Assessment of Production Performance in Relation to Limnological Properties in Low Depth Shrimp *Ghers*

Researchers: Dr. Khan Kamal Uddin Ahmed, Chief Scientific Officer
Md. Motiur Rahman, Scientific Officer
Md. Ariful Islam, Scientific Officer

Objectives

- To survey and categorize the existing shrimp *ghers* based on water depth using altitude reading of GPS (Global Positioning System) meter
- To determine the limnological parameters of waters and chemical properties of soil in the selected *ghers*
- To generate inter-relationship between production performances and water depths
- To express the production performance of low depth *gher* through GIS mapping.

Achievements

A comprehensive study was conducted to survey and categorize the existing shrimp *ghers* based on water depth using altitude reading of GPS meter in October 2015. For achieving objectives under this project, 100 *ghers* of Bagerhat sadar Upazila covering each Union were randomly survey in the year 2015-16. Among the *ghers*, 69% found between 1.5 < to ≤ 3 ft depth, 17% below ≤ 1.5 ft and 14% > 3 ft.

Table 1. Current status of water depth of surveyed *ghers*

Upazila	Covering area	Category based on water depth	*Ghers*	Total *gher* surveyed
Bagerhat Sadar	Randomly 10 Union	≤ 1.5 ft	17	100
		1.5 < to ≤ 3 ft	69	
		> 3 ft	14	

Water quality parameters

The recorded mean water quality parameters in all experimental *ghers* of Bemarta Union of Bagerhat Sadar throughout the experimental period are shown in Table 2. The mean water temperature recorded (24.45±3.70°C), (24.94±3.73°C) and (25.1±3.86°C) in T_1, T_2 and T_3 *ghers*, respectively. The water pH of T_1, T_2 and T_3 *ghers* were recorded (8.2±.33), (8.17±.34) and (8.24±.27), respectively. Dissolved Oxygen was found minimum in T_3 (5.22±1.25) mg/l, maximum in T_1 (5.46±1.60) mg/l and Ammonia was recorded (0.01±.03) mg/l, (0.014±.03) mg/l and (0±0) mg/l in T_1, T_2 and T_3 *ghers*, respectively. The maximum salinity fluctuation was recorded in T_3 (1.38±2.09 ppt) whereas the minimum salinity fluctuation was observed in T_1 (1.3±1.84) *ghers*. The mean alkalinity was observed (156.22±17.68) mg/l, (1.63±1.86) mg/l and (154.22±18.77) mg/l in T_1, T_2 and T_3 respectively. Presence of Iron found as (0.42±.20) mg/l, (0.48±.20) mg/l and (0.44±.21) mg/l in T_1, T_2 and T_3 *ghers*, respectively.

Table 2. Water quality parameters in three categorized *ghers* based on water depth

Parameters	T1 (> 3 Feet depth) (Mean+SD)	T2 (1.5-3 Feet depth) (Mean+SD)	T3 (<1.5 Feet depth) (Mean+SD)
Temp (°C)	24.45±3.70	24.94±3.73	25.1±3.86
DO (mg/l)	5.46±1.60	5.12±1.61	5.22±1.25

pH	8.206±.33	8.17±.34	8.24±.27
Salinity (ppt)	1.3±1.84	1.63±1.86	1.38±2.09
Alkalinity (mg/l)	156.22±17.68	156.92±17.86	154.22±18.77
Ammonia (mg/l)	0.01±.03	0.014±.03	0±0
Nitrite (mg/l)	0.01±.03	0±.03	0±0
Iron (mg/l)	0.42±.20	0.48±.20	0.44±.21
Phosphate (mg/l)	0.33±.07	0.35±.07	0.32±.06
Phosphorus (mg/l)	0.10±.02	0.1±.02	0.1±.02

* Average values of 12 samples collected from December 2015 to May 2016. Sampling Frequencies: Twice in Every Month

Soil characteristics

The recorded average soil parameters in all experimental *ghers* of Bemarta Union of Bagerhat Sadar throughout the experimental period are shown in Table 3. The values of organic matter found as 2.57±1.06%, 2.15±1.22% and 2.06±1.01% in T_1, T_2 and T_3 *ghers*, respectively. The mean value of pH recorded as 7.49±.18, 7.81±.18 and 7.82±.35 in T_1, T_2 and T_3 *ghers*, respectively. The average value of soil salinity found higher in T_3 (5.21±2.25 ds/m) than those of T_2 (4.69±2.36 ds/m) and T_1 (4.57±1.94 ds/m). The average value of phosphorus found higher in T_2 (14±7.10µg/g) followed by T_1 (12±5.81µg/g) and T_3 (12±5.64µg/g). Mean total nitrogen found 0.06±.05%, 0.08±.05% and 0.09±.09% in T_1, T_2 and T_3 *ghers*, respectively. The maximum Potassium recorded in T_3 (0.63±.17m.eq./100g), whereas the minimum observed in T_1 (.63±.13m.eq./100g) during the experimental period. The presence of Sulphar was maximum in T_2 (116.84±84.06µg/g) compared to T_1(115±75.60µg/g) and T_3 (107±77.5µg/g) *ghers* as well. The presence of Zinc was higher in T_3 (0.87±.68 µg/g) than those of T_2 (.63±.25 µg/g) and T_1 (0.88±.53 µg/g) *ghers*.

