

A preliminary study on post larvae (PL) production of *Macrobrachium rosenbergii* in earthen pond

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Giant freshwater prawn (*Macrobrachium rosenbergii*) has significant role in the fisheries sector of Bangladesh. But this important sector is being affected due to seed related problem. Therefore, a preliminary study was carried out to observe the feasibility of producing prawn PL in earthen pond as an alternative to hatchery system. Prawn's larvae were reared in earthen pond and development of the larvae were monitored under microscope during the growth phases upto attaining PL. To do so, broods were collected and stocked in two earthen ponds specially prepared for larval rearing of prawn's hatchlings. After hatching, larvae were reared for a period of 45 days to obtain quality PL. Water quality and feeding were managed during the rearing cycles. pH, DO, salinity, alkalinity and ammonia were found to be optimum with the range of 7.6 ± 0.13 , 7 ± 0.82 mg/L, 12.14 ± 1.57 ppt, 148.57 ± 5.56 mg/L and 0.42 ± 0.09 ppm respectably, where ammonia was at a higher level. Larvae were developing spontaneously throughout the rearing period. After hatching, first larval stage was matured to second stage within 1-5 days. Third, fourth and fifth stages were found within the 5th-9th, 8th-13th and 12th-16th day. Then the other stages (6,7,8,9,10 and 11) were also attained within optimum time range as hatchery standard depicted in the FAO manual. Post larvae was appeared within 38-44 days. Survival rate was 8.94% and 11.46% in two ponds. The experiment showed that, prawn's post larvae production in earthen pond is possible.

Morphometric variation of Grey Mullet (*Liza parsia*) in Satkhira region

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The present study was aimed to determine the variation in morphometric parameters of Gray mullet (*Liza parsia*) collected from Munshiganj, Satkhira region on 19 October, 2019. Total 54 (38 fish from farm of Mohammad Abdur Hamid and 16 fish from Burigualiny River) individuals ranging from 17.38 cm to 10.55 cm in total length (TL) were collected. Principal component analysis were run to measure the variation of the parameters between two sources of fish. All morphometric parameters of fish from two different sources were compared. The relation between total length and all parameters (Total weight, Standard length, Fork length, Width, Eye diameter, Head length, Intestine length, Liver weight, Relative gut length) were determined by regression analysis. The relation between Total weight-Liver weight and Total weight-Hepatosomatic index were analyzed by regression analysis. PC1 shows positive correlation among all parameters, except intestine length, where only intestine length was significantly correlated in PC2 analysis. All morphometric parameters showed significant difference ($P < 0.05$) between farmed reared and wild mullet, except Head length/ eye diameter. r^2 showed significant correlation between parameters. Overall study was performed to provide information that can help to develop new culture strategies to identify the morphometric variation between farm and wild fish and quality analysis.

Effect of probiotics on amylase enzyme activity of *Macrobrachium rosenbergii* at different stocking density

ID: 160603

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The study was carried out to know the effect of commercial probiotics on amylase enzyme activity of *Macrobrachium rosenbergii* in different stocking density. The experiment was conducted on KU FMRT experimental pond complex-II where each pond's size was 60m² and prawns were stocked at the rate of 2m⁻², 4m⁻², 6m⁻². Three different probiotics were applied such as environmental probiotics as P1, feed and environmental probiotics as P2 and feed probiotics as P3 with a control of without probiotics. So the total number of treatment were nine in addition with a control group with three replications. Amylase activity was analyzed in Fish Pathology Lab and Fish Molecular Biology and Biotechnology Lab of Fisheries and Marine Resource Technology (FMRT) Discipline, Khulna University, Khulna. For probiotic-1 in different stocking density the amylase concentration ranged between (T1= 5.88±3.60; T2= 3.91 ± 0.06; T3= 4.78 ± 1.92)µmol/min/mg. For probiotic-2 it resulted (T4= 2.21 ± 0.34; T5= 4.52 ± 0.80; T6= 1.96 ± 0.27) µmol/min/mg, for probiotic-3 the concentration was (T7= 6.55 ± 3.89; T8= 3.57 ± 2.16; T9= 3.18 ± 0.56)µmol/min/mg and Control= (1.81 ± 0.14) µmol/min/mg. The prawn supplemented with the probiotics showed higher amylase concentration than those fed the basal diet (control). There was no remarkable difference (P>0.05) in Amylase concentration between the treated and control groups. And among the three-stocking density (2m⁻², 4m⁻², 6m⁻²) the amylase concentration is higher in stocking density 2m⁻². Although statistically these differences of amylase activity don't significantly vary among the treatment.

Effect of in-feed probiotics and biofloc on the total bacterial and *vibrio* spp. count in shrimp (*Penaeus monodon*) nursing

