

Aquaculture for Income and Nutrition (AIN) Project

WorldFish, Bangladesh

Prawn Partner Hatchery Operation: 2013

Introduction:

The role of freshwater prawn (*Macrobrachium rosenbergii*) is very significant in agro-based economy of Bangladesh. This sector is playing an important role to earn huge foreign currency along with employment and poverty reduction. But it is evident that necessary initiatives are not enough for the sustainability of this potential sector. It is matter of sorrow but the reality is that the prawn farming still mostly depends on the river or wild sources PL. But it must not be the way of sustainable culture system. It is necessary to ensure timely PL supply against demand for sustainable culture management. So, to ensure the supply of PL against demand; hatchery PL production have to be increased

It seems that the freshwater prawn farming in Bangladesh has rapidly increased after 2000. The price of prawn seed has been gradually increasing due to the shortage of supply against demand. For this reason, during 2006-2009 many prawn hatcheries were established all over the country mostly in the south-west region in Bangladesh and most of the hatcheries are established as private enterprise. Initially production was good in these hatcheries and the supply of hatchery produced PL was remarkable as natural sources PL side by side. But most of the prawn hatcheries were not able to produce PL successfully over last 3 years (2011-2013). During last production season (2013), maximum hatcheries faced huge problems and were not able to produce PL similar to past two years.

Possible causes of these problems are -

- Most of the hatcheries followed the traditional operation method
- Improved and new technology are not introduced here yet
- Scarcity of skilled manpower.

It is assumed that 2013 is the critical season for prawn farming, as the supply of natural sources PL is very low and also hatchery produced PL is negligible against requirement.

In this perspective, **Aquaculture for Income & Nutrition (AIN) Project**, WorldFish-Bangladesh started working with two hatcheries in Khulna region during 2013. The objectives of the project are to successfully produce quality PL along with developing skilled manpower, so that the prawn can reach to a sustainable supply of PL.

In 2013, AIN project worked with two (02) prawn hatcheries and their production status was good when other hatcheries were very badly affected. The reasons behind the good performance of these two hatcheries are; having technical assistance from the AIN project and used some new and improved quality materials.

By this time, AIN project already arranged two experience sharing workshops on successful prawn hatchery operation in Barisal and Khulna. Representatives of the department of fisheries along with hatchery owner/technicians were present there.

Hatchery selection:

A survey was conducted with 10 hatcheries for initial intervention of AIN Project using a prepared questionnaire. The questionnaire was prepared in consultation with Program Manager, Khulna and DCOP of AIN Project. Prior to carrying out the survey 20 hatcheries were contacted over phone to know whether they planned to operate their hatcheries in 2013. Primarily 10 hatcheries were selected through that survey those who were interested to operating hatchery in 2013. Following the selection process the hatchery owners were interviewed for collecting information about physical facilities and technical suitability. Physical verification were also took place. Besides, secondary information was also collected from different sources including DoF and Winrock International before survey. Distance, marketing facilities, water sources were also considered as selection criteria. Finally, the collected information were reviewed and analyzed for final selection of hatcheries.

Findings and Observations:

The hatcheries included in the survey were mostly constructed during 2005 to 2008. Among the surveyed, 2 hatcheries located in Barisal while the rest 8 in greater Khulna region. Physical infrastructure and facilities were almost similar for all the hatcheries while there are big differences in number of tanks, its size or volume, water sources, skilled manpower etc. According to the number of larva rearing tanks and its volume 5 hatcheries can be considered as large while 5 as medium scale in terms of production volume.

Final selection:

Considering all facilities (including physical infrastructure, water resources, location, distance, time etc.) two hatcheries were finally selected as AIN partner those were Khulna Prawn Hatchery and Rupsha Golda Hatchery.

Brief description of selected two hatcheries

1. Khulna Prawn Hatchery

It's a medium scale hatchery. Location of hatchery is very good and it is 8 km far from Khulna city. The hatchery is located by the side of Khulna- Satkhira high way and near to koiya Bazar, Khulna. This hatchery was established in 2008. All types of facilities (physical structure, equipment etc.) are available but lack of knowledge and skilled manpower the hatchery faced problem to produce PL last year. The hatchery operated by owner with the help of some semi trained manpower. Hatchery owner was involved himself in this business from last 7-8 years and he is very much committed to his business.