Table 3. Soil quality in three categorized *ghers* based on water depth

Parameters	T1 (> 3 Feet water depth) (Mean+SD)	T2 (1.5-3 Feet water depth) (Mean+SD)	T3 (<1.5 Feet depth) (Mean+SD)
pH	7.49±.18	7.81±.18	7.82±.35
Salinity (EC) (ds/m*)	4.57±1.94	4.69±2.36	5.21±2.25
Organic content (%)	2.57±1.06	2.15±1.22	2.06±1.01
Potassium (m.eq./100g)	0.63±.13	0.61±.16	0.63±.17
Total Nitrogen (%)	0.06±.05	0.08±.05	0.09±.09
Phosphorus (µg/g)	12±5.81	14±7.10	12±5.64
Sulfar (µg/g)	115±75.60	116.84±84.06	107±77.5
Zinc (µg/g)	0.88±.53	.63±.25	0.87±.68

* Average value of collected 6 samples from December 2015 to May 2016
Sampling frequencies: once in every month; 1 ds/m equivalent 0.64 ppt

Qualitative and quantitative phytoplankton count

Bacillariophyceae, Cyanophyceae, Chlorophyceae and Euglenophyceae, Rotifers, Copepods, Crustaceans were found as the dominant groups in T_1, T_2 and T_3 ghers . A number of zooplankton group found higher than phytoplankton group. Densities of zooplankton and phytoplankton were recorded fewer than optimum density. Toxic mycrocystis spp. found higher in T_3(≤1.5 ft) and T_1(> 3 ft) *ghers*.

Table 4. Plankton *availability in* different *ghers* (Based on water depth) of Bemarta Union from December 2015 to May 2016

Treatment	Phytoplankton	Density (nos/L)	Zooplankton	Density (nos/L)
T_1(> 3 ft)	Microcystis spp.	$10x\ 10^3$	Nauplius spp.	1,000
	Euglena spp.	9000	Brachionus spp.	4,000
	Navicula spp.	4000	Cyclops spp.	3,000
	Diatom spp.	1500	Moina spp.	900
	Nitzschia spp.	400	Diaptomus	1,250
	Closteriam spp.	800	Crustacean larvae	800
	Melocera spp.	2000		
	Cyclotellla	100		
T_2 (1.5-3 ft)	Microcystis spp.	9×10^3		
	Euglena spp.	3000	Brachionus spp.	3,100
	Chlorella spp.	2000	Cyclops spp.	2,000
	Fragillaria spp.	1000	Crustacean larvae	2,000
	Gonatozygon spp.	500	Diaptomus spp.	700
	Diatom spp.	2000	Moina spp.	100
	Cyclotella	100		
	Melosera spp.	1000		
T_3(≤1.5 ft)	Mycrocystis spp.	10 000		
	Euglena spp.	2000	Brachionus spp.	2,000
	Melosera spp.	100	Cyclops spp.	1,600
	Naviculla spp.	4000	Moina spp.	100
	Cyclotella spp.	2000	Diaptomus spp.	1,000
	Gonatozygon spp.	100		

Table 5. Production performance of selected 15 *ghers* of Bemarta Union of Bagerhat Sadar Upazilla

Gher Categorization	Area/ dec (Mean +SD)	Culture system	Species composition	Stocking density (nos/dec Shmp/Prwn/Fin	Stocking and harvesting type	Culture period (month)	Production (Kg/ha) Shrimp/ prawn/ Fin fishes	Crop /Year	BCR
T_3 (1.5≤ ft)	34.2±10.60	Integrated (Paddy/ Vegetables/ Fishes) +Mixed(Shrimp/ Prawn/ Fin fishes)	Shrimp/ Prawn/ Fin fishes	224 (177/40/07)	Continuous And Partial	(6-8)	247/494/ 494-741	Paddy double Fishes single	1.23
T_2 (1.5-3) ft	39.4±32.02			258 (208/44/06)	Continuous And Partial	(6-8)	(494/741/1235)	Paddy double Fishes single	1.30
T_1 (3> ft)	68.6±26.87			365 (278/44/43)	Continuous And Partial	(4-6)	(741/944/ 1729)	Paddy double Fishes single	1.60

Impact of Probiotics on Shrimp (*Penaeus monodon*)/Prawn (*Macrobrachium rosenbergii*) Production

Researchers: Dr. Khan Kamal Uddin Ahmed, Chief Scientific Officer
Rubia Akter, Scientific Officer
Md. Motiur Rahaman, Scientific Officer
Rakhi Das, Scientific Officer

Objectives

- To evaluate the impact of probiotics on growth and production of Shrimp (*Penaeus monodon*)/ Prawn (*Macrobrachium rosenbergii*) (on farm)
- To evaluate the economic feasibility of production of shrimp with or without added probiotics
- To study the soil and water quality parameters of the experimental ponds
- To develop technology on impact of probiotics for shrimp (*Penaeus monodon*)/prawn (*Macrobrachium rosenbergii*) production.