ID: 160604

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Aquaculture is growing rapidly though it is facing enormous social, technical and environmental problems that ultimately led to disease problem which is one of the significant hindrance in the development of aqua farming. Though antibiotic was used frequently to prevent disease, however, nowadays biofloc technology (BFT) and/or probiotics are providing a promising consequence in aquaculture through several ways such as improvement in growth and survival rate of aquatic animals as well as proving other benefits as maintaining water quality without any environmental pollution along with microbial management. Therefore, this study was conducted to assess the effect of probiotics and biofloc on total bacteria and *Vibrio* spp. load in nursing phase of shrimp. A commercial probiotic (PRO-2) (T1), biofloc (C:N=1:12) (T2) and their combinations (T3) were applied with a control group (C) for 27 days in nursery tank at Redient Shrimp Hatchery at Shaymnagar Upazilla of Satkhira District. The populations of total bacteria and pathogenic bacteria of *Vibrio* spp. were enumerated in shrimpjvenile and culture water. The results of this study reported that biofloc(T2) treatment in the nursery phase of *P. monodon* did not have any significant impact on the total microbial load. In contrast, in feed probiotics (T1) and combination of biofloc and feed probiotics (T3) was found to have good contribution to develop a microbial community in the gut of *P. monodon*, which was capable to protect exploring *Vibrio* spp. community. On the other hand, biofloc itself and its combination with in feed probiotics was found to control the *Vibrio* spp. more efficiently than that of other treatments. Thus, application of probiotics and bioflocs could be beneficial during shrimp nursing to maintain the culture environment eco-friendly and to obtain disease-free production that leads to a great profit for shrimp farmers as most of them are now-a-days severely affected by vibriosis disease.

Comparative assessment of the proximate composition of freshwater snail *Pila globosa* from two isolated areas, Boluho Cxbow Lake and Beel Dakatiya

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Aquatic organisms are suitable for food and feed are worldwide importance. They are excellent sources of high quality proteins and biochemical composition. The present study was conducted to know the biochemical composition in freshwater snail *Pila globosa* in habiting beel and oxbowlake environment. Comparing the nutritive value of snail from different environments is important to utilize this species properly. The proximate composition analysis revealed that there was significant difference in proximate composition among body parts ($P < 0.05$). The result showed that highest and lowest moisture contents were found in mussel and stomach of *P. globosa* collected from oxbowlake and beel, respectively. Highest content of protein was found in stomach of snail collected from beel followed by stomach, mantle of snail from oxbowlake, respectively. Highest content of lipid was found in stomach of snail collected from oxbowlake followed by mussel was collected from beel and oxbow lake respectively. Highest content of ash was found in mussel of snail collected from oxbowlake followed by mussel, mantle was collected from beel and oxbowlake, respectively. It's becomes preety sure that *P. globosais* excellent source of some nutrients for the proper growth and development of human being and can also be used for Industry and Aquaculture sector.

Biochemical basis of adaptive response to variable ionic gradients by the Tiger Shrimp (*Penaeus monodon*)

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Understanding the biochemical basis of adaptive response to different salinity levels is of prime importance to evolutionary biologists because transition between salinities is thought to bring so much diversity of species now present on earth. The present study was conducted to evaluate the pattern of changes in the amount of free fatty acid (FFA) and free amino acid (FAA) in tiger shrimp, *Penaeus monodon* exposed to three different salinities across nine time intervals (1hr, 6 hr, 24 hr, 2 day, 3 day, 5 day, 10 day, 20 day and 30 day). FFA and FAA were measured in low (0‰) and high salinity (20‰) stressed shrimps in comparison to control shrimp samples maintained at 10‰ salinity. Saturated Fatty Acid (SFA) was significantly lower ($p < .05$) in the shrimps exposed to high salinity (20‰) stress from 1 hour to 2 days and significantly higher to low salinity (0‰) compared with the control group (10‰) while no significant difference was observed at any time interval. Unsaturated Fatty Acid (UFA) was significantly increased in both low and high salinity. Higher increase of UFA was observed at 0‰ treatment (1hr -24hr) compared with the 20‰ treatment (high level was observed from 1-24 hr) followed by the stable pattern to the end. An opposite pattern was evident for FAA over the same time frame. Significantly a generalized decreasing trend ($p < .05$) was observed with salinity reduction at 0 ‰ from 6 hours to 5 days and gradual increasing trend was observed at 20‰ salinity from 1 hour to 3 days. Results of this study revealed that the changes of FFA and FAA played key roles in adaptive responses to variable environmental salinity conditions.

Phytoplankton abundance and diversity in the Ichamati river

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The present study was conducted on plankton abundance and diversity in response to tides in the Ichamati river of Satkhira. During the study period we collected sample from three different stations. Each day sample was collected both in high tide and low tide. Tidal cycles had no significant effect on the abundance or community structure of plankton at Ichamati river nor had any physicochemical factor, except pH although variation in the physicochemical data measured was small. The outcomes may be the reason from not accepting the current flow from its origin all the time because of its serpentine shape. The major components of the phytoplankton community throughout the study were Cyanophyceae. There was hardly any change in abundance of plankton with tidal fluctuation. The experiment shows increase in number of Cladocera and Rotifer but decrease in number of Copepoda in post monsoon period. It was seemed to be happened because of drastic change in salinity in that time due to huge rainfall.

Salinity based molluscan abundance and diversity in Sundarban Mangrove Forest

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The present study was conducted to observe salinity based molluscan abundance and diversity in three different areas of Sundarban Mangrove Forest. The mollusks have been shown to be especially sensitive to salinity in other parts of the world. Low, moderate and high salinity zones were investigated in Bhola, Koyra and Chuna river covering Shoronkhola, Koyra and Munsiganj respectively. Mollusks were collected by hand picking from pneumatophores, trees and concrete structures of several sampling sites, while mud specimens were collected using 1m² quadrat. A total of 7 species of molluscs were recorded, among them 2 species of bivalves belonging to 2 families and 5 species of gastropods belonging to 3 families. The horn snail (*Telescopium telescopium*) was found as dominant group, followed by California horn snail, small sea snail, and blood clam. There was significant difference between the abundance of mollusks species in high salinity with low salinity ($P < 0.05$); high salinity with moderate salinity ($P < 0.05$); moderate salinity with low salinity ($P < 0.05$). Mollusk diversity and richness have been calculated by Shannon diversity index, showing highest value in high salinity. However, the conducted study try to bring out some basic information on alteration of molluscan abundance and diversity. Therefore, further investigation should be conducted in mentioned rivers and other major rivers of Sundarban Mangrove Forest and Sundarban Reserve Forest.