2. Rupsha Golda Hatcheries

It's a well reputed hatchery in prawn hatchery sector. The hatchery established in 2008 and it is a large scale hatchery. This hatchery is located either side of the Rupsha Bridge and by the side of Khulna-Bagerhat high way. It is the nearest hatchery from Khulna city (7km far from Khulna city) and communication is very well. The hatchery continued operation every year without any interruption. Different essential facilities

(freshwater source, equipments, semi skilled manpower etc.), commitment of hatchery owner all are suitable in condition. The hatchery owners very much interested to work with WorldFish and desired any sorts of assistances especially sustainable technical support to ensure PL production.

1. Prawn Hatchery Operation:

Prawn hatchery operation management is a long term activities. So, it is very difficult to give full description of hatchery activities in brief. However, the main hatchery activities are narrated here briefly. Around 28-30 days is required for larvae to be converted into post larvae (PL) and during this period many activities have to be done. If good hatchery management is ensured then it will take comparatively less time for the larval development and also to reach post larvae (PL) and even possible to get better production. Success depends mainly on all activities to be done with very carefully and accurately in every steps of the hatchery operational management.

Important priority activities that followed in partner hatcheries are given below-

- * Bio-security in all steps of hatchery operation.
- * Disinfection of hatchery structure and others necessary materials
- * Cleanse of both fresh and brine/salt water.
- * Around 12 ppt water preparation for larvae rearing
- * Berried prawn collection, treatment and transfer to the hatching tank
- * Larvae collection, treatment and stocking in the larvae rearing tank
- * Larvae rearing tank management of (feeding management, water quality management, cleanse and water changes of larvae rearing tank)
- * PL packing and transportation
- * Record keeping

1.1) Bio-security management

Implementation of biosecurity protocols in every steps of the hatchery operation to minimize the possibility of infection, contamination or spreading within the hatchery and also helps to keep disease free environment.

Implementation of a biosecurity program in hatchery operation following steps were followed -

- Selected sound health of brood stock
- Used quarantine/isolated areas for all incoming brood stock
- Treated all incoming brood stock for eliminating pathogenic microbes
- Treated all incoming water to eliminate pathogens
- Disinfected all equipment's and materials

- Maintained personal hygiene measures including washing of hands, feet and clothing by anti-bacterial soap
- Developed knowledge of the hatchery operators on potential pathogenic diseases and the sources of risk enhancers and methods and techniques for their control and/or eradication
- Maintained of optimum and healthy environmental conditions within all phases of the facilities and hatchery operation

Different areas of the hatchery were classified according to the level of risk of disease occurrence or transfer.

1. Quarantine areas where a pathogen of concern is potentially present or suspected
2. Specific protocols and restrictions may be adopted for each of these biosecurity levels to prevent pathogen entry or transfer

1.2) Disinfection:

Disinfection is a very crucial or fundamental process for disease prevention that minimizes the contamination and spreading of pathogenic organisms in prawn hatchery during operation and also prevents the outbreak of diseases. So, prior to operate hatchery all the disinfection ensured for all necessary equipment, hatchery infrastructure, utensils, aeration line, etc. before hatchery operation. **Bleaching powder, Iodine, formalin** etc. and different types of disinfectant were used maintaining different doses for disinfection of necessary hatchery materials.

1.3) Cleanse of freshwater and Brine (salt water):

It is important to know the sources of brine/salt water during collection and these sources should be cleaned and also better located for collecting suitable brine. Freshwater sources should also be cleaned as far as possible for getting good quality water which were suitable for both the selected hatcheries. Soil particles or organic substances in water were removed by using different filter (like bag and pressure filter) and it was done before mixing to prepare 12ppt saline water.

After collection of brine treated with 30-50ppm (the does may vary depends on the suspended soil or organic particles in brine) bleaching powder (65-70% active chlorine) and clean brine water was stored in a reserve tank.

1.4) 12ppt water preparation for larvae rearing:

Prawn is a freshwater species but the development of larvae needs around 12‰ brackish water until larvae is converted into post larvae (PL). Appropriate water treatment procedure was followed for preparing of larvae rearing water (12‰) that resulted successful hatchery operation. The success of the hatchery operation process depends mostly on the brackish water preparation protocols that needed for larvae rearing. For preparing brackish water for larvae rearing, used freshwater and brine water. Sources of freshwater and brine solution was also fresh and clean and the water was organic

substances free. Fresh and salt water (brine) were cleaned before preparing 12‰ brackish water by using different filters (bag and pressure filter)..

Process followed: Brackish water (12‰) was disinfected by using 10-12 ppm (60-65% effective chlorine) bleaching powder during water preparation for larvae rearing. After using bleaching powder, aerated vigorously around 10 minutes for proper chlorination and then chlorinated water kept for 20-24 hrs stopping aeration for eliminating or killing the infectious pathogenic organisms (especially bacteria). After then strong aeration ensured to remove chlorine and it continued until chlorine comes to absolutely zero. To know the existence of residual chlorine water was tested after 10-15 hours starting of aeration by chlorine test kit.