Achievements

Trial on golda (Macrobrachium rosenbergii) culture using probiotics

For determining the growth, survival and production of Golda (*Macrobrachium rosenbergii*) in *gher* conditions through application of probiotics. In (2011-12) the experiment was carried out in 6 ponds of Shrimp Research Station having an area of 0.052—0.064 ha. Three treatments of the experiment were : Super biotics probiotics mixed with feed (T_1), Super Ps probiotics broadcast all over the ponds mixed with clay (T_2) and feed without probiotics (T_3) and each treatments having 2 replicates. Higher production (1,124.03 kg/ha) was obtained from T_1 than T_2 (1,033.36 kg/ha) and T_3 (848.35 kg/ha). The results revealed that higher growth, survival and production of prawn were recorded from the ponds treated with super biotic probiotics. In (2012-13) similar, experiments were carried out in 9 on station ponds with 3 treatments, and Super biotic probiotics exhibited better production than other treatments. Due to fund constraints the aforesaid findings could not tested in the farmer`s field. So, using super biotic probiotics the experiment was tested in the farmer`s *gher* in 2015-16

Treatments	Replication	Stocking density (No./ha)	Application of probiotics	
			Probiont type	Dose
T1	3	25,000	Super biotic Probiotics mixed with feed	5-10gm/de/ day

A selected probiotics such as Super biotic is applied at 5-10gm/dec/day. The artificially manufactured probiotics (beneficial bacteria), *Bacillus* spp. Comprising strength of ±CFU/g (recommended by manufacturer) is administered in the ponds. The population of total heterotrophic bacteria (THB) of pond waters and sediments is estimated on monthly intervals. Bacterial floras present in ponds are analyzed and it is found that bacterial load in water and sediment ranged from 6.910×10^8— 5.013×10^8 , 3.612×10^8— 2.562×10^8 respectively.

Table 1. Bacterial load of soil and water in different treatments

Treatments		Bacterial load (CFU/mg & CFU/ml)
T1 (Ex-1) Golda	Soil	3.612×10^8— 2.562×10^8
	Water	6.910×10^8— 5.013×10^8

Different water quality parameters (temperature, water depth, dissolved oxygen, pH, salinity, ammonia, nitrate, total alkalinity and transparency) are measured at weekly intervals. Remarkable variations in parameters were not found among the different treatments.

Growth of prawn was measured and feed was adjusted after every fortnight. On 27th September 2016, the average weight of prawn in T_1 and T_2 (on-station) was 62.14 ±10.25, 54.5±0.70 gm respectively. From the collected data so far, it can be mention that the highest production was found using Super biotic.

Table 2. Growth, survival and production of (*Macrobrachium rosenbergii*) in farmers gher during the culture period

Particulars	Treatments	
	T_1 (Super biotic) (on-farm)	T_1 (Super biotic) (on-station)
Stocking density (no./m^2)	2.5	2.5
Stocking size (g)	11.66±3.24	1.0±0.29
Harvesting size (g)	62.14±10.25	54.5±0.70
Survival (%)	84.0±1.20	82.5±1.40[a]
FCR	2.71	2.70
Production (kg/ha)	1210	1124.03±20.3[a]

Trial on bagda (Penaeus monodon) culture using probiotics

In (2013-14) the experiment was carried out in 9 ponds of Shrimp Research Station having an area of 0.052—0.064 ha. Three treatments of the experiment were : Super biotics probiotics mixed with feed (T_1), Super Ps probiotics broadcast all over the ponds mixed with clay (T_2) and feed without probiotics (T_3) and each treatments having 3 replicates. Higher growth was obtained from T_1 followed by T_2 and T_3. After 90 days of husbandry, all shrimp were harvested. The survival rate of shrimp production was recorded 80%. The production of shrimp was found 475 kg/ha in T_1, 327.57 kg/ha in T_2 and 136.79 kg/ha. in T_3. So the highest production was found using super PS (T_1). In (2014-15) similar, experiments were carried out in 9 on station ponds with 3 treatments, having three replication and super PS probiotics exhibited better production than other treatments. Due to fund constraints the aforesaid findings could not test in the farmer`s field. Using super PS probiotics the experiment was trialed in the farmer`s gher in 2015-16.

Treatments	Replication	Stoc. density No./ha)	Application of probiotics	
			Probiont type	Dose
T_1	3	30,000	Super PS Probiotics broadcast on the pond	Every 10days Intervals (15 liter/ha)

A selected probiotics such as super PS is applied at 15 liter/ha. The artificially manufactured probiotics (beneficial bacteria), *Bacillus* spp. Comprising strength of ±CFU/g (recommended by manufacturer) is administered in the ponds. The population of total heterotrophic bacteria (THB) of pond waters and sediments is estimated on monthly intervals. Bacterial floras present in ponds are analyzed and it is found that bacterial load in water and sediment ranged from 2.733 x 10^8— 3.253x 10^8, 5.722 x 10^8—6.082 x 10^8 respectively.

Table 3. Bacterial load of soil and water in different treatments

Treatments		Bacterial load (CFU/mg & CFU/ml)
T_2(Ex-2) Bagda	Soil	5.722×10^8—6.082×10^8
	Water	2.733×10^8— 3.253×10^8

Different water quality parameters (temperature, water depth, dissolved oxygen, pH, salinity, ammonia, nitrate, total alkalinity and transparency) are measured at weekly intervals. Remarkable variations in parameters were not found among the different treatments. Values of different water parameters.

Growth of shrimp was measured and feed was adjusted after every fortnight. On 27th July 2016, the average weight of shrimp in T_1 and T_1 (on-station) was 23.18 ±0.35, 22.065± 5.52gm respectively. From the collected data so far, it can be mention that the highest production was found using Super PS.