Antibacterial effect of methanol extract of chitin against *Vibrio parahaemolyticus*

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Vibriosis is one of the most prevalent shrimp diseases caused by bacteria belonging to the genus *Vibrio*. *Vibrio parahaemolyticus* is more pathogenic bacteria. A recently emerged bacterial disease in shrimp farming is the acute hepatopancreatic necrosis disease (AHPND), also known as early mortality syndrome in shrimp post larvae. In this study aimed to know the present scenario of vibriosis in Satkhira district and to analyze the antibacterial effect of chitin extract in inhibiting the growth of *Vibrio* spp. (*Vibrio parahaemolyticus*). A comparative study of chitin, collected from shrimp shell, was observed using both methanol and aqueous extracts. The antibacterial activities of the extracts were investigated and enumerated the bacterial load before and after 2hr. treatment of both extracts. The Minimum Inhibitory Concentration (MIC) value of methanol and aqueous extracts in inhibiting the growth of *Vibrio parahaemolyticus* was 200 ppm, 5% and *Vibrio* load 1.2×10^2 and 2.4×10^2 respectively. Though both extracts showed strong sensitivity to the studies bacteria but methanol extract of chitin was found to be more effective than aqueous extract. So, methanol extract of chitin can be used an alternative medicine to prevent the pathogenic diseases of EMS/AHPND which is caused by *Vibrio parahaemolyticus*.

Growth rate of hatchery sourced and wild sourced *Macrobrachium rosenbergii* in grow out pond

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The present study was conducted to assess the growth performance of *Macrobrachium rosenbergii* (De man, 1879) collected from the wild and the prawn hatchery. Post-larvae (PL) were collected from the river in Dacope of Khulna district, and from Khulna Galda Chingri Hatchery. At first, PLs were nursed in the hapa, and then Juveniles were cultured in the grow outpond, with equal stocking densities and 2 replications for a period of four months. Water quality and growth parameters were monitored. The wild pond water temperature was between 26 to 31.1°C, transparency between 37 and 56 cm, dissolved oxygen DO between 7.6 and 8.8 mg/L, pH between 7.4 and 7.1. Hatchery pond water temperature was between 25.7 and 31.3 °C, transparency between 42 and 60, DO between 7.6 mg/L and 8.3 mg/L, pH between (6.3 and 8.1). There was no significant difference ($P > 0.05$) in the water parameters. The weight gain of *Macrobrachium rosenbergii* was 2.9380 ± 2.42 g (Wild) and 3.7414 ± 2.3423 g (Hatchery). The specific growth rate (SGR) were 3.800 ± 2.86 (wild) and 3.68 ± 3.40 (Hatchery). There was also no significant difference ($P > 0.05$) in growth performance between wild- and hatchery-source juvenile. The variation in the growth parameters between these two-source PLs is likely associated with genetic background of brood stock and individual prawn performance. The data of the present study will be helpful for the prawn farmers to decide using PLs of both sources.

Age determination of mud crab (*Scylla olivacea*) using length-age data

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The present study was conducted to determine the age of crab (*Scylla olivacea*) by using length-age data. In the study, 700 hatchery produced crab-lets were stocked in each pond having three replication. The experiment was started with the hatchery-produced crab-lets of 28-30 days age. On the 3rd week of culture period 300 wild crabs weighing 25-30 g were released at each pond maintaining triplication. It was accepted that the age of wild crab-lets were pretty much same contrasted with hatchery produced crab-lets because of same weight of the two sources crab-lets were cultured for 11 weeks. Hatchery-produced and wild-collected *Scylla olivacea* juveniles were stocked in ponds separately. The juveniles were feed daily with chopped eviscerated tilapia at the rate of 5-8% body weight and weekly sampling was accomplished to assess the growth. After 11 weeks of pond culture experiment, the results demonstrated that there was no significant difference ($p > 0.05$) in growth rate between crabs from the two sources and between sexes in terms of carapace width increases per week. These results show that without considering their sex, we can predict the age of wild crab. As hatchery produced crab-lets was known and using the Carapace width – age relationship a general model of regression was established: Age (days) = $11.979 \text{ CW} + 24.734$ where, $R^2 = 0.9262$. This model will be helpful for the policy makers, scientific community to determine age of crab easily.

