Outdoor brood tank should be safe to minimize the disease contamination
- Water treatment protocol should be followed properly and carefully
- Larvae (hatchling) collection, treatment & release in LRT should be done carefully
- Probiotics may be used in hatchery for better production
- Ensure biosecurity protocol in every steps of operation
- Ensure record keeping of all tanks

Photo Gallery



A part of Hatchery



Laboratory Room



Artemia Hatching Room



Artemia Naupli



Thanks