Table 4. Growth, survival and production of *Penaeus monodon*in farmers gher during the culture period

Particulars	Treatments	
	T_1 (Super PS) (on-farm)	T_1 (Super PS) (on-station)
Stocking density (no./m2)	3.0	3.0
Stocking size (g)	0.025	2.00
Harvesting size (g)	23.18 ±0.35	22.065±5.52
Survival (%)	80%	78.33%
FCR	1.83	1.86
Production (kg/ha)	662	475

Development of Cost Effective Quality Feed using Locally Available Feed Ingredients for Black Tiger Shrimp (*Penaeus monodon)*

Researchers: Dr. Khan Kamal Uddin Ahmed, Chief Scientific Officer
Md. Wahed Ali Pramanik, Deputy Director
Rakhi Das, Scientific Officer
Rubia Akter, Scientific Officer

Objectives

- Formulation of cost effective artificial diets for bagda grow-out using locally available ingredients
- Determine the efficacy of formulated feed on growth, survival and production of shrimp in earthen ponds/ghers.

Achievements

Different types of local feed ingredients *viz.* dhyancha seeds (*Sesbania* sp.*)*, duckweed (*Lemna minor*), Kolmilata (*Ipomoea aquatica*), mustard oilcake, soya bean meal, meat and bone meal were selected for the formulation of grow-out feeds (Table 1). Analysis of selected feed ingredients was done in the Shrimp Feed and Nutrition Laboratory of Shrimp Research Station, Bagerhat. Three diets with a protein level of

35% were formulated using Pearson`s Square Method and was adjusted this level by trial and error method. Essential Amino Acid (EEA) and Essential Fatty Acid (EFA) profiles of the selected ingredients were included in test diets. The protein content and amino acid was readjusted until the fulfillment of protein and amino acid level in the diets. Locally available feed ingredients like rice bran, wheat bran, wheat flour, broken maize as well as vitamin & minerals were also used as common ingredients for the formulation of three diets. Proximate composition formulated diets was analyzed to check the accuracy of formulation (Table 2). Diets were palletized and dried at room for 2-3 days. The feed were kept in airtight polythene bags and stored at room temperature.

Table 1. Feed formulation

Ingredients	Feed-1	Feed-2	Feed-3	Feed-4
Fish meal	12.00	12.00	12.00	Quality feed (Gold Grower)
Meat & bone meal	15.00	15.00	15.00	
Soyabean meal	10.00	12.00	12.00	
Mustard oil cake	10.00	10.00	12.00	
Sunflower oil cake	10.00	10.00	10.00	
Duck weed	5.00	5.00	10.00	
Kolmilata	5.00	10.00	5.00	
Rice bran (Auto)	16.00	14.00	12.00	
Wheat flour (Atta)	5.00	5.00	5.00	
Lime Stone	1.00	1.00	1.00	
Salt	0.50	0.50	0.50	
Vit. & minerals premix	0.20	0.20	0.20	
Pellet binder	0.30	0.30	0.30	
Total	100	100	100	

Table 2. Proximate analyses of feed

Parameters	Feed-1	Feed-2	Feed-3	Control
Crude protein	34.80	34.50	34.48	37.5 (28.53)
Crude fat	8.40	8.20	8.15	7.0
Ash	12.30	11.78	11.79	3.0
Fibre	5.63	6.09	6.26	-
NFE	30.03	30.77	31.82	-
GE (kJ g^{-1})	16.50	16.55	16.45	-

* 28.53 crude protein found in Lab analysis.

Eight ponds were selected in Shrimp Research Station, Bagerhat. These ponds were dried, renovated and prepared using lime (CaO, 01 kg/dec.). The ponds were filled up with tidal water and rotenone of 40g/decimal were applied to remove the unwanted fauna from the water bodies. Then ponds were treated with lime @100 g/dec. for neutralizing the action of rotenone and the ponds were fertilized with inorganic fertilizers followed by Urea: 200-250g/dec., TSP: 100-125g/dec. and Potassium permanganate: 60-80 g/dec. Black tiger shrimp *(P. monodon)* post larvae was collected from the local markets of Bagerhat district. PL acclimatized in nursing point of SRS, Bagerhat for temperature and salinity adjustment. Post larvae of shrimp reared in nursery pond for 21-25 days. Thereafter, stocking was done with nursed PL.

Feed was supplied twice daily @10% of body weight for the first month, 8% for the second month and 5-3% for the rest period. About 10% of stocked shrimp was sampled by cast net. Weight of the shrimp was taken using portable balance for growth monitoring, feed adjustment and disease checking. Water quality was also monitored and recorded at weekly intervals.

Water quality parameters of the ponds monitored and recorded at weekly intervals. Water temperature ranged from 28-29°C. The pH of all treatment ponds was always alkaline and varied from 8.17-8.31 (Table 6). In all treatments DO concentration ranged from 7.0-5.08 mg/l. Water salinity was around 5 ppt that showed similar value in all treatments. The average value of ammonia was higher in T_4 (0.046mg/L) than the values recorded in T_1, T_2 and T_3 and significant difference was not observed among the treatments.