Intensification of *Macrobrachium rosenbergii* culture in a non-aerated probiotic application system

ID: 160617 Candidate Name: Md. Rofiqul Islam Supervisor: Dr. Khandaker Anisul Huq

The study was carried out to evaluate the effect of commercial probiotics on growth and production performance of fresh water prawn (*Macrobrachium rosenbergii*) with increasing stocking density. Experiment was conducted on KU FMRT experimental pond complex for 90 days and samples were taken at every 20 days interval. There were ten experimental groups where nine were treatments and one control, the experiment was conducted with nine treatments where three probiotics were applied and one control pond without using probiotic where each has three replication at different stocking density $2/m^2$, $4/m^2$ and $6/m^2$. among those four groups were (a) control or without probiotics treated prawn (C), (b) Probiotic-1 (T1) treated prawn, (c) Probiotic-2 (T4) treated prawn and (d) Probiotic-3 (T7) treated prawn at same stocking density $2/m^2$. The prawn supplemented with the probiotics showed significantly better final weight, weight gain (WG) daily weight gain (DWG) and daily growth rate (DGR), Relative growth rate (RGR) and specific growth rate (SGR) than those without probiotic use (Control) ($P < 0.05$). After 90 days the weight gain(g) of prawn were 6.18 ± 5.99 , 10.39 ± 5.27 , 18.79 ± 9.42 , 14.21 ± 6.32 g in C, T1, T4 and T7 respectively where T4 showed highest growth. Weight gain of P1, P2 and P3 treated pond were 10.39 ± 5.26 , 9.04 ± 6.51 , 8.20 ± 7.43 , 18.79 ± 9.42 , 13.43 ± 9.12 , 11.73 ± 4.77 , 14.21 ± 6.32 , 12.81 ± 5.0 , 7.00 ± 5.57 g in T1, T2, T3, T4, T5, T6, T7, T8, T9 and 6.18 ± 5.99 g in control where T4 showed the highest growth where P2 was applied at stocking density $2/m^2$. SGR were found to be 1.61 ± 0.88 , 1.92 ± 0.64 , 2.99 ± 0.76 , 2.36 ± 0.50 % BW/day in C, T1, T4 and T7 respectively where T4 showed highest response. The length weight relationship curve shows that their intercept were negative highly in probiotics treated ponds. Highest growth and production were found in (T4 as SGR is high). Application of feed probiotic and environmental probiotic (Probiotic-2) is recommended for a better growth and high production at stocking density $2/m^2$.

Population parameters and stock status of *Pampus argenteus* in the Bangladesh part of Bay of Bengal

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The study aims to investigate the population dynamic parameters including length-weight relationship, mortality, exploitation rate, Maximum Sustainable Yield and stock size of silver pomfret (*Pampus argenteus*) in the Bay of Bengal (BoB) of Bangladesh using length-weight, length-frequency and catch-efforts data. The relationship between fork length and total weight was estimated as $W = 0.05073 * FL^{2.8451}$ ($R^2 = 0.981$, $n = 98$) and indicated negative allometric growth of *P. argenteus* in the study region. The estimated asymptotic length (L_a) was 34.8 cm obtained from the length-frequency data of 594 pomfrets. The annual instantaneous rate of total mortality (Z) was 1.31 yr^{-1} (72.95%), the natural mortality (M) was 0.11 yr^{-1} (10.44%) and the fishing mortality (F) was 1.20 yr^{-1} (62.51%) considering the instantaneous growth rate $K = 0.53 \text{ yr}^{-1}$. Furthermore, the exploitation rate (E) was calculated as 0.92. The MSY obtained from Schaefer surplus model in gillnet was 13,750 tons with the f_{MSY} 71365 per number of gillnet. Results of the obtained exploitation rate showed that the resource was heavily over-exploited and some measures of management should be rapidly implemented to protect the silver pomfret population in the BoB.

Abundance and diversity of mollusks in disturbed and non-disturbed area of Sundarban Mangrove Forest

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The investigation was carried out to observe abundance and diversity of mollusks in disturbed and non-disturbed area of Sundarban mangrove forest. Molluscs were collected from mud, pneumatophores, trees and concrete structure of several sampling sites mentioned as disturbed and non-disturbed zones considering human activities of Chuna (high salinity) and Koyra river (moderate salinity). Samples from mud were collected by using 1m² quadrat, while sample from pneumatophores and trees were collected by handpicking. A total of 6 species viz. *Telescopium telescopium*, *Anadragranosa*, *Crassostrea madrasensis*, *Cerithideobobolus*, *Neritina articulata* and *Cerithideopsis californica* were observed in those two rivers where *T. telescopium*, *A. granosa*, *N. articulata* and *C. californica* were found in both disturbed and non-disturbed areas whereas *C. madrasensis*, and *C. obtusa* were found only in disturbed and non-disturbed area respectively. The abundance of mollusks was observed 5.54 individuals/m² in Kolagachi point and 11.13 individuals/m² in Koyra deep zone which were considered as non-disturbed areas is quite higher than the disturbed areas containing 4.58 individuals/m² in Chuna point and 2.93 individuals/m² in Koyra disturbed zone. There was a significant difference in the abundance and diversity between disturbed and non-disturbed areas at P<0.05. Along with human impacts over mangrove, these variations in abundance and diversity of mollusks may be influenced by different kinds of biological and ecological factors and physical factors as well. However, the present study reveals basic information on mollusks abundance and diversity in disturbed and non-disturbed areas of Chuna and Koyra river.