Note: If found any residual chlorine in test then used a little (< 2ppm) sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$) to remove the remaining chlorine. Keep in mind that using excess sodium thiosulphate is harmful or lethal for prawn larvae because it is a toxic chemical.

EDTA was used for removing all heavy metals from water at the rate of 5-10ppm. Vitamin -C also was used as enhancer of water quality.

After treating the water, kept more time (around 48 hrs) for settling. Thus the treated water got more time for settling and clean. Then the clean treated brackish water passed through the pressure filter and stored in reserve tank for used in larvae rearing tank.

1.5) Collection of berried prawn and shifted in the hatching tank:

Collection of berried female is very crucial for prawn hatchery production. It's a common phenomenon that berried females seem weak when they bear eggs in the breeding season. So, berried prawns were collected very carefully and brought after evening when temperature became low. 22-25⁰C water temperature is better for brood transportation. Saline and vitamin-C were used for their energy regain and keeping fresh



Fig: Berried prawn bearing brown color egg

The following steps were considered during berried prawn collection and smooth transportation to avoid hazards: --

- * Brood collected from suitable sources as possible (river)
- * Broods were strong, healthy and disease free
- * Brood weight was 70-100g /individual
- * Egg color was grayish to shiny blackish
- * Ensured less handling and less density during transportation as possible
- * Maintained water temperature 22-25 °C and not exceed 28°C
- * Maintained clean water during brood carrying

Disinfection of berried prawn:

After arrival the berried prawn were kept in resting tank for matching with new condition and after 1-2 hrs, brood stocks were disinfected with 200-250 ppm formalin for a short bath (30 minutes) and followed by 100-150 ppm povidone iodine for another short bath (15 minutes). After completion of disinfection, berried prawns were shifted into the brood management tank. The following day egg color observed and segregated the prawn those were bearing shiny blackish eggs and transferred into hatching tank. Rest of broods were kept in the brood tank until egg color turned into grayish to blackish

Hatching tank was cleaned and water exchange daily early in the morning. Density was maintained 4-5nos./sq.m².

2.) Larvae collection, disinfection, acclimatization and stocking in rearing tank:

Generally prawn larvae hatch out during night and hatched out larvae float on the water surface that comes from mature egg. Following day early in the morning larvae were collected with scoop net and kept it in the bowl (25-30L capacity) with hatching tank water. Salinity of the bowl water raised up gradually around 12ppt by adding of 12ppt treated water and it was done within 3-4 hrs to reached 12ppt.

Larvae disinfected by formalin with @100ppm for 1-2 minutes and after treatment, most of the water was changed and again refilled with new water and followed by the second treatment were given for 1-2 minute using 50ppm iodine as a short bath and then water changed from bowl totally and refilled with new water.

After treatment larval bowl drifted in the rearing tank for acclimatization and later larvae allowed spreading in the tank water.

Stocking density of larvae depends on the culture management. Culture management includes stocking, feeding, water quality management, hygiene maintains disease prevention etc. However, stocking density of larvae was maintained 100-125 nos. /liter.

3.) Management of larvae rearing tank:

Production success of freshwater prawn mainly depends on the appropriate larvae rearing management. Larvae rearing management includes larval density, feeding practices, water

quality management, health observation and monitoring, larval tank cleaning, water change etc. All the activities were done very carefully during larvae rearing in two hatcheries. Ensured intensive larval health observation and monitoring water quality parameters. Thus optimized larval development and increased feed conversion efficiency that ensured appropriate quality and nutritious balance feed, maintains water quality parameters for keeping suitable environment as possible. However there have some crucial activities followed during PL production which stated below: ---



3.1) Larval feeding in rearing tank:

Mainly two types of feed were used for larvae rearing such as- 1) Artemia nauplii as live feed and 2) custard as supplemented feed.

First 8-10 days after larvae stocking only artemia nauplii was given 2 to 3 times daily based on larval feed intake as live feed. After 10 days prepared or commercial custard feed along with artemia nauplii continued until larvae converted in to post larvae (PL).