Table 3. Parameters of water quality

Parameters	Treatments			
	T_1	T_2	T_3	T_4 (Control)
Temperature (^{0}C)	28.95±0.77	28.83±0.72	29.02±0.60	28.91±0.71
pH	8.31±0.18	8.17±0.23	8.23±0.27	8. 25±0.26
Salinity (ppt)	5.07±0.78	5.08±0.69	5.02±0.79	5.02±0.62
DO (mg/l)	7.08±0.28	7.03±0.29	7.04±0.24	5.00±0.35
Ammonia (mg/l)	0.03±0.01	0.03±0.01	0.02±0.007	0.046±0.04

Post larvae of shrimp (*P. monodon),* average body weight of 0.005g were collected from Cox`s Bazar through PL supplier. The nursed shrimp PL of average body weight of 2.0 g stocked at the rate of 120/dec. and reared for a period of 90 days. They fed with Feed-1, Feed-2, Feed-3 and Feed-4. Weekly sampling was done for measurement of growth and survival and feed was adjusted accordingly. As the experiment conducted in the farmers field where the nursed shrimp PL of average body weight of 1.5 g stocked at the rate of 120no./dec. After three and half months of culture, the growth recorded 18.69g, 20.12g, 18.39g and 17.01g for Feed-1(T_1), Feed-2 (T_2), Feed-3 (T_3), and Feed-4 (T_4) (commercial feed) respectively. The highest growth performance of 20.12g obtained from Feed-2 (fish meal 12%, meat & bone meal 15%, soya-bean meal 12%, Sunflower oil cake 10%, mustard oil cake 10%, Kolmilata 10%, Duck weed 5%, rice bran 14%, wheat flour 5%, lime stone 1%, Salt 0.5%, vitamin & minerals 0.2%, Pellete binder 0.3%) and the lowest of 17.69g was recorded in grower shrimp supplied with feed-3. Different growth parameters and survival of shrimp with different feeds are shown in Table 4.

Survival: The initial stocking density of PL was 120 in each treatment. At the end of rearing, the survival of shrimp was 72.0%, 75.0%, 71.0%, and 69.5% in T_1, T_2, T_3 and T_4 respectively. Highest survival (75.0%) was found in T_2 than those of T_1, T_3, and T_4.

Table 4. Growth performance and survival of shrimp using different feeds

Treatments	Initial wt. (g)	Final wt. (g)	SGR* (% days)	Survival (%)
T_1 (feed-1)	1.5	18.69±1.36	2.63	72.0
T_2 (feed-2)	1.5	20.12±2.12	2.97	75.0
T_3 (feed-3)	1.5	18.39±1.20	2.70	71.0
T_4 (Control) (commercial feed)	1.5	17.01±1.82	2.50	69.5

Investigation into Shrimp/Prawn Diseases and their Control Strategies

Researchers: H.M. Rakibul Islam, Senior Scientific Officer
Md. Ariful Islam, Scientific Officer
Rakhi Dash, Scientific Officer

Objectives

- To identify the available viral pathogens affecting shrimp (*P. monodon*) production
- To identify the available strains of White Spot Syndrome Virus (WSSV) causing shrimp (*P. monodon*) mortality
- To investigate the bacterial resistance to antibiotics and optimization of antibacterial dose in PL production of *M. rosenbergii* in hatchery.

Achievements

In the year 2015-16, investigation of immerging diseases was one of the most important objectives of the research programme. Therefore, under the project 15 shrimp *ghers* of Bagerhat Sadar were investigated randomly in context to aqua ecology and pathogens. Among the *ghers*, 60% of them appear with white spot on the shell and 80-90% mortality within a week. Twenty five percent of *ghers*, no spots appear, shrimp appear into opaque color, stop feeding, sometimes turns into reddish color, 2-5% mortality with a consistence interval (Fig. 1).

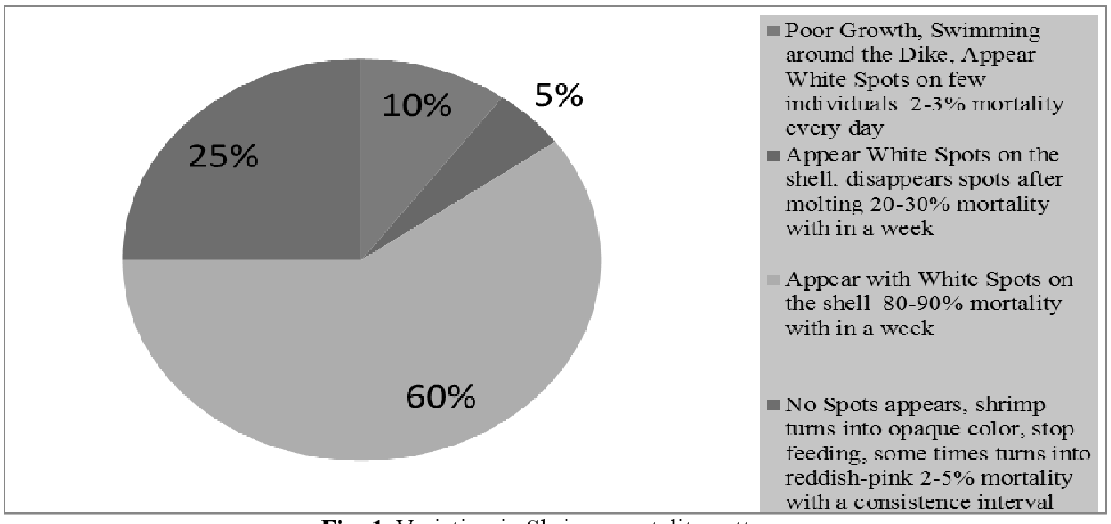

Fig. 1. Variation in Shrimp mortality pattern.

In past few years, the salinity in the river water was very steady and hardly cross the range 2-3 ppt, but in the current year, the river water salinity hikes up to 11 ppt (Fig. 2) due to the dredging and excavation of Ghoshiyakhali channel of the Sundarbans. Therefore, due to heavy rainfall, the shrimp (*Penaeus monodon*) face higher salinity fluctuation which make those more vulnerable to WSSV.