Contribution of women in Crab fishery a case study on selected coastal villages of Satkhira district

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The present study was carried out to assess the contribution of women in crab fishery of the coastal villages at Satkhira district. A total 112 respondents were surveyed during January 2019 to August 2019 through face to face interview involving semi-structured questionnaire. From the survey it was found that most of the women (40.18%) belonged to age group 35-44 years with majority (81.25%) of them being Hindu. It was found that 70.54% of the respondents were illiterate and mostly (80.36%) involved in crab fishery for poverty. Most of the women (81.82%) were involved in grow out of crab and only 10.71% women had their own pond. Women were highly involved in different pre-stocking management activities like 68.18% in carrying mud, 40.91% in dyke preparing, 22.73% in liming, 54.55% in dyke repairing, 36.36% in canal preparing etc. They were also highly engaged in different stocking and post-stocking management activities like 45.45% in weeding, 22.73% in stocking of crab, 63.64% in feed preparing, 68.18% in feed supplying, 81.82% in monitoring etc. Moreover, women took part in box cleaning, feed preparing, growth checking, box floating etc. activities as a labor in the soft shell farm. Present study reveals that the participation of women is increasing day by day which accentuates their contribution in crab fishery though their participation is less than that of male participants. Such contribution of women in aquaculture is often unrecognized and seldom acknowledged or evaluated.

Effect of probiotics on the digestive enzyme activity (Lipase) of *Macrobrachium rosenbergii*
ID: 160625 Candidate Name: Fatima Tuz Zohora Supervisor: Dr. Khandaker Anisul Huq

Freshwater prawn (*M. rosenbergii*) farming is currently one of the most important sectors of the national economy and during the last two decades, its development has attracted considerable attention because of its export potential but sustained production is increasingly hampered by environmental pollution, poor management and epizootic diseases. Diseases in fresh water prawn culture are controlled by using antibiotics and chemicals which has an adverse effect on the aquatic environment. In recent times, the use of probiotics has become a popular alternative to antibiotics for improving and maintaining a healthy environment that leads to more environment-friendly aquaculture practices. The present study was conducted observe the effect of probiotics on the digestive enzyme (lipase) activity of *M. rosenbergii* at different stocking density. This research work has been conducted with the support and as a part of BRAC, NAPT-2, Sub-Project No. 031, Khulna university pond complex 2(pond size 60 m²). Probiotic 1 (Environmental probiotic), Probiotic 2 (mixture of feed & environmental probiotic) and Probiotic 3(feed probiotic) were incorporated in the feed of prawn in 9 triplicated treatment ponds at the rate of 18g/60mL, 5g/kg & 1g/kg respectively. After 6 months, probiotic incorporated feed showed a little effect on the lipase enzyme activity at different stocking density but the significance level was higher ($P > 0.05$). Though the effect of probiotics was not statically significant but the effect was shown over control and at low stocking density (2m⁻²), the effect of all probiotics was higher. The highest effect was found at treatment 7 (8.7270±1.88) of feed probiotic. But the overall result indicates that the probiotics are useful for increasing lipase enzyme activity as we know that the breakdown of lipid by lipase enzyme and production of energy is the source of all metabolic and immunological activities.

**Water quality assessment in larval rearing earthen pond
of Prawn (*Macrobrachium rosenbergii*)**

ID: 160626 Candidate Name: Monjurul Amin Supervisor: Md. Shahin Parvez

The study was carried out to assess some water quality parameters (DO, pH, salinity, Alkalinity, NH₃) in larval rearing earthen pond of freshwater giant prawn (*M. rosenbergii*). Water samples from two different larval rearing ponds were collected at 5 days interval and DO, pH, salinity, alkalinity and ammonia were 6.71±0.76 mg/L, 7.6±0.13, 12.14±1.57 ppt, 148.57±5.56 mg/L, 0.41±0.09 mg/L respectively. Total bacterial, *vibrio* count and plankton abundance were also assessed in the rearing ponds. The range of total bacteria and *vibrio* load were (6.3×10⁴ CFU/ml to 3.1×10⁵ CFU/ml) and (1.0 ×10¹ CFU/ml to 2.9×10² CFU/ml) respectively. Total abundance of phytoplankton and zooplankton were 1860±252 (individual/L) and 1041±128 (individual/L). The identified groups of phytoplankton were Bacillariophyceae (41%), Cyanophyceae (38%) and Zygomatophyceae (21%) and identified groups of zooplankton were Copepoda (61%), Cladocera (15%) and Cyclopoida (24%). In phytoplankton, Bacillariophyceae (41%), was more dominant group and in zooplankton, Copepoda (61%) was more dominant group. In the larvae rearing pond biodiversity of plankton was less and the total bacterial, *vibrio* abundance were not harmful for prawn larvae.

**Truss networkanalysis in delineating the stock structure of freshwater snail
(*Pila globosa*) in Beel dakatiya and Boluhor Oxbow Lake**

ID: 160627 Candidate Name: Khadiza Khatun Supervisor: Dr. Md. Golam Sarower

Despite the status of freshwater snail are regarding as a least concern species in Bangladesh but indiscriminate fishing and anthropogenic activities will be led more vulnerable if such kinds of activities are frequently practiced in future. The present study was aimed to discuss the stock structure of freshwater snail, *Pila globosa* on the bases of landmark-based truss morphometric analysis. Wild molluscs species (*P. globosa*) were collected from the DakatioyaBeel, Khulna andBaluhor Oxbow lake of Jhenaidah in Bangladesh. A number of 30 individuals were randomly selected from each stock. Then the sample were used to capture in digital image and subsequently 14 truss distance were measured by using Imagej Software. This investigation was done by using univariate analysis of 14 truss measurements. Significant differences ($p < 0.05$) were observed in 11 (Dis 1-2; Dis3-4; Dis 4-5; Dis 5-6; Dis 6-7; Dis 1-5; Dis 4-6; Dis 3-7; Dis 2-8; Dis 3-6 and Dis 4-7) out of 14 truss network measurements between the stocks. The result of this experiment revealed a high degree of variation in morphological characteristics of *P. globosa* between two stocks. The baseline information of the study will be helpful in further conservation, breeding as well as protect them from extinction.