A feeding chart for LRT is given below:

Age (Day)	Stage	Feeding time								
		7:30 am	9:00 am	11:00 am	12:00 pm	1:00 pm	2:00 pm	3:00-5:00 pm	6:00 pm	10:00 pm
02-08	II-V	AN		-	AN	-	-	Siphoning	AN	-
09-11	VI-VII	PF ₁	AN	PF ₁	AN	PF ₁	PF ₁	"	AN	-
12-19	VIII-X	PF ₂	AN	PF ₂	AN	PF ₂	PF ₂	"	AN	AN
20-35	XI-PL	PF ₃	AN	PF ₃	AN	PF ₃	PF ₃	"	AN	PF ₃

Note: AN = Artemia Nauplii

PF₁= Prepared feed retained on 230 micron sieve

PF₂= Prepared feed retained on 350 micron sieve and

PF₃ = Prepared feed retained on 600 micron sieve

3.2) Water quality management of larvae rearing tank

a.) Optimized water quality:

Management of water quality of larvae rearing tank is highly important task for prawn hatchery operation. It is mandatory to maintain better water quality in larval tank to achieving smooth and healthy production. Good water quality means all the parameters must be optimized and under controlled which are influenced the water quality as well as

larval environment. Water quality deteriorate due to various causes, like- over stocking, over feeding, low or no water changes, no cleanse of larval tank, careless activities etc.

So, for maintaining better water quality ensured optimum density, quality feed, regular water exchange, cleanse larvae rearing tank etc. above steps were followed very carefully which finally ensured sound and healthy production.

Optimum level of water quality parameters for larva rearing which were maintained given bellow-

Water Parameters	Optimum Level
Temperature	30-31°C
Salinity	12‰ ± 2‰
pH	7.5 - 8.5
Chlorine (Cl)	Nil
Dissolve Oxygen(DO)	>5.0ppm
Iron(Fe)	<2.0ppm
No3-N	<20ppm
No2-N	<0.1ppm

3.3) Observation and monitoring of larval health:

It is important to observe or check larval health and its development during hatchery operation as a routine work. By observing larval health it has to be confirmed different issues which are- larval development that includes larvae infected or not, larvae suffer from malnutrition or not, and also what to be done for better health of larvae.

So, larval health was observed accordingly 2-3 times daily by randomly taken sample in glass beaker from different places of larval tank. Water quality parameters also monitored 2-3 times daily which are associated with larval entire activities and also influence larval development.

4.) Post larvae (PL) packing and transportation:

Prawn post larvae (PL) packing and transportation is very important task of prawn hatchery. Two polythin bags were used of which one is filled with freshwater for PL carrying and another is for backup. Treated clean and pollution free water was used in bags during PL transportation along with oxygen for keeping PL alive and fresh in poly bag. Poly bags were tied very well with rubber band or rope. The number of PL in poly bag depends on the distance of the final



destination. Density of 1000 PL followed for 8-10 hours distance with 6-7 liter water. Maintained water temperature range of 22-25°C which is better for PL transportation. A little amount of artemia nauplii, Vitamin-C, Saline (oral saline) water were also used during PL transportation for energy regain.

5.) Record keeping

Record keeping is also an important part of hatchery management and it starts from beginning to PL delivery. It is also necessary to meet up consumers demand some times. Besides, it also bears the reputation of the hatchery to the farmers/cultivators

Following informations were attached on the PL transporting bags and record book as well

- * Name and address of the hatchery
- * Registration number
- * Delivery date
- * Age of PL
- * PL numbers
- * Salinity
- * Batch no/Cycle no

Note: Hatchery operational activities records were kept separately in official record book and also in own computer as backup

6.) Economics:

- **Khulna Prawn Hatchery:**

Produced total PL = 3.81million, Total return=10353000 BDT.

Total variable cost= 3578484 BDT. (Including interest on capital)

Gross Margin= (Total return – Total variable cost) = 6774516 BDT.

- **Rupsha Golda Hatchery:**

Produced total PL = 2.95million, Total return=8130000 BDT.

Total variable cost= 3546961 BDT. (Including interest on capital)

Gross Margin= (Total return – Total variable cost) = 4583038 BDT.

It is stated that this production (PL) came from using partial (only 35-40%) capacity of both hatcheries.

7.) Conclusion:

Nothing is definite but if we follow the above mentioned steps very carefully and methodically then it may safeguard successful production of PL in the hatchery. It is noted that every steps of prawn hatchery operation is very important and threats comes from any stages and occur disease and can rapidly spread in the entire hatchery and then it may go beyond control.

8.) Present Plan:

- Preparation of an intensive hatchery operation training module
- Discussion with interested hatchery owners
- Organize training on hatchery operational management for around 40 hatchery owners and technicians before next production cycle
- Work with other new hatcheries which will be selected after training along with previous two partner hatchery.