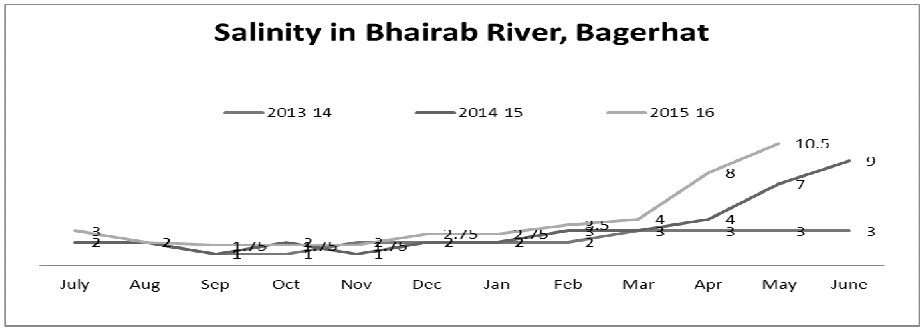

Fig. 2. Water salinity in the Bhairab River in 2013-14, 2014-15 & 2015-16.

Different water quality parameters *viz*. pH, Salinity, Nitrite, Iron, Ammonia and Oxygen fluctuations were observed which also make those vulnerable to WSSV (Fig. 3).

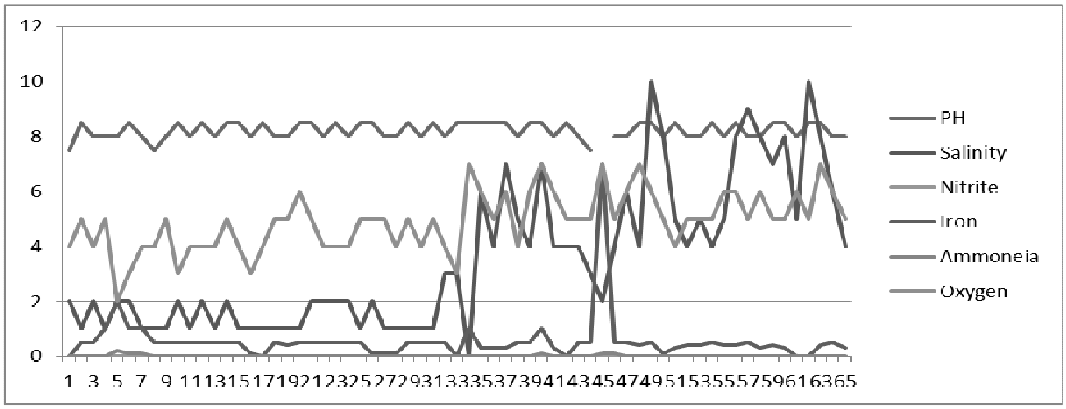

Fig. 3. Different water quality parameters fluctuations.

Modern, Niribili and Bengal Bay hatchery send their fingerlings for test. Where 50-55% fingerlings are alive wher 25-30% fingerlings are week and appendageless(Fig. 4) (Table 1).

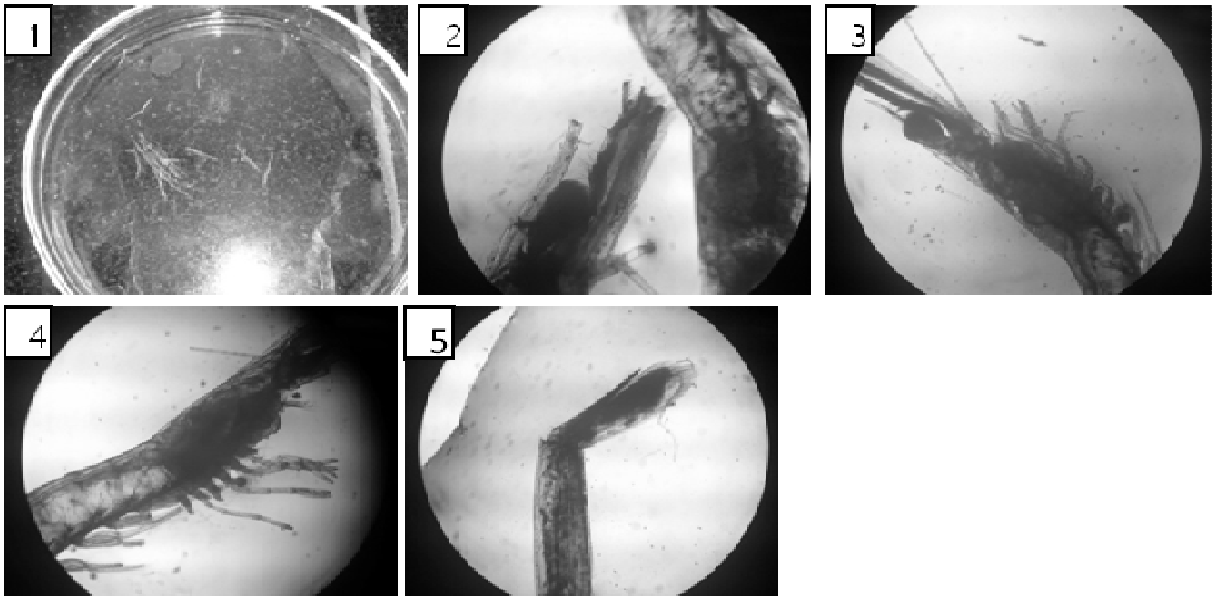

Fig. 4. Microscopic observation of obtain sample (1. dead fingerlings, 2. Food and pry hunting Antenna & Rostrum are broken (Sensory organ), 3 and 4. Pleopods are broken which are used for feeding, 5. Uropods and Telson are broken which are used for swimming and defense.