**Salinity induced changes in expression patterns of the two selected osmoregulatory
Genes in the Tiger Shrimp (*Penaeus monodon*)**

ID: 160628 Candidate Name: Hasna Hena Supervisor: Dr. Md. Lifat Rahi

Osmoregulation in crustaceans is one of the most important physiological function in their adaptation to environmental changes. The present study quantified relative gene expression patterns (using an RT-qPCR approach) of two selected osmoregulatory genes of brackish water shrimp species (*Penaeus monodon*). Expression patterns relative to the 18S rRNA gene were measured for selected candidate genes (AQP and CLA) under three different salinity treatments (0‰, 10‰ and 20‰) over 30 days. Expression levels of the AQP gene were initially high (24 h) and after which expression of this gene declined sharply in 0‰ treatment. In 10‰ treatment at first the expression was low from 1 hr to 2 day and after which expression levels reached a fairly constant towards the end of the experiment. CLA is known to play an important role in maintaining ionic balance in low ionic environments (0‰) compared with saltwater conditions (10‰ and 20‰). High CLA expression was observed in the 0‰ treatment in the first 24 hr and then declined between 2 day to 5 day. Then suddenly increased in 10 day and after which reached a relatively constant expression pattern. Significantly higher expression levels ($p < 0.05$) were also observed at 0‰ over 10‰ condition for both of the genes throughout the experiment period. No significant differences ($p > 0.05$) were found between 10‰ and 20‰ treatments in all over the experiments. The study can provide a foundation for investigating that how genes played.

**Present scenario of soft shell crab farming (*Scylla olivacea*) in Shyamnagar upazila, Satkhira
ID: 160629 Candidate Name: BM Yasib Tanvir Supto Supervisor: Md Rashedul Islam**

People are getting interested in the soft shell farming day by day because of its high demand in the international markets. A majority number of people in the study area have chosen soft shell crab farming as their exclusive source of income. The present study was aimed to know the current status of soft shell crab farming including the farming practice procedures, physio-chemical parameters of farms and economics of this industry in southwest coastal region (Shyamnagarupazila) of Bangladesh. A total of 30 soft shell crab farms were randomly selected from this upazila. The farmers stocked between 40g-90g crabs in size which is almost 65% of the total stock. Farming is continued almost year round except the winter months. Most farmers use minced tilapia and/or snail meat as feed for production of soft-shell crabs, often feeding at 5-10 percent body weight on 3-4 days interval or as need based. After stocking one crab per individual box, crabs are checked at 4-h intervals to monitor molting status. The period of molting varied from 10 to 25 days depending on the maturation stage. The average value of the pH, DO, salinity and temperature of the surveyed farms were 8.03, 12.83ppt, 7.65mg/l and 25.68°C respectively. These values were in the range of optimum levels that usually required for the suitable farming practice. The study also showed that the average gross return was found to be Tk. 727000 for producing total 900 kg of soft shell crabs and the estimated average net return was found to be Tk. 289000 from one acre farm of culture. The economic analysis of this study revealed that soft shell crab production is a profitable business for the farmers.

**Morphometric variation of freshwater snail, *Pila globosa* between two isolated stocks, the
Dakatiabeel and Baluhar oxbow lake**

ID: 160630 Candidate Name: Anup Kumar Karmokar Supervisor: Dr. Md. Golam Sarower

The status of freshwater snail species in Bangladesh are considered to be the least concerned, but indiscriminate fishing and anthropogenic practices will be more vulnerable if such activities are regularly carried out in the future. The present study was aimed to discuss the stock structure of freshwater snail, *Pila globosa* were collected from Dakatiabeel, Khulana and Baluhar oxbow lake of Jhenidah Bangladesh. A number of 30 individuals were randomly selected from each stock. Then the sample were used to capture in digital image and subsequently four morphometry distance were measured by using image software. This investigation was done by using univariate analysis of four morphometric measurements. Significant differences ($p < 0.05$) were in all the four measurements. The result of this experiment indicates that a high degree of variation in morphological characteristics of *P. globosa* between two stocks. Mainly geographical distribution causes morphological variation between same species. Environmental differences like habitat for snail or food resource availability variability in water depth, and other environmental factors and some co factors are main cause. The base study will be helpful in further conservation, breeding as well as protect them from extension.

**Present scenario of seed supply for the Freshwater Prawn (*Macrobrachium rosenbergii*)
in Khulna and Satkhira Region**

ID: 160632 Candidate Name: Sazid Hasan Supervisor: Dr. Muhammad Yousuf Ali

Freshwater prawn (*Macrobrachium rosenbergii*) culture has gained popularity in Bangladesh during last few decades. In 2018 this sector produced 51571 Metric tons of prawn and helped to earn 567.07 crore taka by exporting 5878.47 Metric tons. Despite immense importance, there is a shortage of sufficient supply of PL of this species in our country. In recent time prawn hatchery has experienced serious collapse due to disease infestation. In recent time, a rumor is going on about smuggling of prawn PL from India. Finding out the existing sources and routes of prawn juveniles has become very crucial in order to take immediate action and ensure the consistent supply of prawn seed. A study was conducted to explore the possible sources of prawn PL in Khulna and Satkhira districts. A total of 40 farmers and 8 intermediaries (phorias and aratdars) were interviewed through structured questionnaire in Khulna and Satkhira districts. The study revealed that prawn hatcheries in Bangladesh are failing to supply any seed because of their acute production failure. Farmers usually use wild seed collected from the rivers and hatchery PL smuggled from India. Among the interviewed farmers approximately 44% use both wild and smuggled seeds, 23% use only smuggled seed and 33% use only wild seed. These percentages vary between the two studied districts. Comparatively wild seed are used in a greater quantity in Khulna, while in Satkhira, farmers use more smuggled Indian seed. The smuggled seeds are distributed from Satkhira. The findings of the study will be helpful in taking further action plan to save the prawn sector with consistent PL production.

Quality assessment of iced Tilapia, *Oreochromis mossambicus*

ID: 160633 Candidate Name: Lopa Mudra Das Supervisor: Md. Shahin Parvez

The aim of the study was to evaluate the changes in sensory, biochemical and proximate composition of tilapia, *Oreochromis mossambicus*, during storage in ice. Live tilapia samples were collected from a farm near Khulna University. Live fishes were slaughtered by immersing in ice-cold water (hypothermia) and stored in insulated ice box with an appropriate amount of ice. After 0, 1, 2, 4, 6, 9, 12, 15, 18 and 19 days, sampling was done to determine sensory, chemical and proximate changes during ice storage. Sensory analyses were performed by a panel of four trained assessors following quality index method (QIM). The sample was also used to determine pH, Trimethylamine-Nitrogen (TMA-N) and Total Volatile Base Nitrogen (TVB-N) attributes of chemical parameter and protein, lipid, moisture content of proximate composition. During ice storage of tilapia moisture content increased and protein and lipid content decreased gradually. TMA-N content increased continuously from 0.60 mg/100g to 6.43 mg/100g where TVB-N value for ice-stored samples increased from 3.91 mg/100g to an acceptable value of 26.57 mg/100 g in 12 days and finally reached to rejection value of 45.20 mg/100g at the end of 19 days storage period. Similarly, pH has increased with the time from 6.37 to 7.37 during the ice storage period. pH, TMA-N and TVB-N values indicated that ice storage period of 4 days of tilapia keep the fish in very good condition. The sensory analysis based on demerit points also supported the findings of the chemical analysis.

Impact of salinity change on the rate of oxygen consumption, gill ultra-structure and expression pattern of candidate gene in the tiger shrimp (*Penaeus monodon*)

ID: 160634 Candidate Name: Md. Kazi Sabbir Hossain Supervisor: Dr. Md. Lifat Rahi

Osmoregulation is known to be the principal mechanism for ionic balance between extra- and intra-cellular environments when natural saltiness levels change or fluctuate. The present study was conducted to investigate the effects of salinity changes on the gill ultra-structure, expression pattern of Integrin gene and rate of O₂ consumption in tiger shrimp (*Penaeus monodon*) with time. Shrimp individuals were maintained at three different salinity levels (0‰, 10‰ and 20‰) for a period of 30 days. Significant differences ($p < 0.05$) were observed between salinities across different sampling time for the changes in gill ultra-structure, expression pattern of integrin gene and rate of O₂ consumption. For all three biological aspects (gene expression, O₂ consumption and gill structure), 0‰ salinity showed the highest levels of responses compared to the other two salinity levels (10‰ and 20‰). Changes in the gill ultra-structure reflected elevated or decreased number of mitochondria rich cells (known as monocytes) and changes in cell volume (regulatory volume increase or decrease). Results clearly indicate that freshwater (0‰) environments represent the most challenging condition for ionic balance and highly energy expensive (or demanding).

Antibacterial effect of ethanol extract of chitin against *Vibrio parahaemolyticus*

ID: 160636 Candidate Name: Jannatul Fartheus Supervisor: Dr. Ghausiatur Reza Banu

Vibriosis is a disease caused by gram-negative bacteria in the family vibronaceae. It can cause high mortality and morbidity in farmed shrimp. Early mortality syndrome (EMS) is a new emerging disease, causes shrimp mortality in post-larvae stage. Again, use of antibiotics in aquaculture was found less effective due to development of multiple resistance in pathogen. This study aimed to know the present scenario of vibriosis in different farms of Bagerhat district and the antibacterial effect of chitin against *Vibrio parahaemolyticus*. A comparative study of chitin collected from shrimp shell, was observed using both ethanol and aqueous extract. The antibacterial activity of extract was determined by in vitro process. The bacterial strain showed sensitivity to ethanol and aqueous extract of chitin. The minimum inhibitory concentration (MIC) of ethanol extract was 300 ppm. Ethanol extract of chitin was found to be highly effective for *Vibrio parahaemolyticus* rather than aqueous extract of chitin. This result suggested that ethanol extract of chitin could be used as an alternative to antibiotic for its antibacterial effect against *Vibrio parahaemolyticus*.