To find out the presence of virus PCR test has been done of supplying sample. In Niribili hatchery sample, White Spot Syndrome Virus was found by this PCR test (Fig. 5)

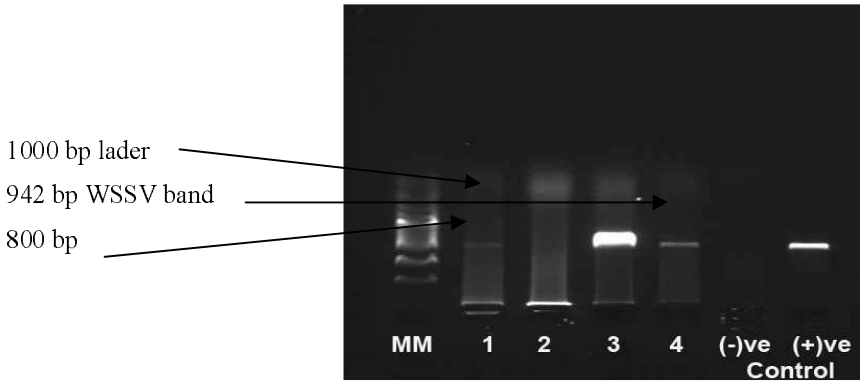

Fig. 5. Identification of Virus DNA band by Gel Electrophoresis
1.SR Hatchery, 2. Bengal Hatchery, 3. Niribili Hatchery, 4. Modern Hatchery)

Impact of Alkalinity on survival and molting of M. rosenbergii larvae

This study revealed higher molting ratio with the higher level of alkalinity. However, several literature suggested to maintain the alkalinity range within 90-110, the experiment shows higher molting rate at the salinity level of 200 mg/l compared with 120, 140 and 160 (Fig. 6). Therefore, further detailed investigation along the line is required.

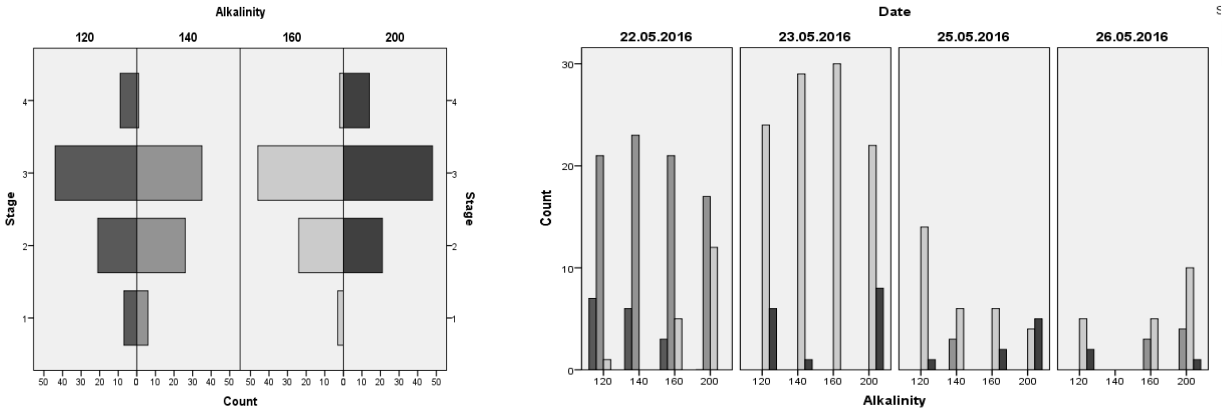

Fig. 6. Impact of alkalinity on survival and molting of *M .rosenbergii l*arvae.

Survey of the existing prawn hatcheries

Four golda hatcheries namely, SRS Golda hatchery, BRAC 1A Hatchery, BRAC 1B Hatchery and BRAC 2 Hatcheries have been investigated under the project and found facing different problems associating with different water quality parameters mainly. For the presence of pathogenic bacteria, three different agar media were used to determine gram negative bacteria , pathogenic enterobacters and vibrios (Tables 4 & 5). Bacterial loads were also higher in the hatcheries which was a concerning issue.

Table 4. Bacterial load of SRS golda hatchery

EMB Agar		
06.05.16	5.61 X10^7	
09.05.16	1.51X10^7	
MAC Agar	Opaque Colony (*Enterococcus faecalis, Salmonella enteric, Proteus mirabilis*)	Pink colony (*Escherichia coli*)
06.05.16	4.1 X10^8	6.9 X10^7
09.05.16	2.234X10^8	9.46 X10^6
TCB Agar	Yellow Colony *(Vibrio alginolyticus , V. fluvialis , V. furnissii)*	Green colony (*V. parahaemolyticus, V. vulnificus, V. hollisae)*
06.05.16	2.016 X10^7	2.63X10^8
09.05.16	1.17X10^8	1.85X10^7

Table 5. Profile of different bacterial load in different hatcheries

Mac Agar	Opaque colony (*Enterococcus faecalis, Salmonella enteric, Proteus mirabilis*)	Pink colony (*Escherichia coli*)
BRAC.1 B	6.190 X10^6	2.857X10^6
BRAC.1A	1.780X10^6	
BRAC. 2	1.014X10^5	
Rupsha	9.274X10^4	
EMB Agar		
BRAC.1 A	2.191X10^6	
BRAC.1B	8.571X10^5	
BRAC.2	4.783X10^5	
Rupsha	6.183X10^4	
TCBS Agar		
BRAC.1 B	4.761X10^4	

Bioaccumulation of Hazardous Chemicals in Shrimp Farming Systems of Bangladesh

Researcher: Dr. Khan Kamal Uddin Ahmed, Chief Scientific Officer
H.M. Rakibul Islam, Senior Scientific Officer
Md. Ariful Islam, Scientific Officer
Rakhi Das, Scientific Officer

Objectives

- To identify available chemicals that may contain banned antibiotics which are used in shrimp/prawn farms
- To identify the source of hazardous antibiotics in shrimp/prawn culture system
- To assess available pesticides residues in rice-prawn/shrimp farming system.

Achievements

Identification of chemicals/aqua drugs available to traders and farmers

Using a short questionnaire the following chemicals and drugs are identified which are used by the farmers for *gher* preparation, water quality management, gas removal and disease treatment.

Table 1. Identified chemicals/aqua drugs available to traders and farmers

Category	Aqua Drugs/ Chemicals	Active ingredients	Purpose of use
Gher preparation and water quality management	Gastrap	Lactic acid, *Bacillus subtilis*, amilase, lipase	to remove gas
	Geotox	SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O	to improve soil and water quality
	Zeolite	SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O	-do-
	Aquaclean	Tetradesile trimethyle, amonium bromide, aminonitrogen	used as disinfectant in water
Pest control	Prontek	--	to control pest in rice field
	Harvest	--	-do-
	Theovit	--	-do-
	Asatac	--	-do-
Disease treatment	Bactitab	Oxytetracycline 20%	to inhibit pathogenic bacteria
	Cotrim Vet	Sulphamethoxazole+Trimethoprime	-do-
	Renamycin	Oxytetracycline	to increase resistance capacity
	Oxytetracyclin	Oxytetracycline	-do-
	Renamox	Amoxacillin trihydrate	-do-
	Sulfatrim	Sulphadiazine and trimethoprime	to inhibit pathogenic bacteria

Detection of hazardous antibiotic Chloramphenicol (CAP) to identify it's source

For the analysis of banned antibiotics like Chloramphenicol (CAP), shrimp and prawn samples were collected from Kochua, Rampal, Chitolmari and Bagerhat Sadar Upazila. No hazardous Chloramphenicol (CAP) was found from the shrimp samples collected from improved-extensive culture system.

Assessment of available pesticide residues in shrimp/prawn farms

An experiment was conducted to investigate the concentration of Organochlorine pesticides residues such as DDT, Heptachlor, Dieldrin and Endrin used in rice-cum shrimp/prawn *ghers*. A total of six sites *viz.* Bagerhat Sadar, Kochua, Rampal, Chitolmari Upazilas of Bagerhat District and Avaynagar, Keshabpur Upazilas of Jessore District were selected for this study and shrimp/prawn samples were collected from these sites. Most of the farmers of these sampling sites use Carbofuran pesticide to control pest of rice.

Table 2. Detected pesticides concentration and risk based consumption for contaminated shrimp/prawn

Sampling Sites	Pesticides	ARL	BW (Kg)	CSF	Pesticides concentration Cm (ppm)	CR_{lim} (Kg/day)	CR_{mm} (Kg/yr)
B'hat Sadar	Heptachlor	0.00001	70	2	**0.177**	0.002	**3.22**
Kochua		0.00001	70	2	0.024	0.015	24.14
Rampal		0.00001	70	2	0.020	0.018	28.96
Chitolmari		0.00001	70	2	**0.309**	0.001	**1.61**
Keshobpur		0.00001	70	2	0.026	0.013	20.92
Avaynagar		0.00001	70	2	0.016	0.022	35.40
B'hat Sadar	Dieldrin	0.00001	70	2	0.008	0.044	70.80
Kochua		0.00001	70	2	0.011	0.032	51.49
Rampal		0.00001	70	2	0.009	0.039	62.75
Chitolmari		0.00001	70	2	0.008	0.044	70.80
Keshobpur		0.00001	70	2	0.010	0.035	56.32
Avaynagar		0.00001	70	2	0.017	0.020	32.18
B'hat Sadar	Endrin	0.00001	70	2	0.073	0.005	8.045
Kochua		0.00001	70	2	Not detected	Not detd.	Not detd.
Rampal		0.00001	70	2	-do-	-do-	-do-
Chitolmari		0.00001	70	2	0.044	0.008	12.87
Keshobpur		0.00001	70	2	Not Detected	Not detd.	Not detd.
Avaynagar		0.00001	70	2	-do-	-do-	-do-
B'hat Sadar	DDT (2,4-Dichloro-diphenyl-trichloro ethane)	0.00001	70	2	Not Detected	Not detd.	Not detd.
Kochua		0.00001	70	2	-do-	-do-	-do-
Rampal		0.00001	70	2	-do-	-do-	-do-
Chitolmari		0.00001	70	2	-do-	-do-	-do-
Keshobpur		0.00001	70	2	-do-	-do-	-do-
Avaynagar		0.00001	70	2	-do-	-do-	-do-

In this study, the banned antibiotics like Chloramphenicol residues were absent in shrimp. On the other hand, pesticides residues in shrimp has shown that few organ-chlorine pesticides like Heptachlor, Dieldrin, Endrin were present in the experimental farms in limited concentration.