Effects of probiotics on the superoxide dismutase enzyme activity of *Macrobrachium rosenbergii* in different stocking density

ID: 160637

Candidate Name: Sadia Samiha Sarmin

Supervisor: Jayanta Bir

The study was carried out to know the effect of commercial probiotics on superoxide dismutase enzyme (SOD) activity in fresh water prawn (*Macrobrachium rosenbergii*) from May to November, 2019 in Khulna university pond complex-II and Fish Pathology Lab and Fish Molecular Biology and Biotechnology Lab of Fisheries and Marine Resource Technology (FMRT) Discipline of Khulna University. Prawn larvae was stocked at the rate of 2, 4 and 6 m⁻² successively for three different types of probiotics (environmental probiotics as P1, both feed and environmental probiotics as P2 and feed probiotics as P3) and with a control group (No probiotics, 2 m⁻²). Therefore total experiment had nine treatment and one control group where each were replicated thrice. Almost higher SOD value was observed for environmental probiotic (P1). The SOD concentration for environmental probiotics treated prawn were (T1=60±13.88, T2=75.27±1.54, T3= 70.91±13.88) U/mg, feed probiotics treated prawn having (T7= 52.36 ±3.08, T8= 68.73 ±4.63, T9= 62.18 ±1.54) U/mg. Whereas both probiotics treated group having (T4= 47.54 ±19.54, T5= 54.55 ±12.34, T6= 48±27.77)U/mg respectively and control group was (C= 37.86 ±26.68616)U/mg. Although 4 m⁻² have the highest SOD activity but there was no statistically significant effect observed among the other treatments (P > 0.05). Therefore, it could be concluded that probiotics might have some functions to increase the superoxide dismutase activity in *Macrobrachium rosenbergii* comparing to control groups.

Assessment of quality related changes in parse (*Liza parsia*) during icing

ID: 160638

Candidate Name: Mohebbullah

Supervisor: Md. Shahin Parvez

The aim of this study was to assess the sensory, chemical and proximate compositional changes of parse, *Liza parsia*, fish during ice storage. Live parse fishes were collected in fresh condition and were delivered to the laboratory within 6h of harvesting. The fishes were slaughtered by immersing in ice-cold water (hypothermia) and stored in ice with insulated box. The samples were taken on 0, 1, 2, 4, 6, 9, 12 and 13 days of storage to determine the sensory, chemical and proximate changes during the storage period. Sensory analyses were performed by a panel of four experienced assessors following quality index method (QIM). pH, Trimethylamine-Nitrogen and Total Volatile Base Nitrogen (TVB-N) attributes of chemical parameter and protein, lipid, moisture content of proximate composition were also determined using the samples. During iced storage of whole parse fish, moisture content increased but lipid and protein content decreased with storage period. TMA-N has increased from 1.63 to 9.08 mg N/100 g and TVB-N value increased from 3.63mg/100g to an acceptable value of 22.47 mg/100g in 9 days and finally to a rejection value of 32.79 mg/100g at the end of 13 days storage period. Similarly, pH has increased with the time from 6.23 to 7.13 during the ice storage period. pH, TMA-N and TVB-N values indicated that ice storage period of 2-3 days of parse keep the fish very good condition. The sensory analysis based on demerit points also supported the findings of the chemical analysis.

Availability of fishes under legal size in local fish markets of Khulna

ID: 160640 Candidate Name: Rahat Bin Shahid Supervisor: Dr. Muhammad Yousuf Ali

The permissible size for catching fish is very important to protect immature fish and conserve spawning populations. In this study a total of three main fish markets of Khulna, two fishermen and three government officers were visited and interviewed for about four months. During the study all fishes that were under legal size and assumed to be immature in size were recorded. Length and weight of the samples were taken under analysis. At the end of study we documented 25 species that were very small in sizes. Out of 25 species, only one species Ayor (*Sperataaor*) was enlisted in “The Protection and Conservation of Fish Act of 1950 & Rules” and the recommended minimum legal capture size 30 cm. There is no information of other 24 specie in the act, but they were very small in size and apparently under legal size. Some sample of small prawns (locally called ghushachingri) were collected and we observed that 3648 individual of prawns and shrimps were present in 1 kg of fish, which worth about 70-80 Tk. Per kilo. The findings of the study will assist in taking action to formulize proper guidelines and to save the immature fish and ensure their safe spawning.

Comparative study on morphometry of wild and hatchery sourced *macrobrachium rosenbergii*

ID: 160641 Candidate Name: Wasim Akram Supervisor: Dr. A.F.M. Hasanuzzaman

The present study was aimed to assess the morphometric variation of wild and hatchery sourced *Macrobrachium rosenbergii* (De man, 1879). Prawn post-larvae (PL) were collected from the river in Dacope of Khulna district, and from the hatchery of Khulna Golda Chingri and Telapia Hatchery, Koiya Bazar, Dumuria, Khulna. PLs were reared in the pond, with equal stocking densities (2PL/m²) and two replications for a period of May to October, 2019, in 2 experimental ponds in the pond complex of Fisheries and Marine Resources Technology of Khulna University. A total of 244 prawns (123 males and 121 females) from the wild sourced and 151 prawns (73 males and 78 females) from hatchery sourced were examined, and 17 morphometric data were recorded. Significant difference in the mean was observed between sexes and sourced for most of the morphometric parameters ($P < 0.05$). The results showed that total length, rostrum length, second abdominal segment length, third abdominal segment length and fourth abdominal segment length were significantly different between the sexes and sourced (at 5% level). Hepatic spine width, rostral teeth number upper, rostral teeth number lower, carapace length, carapace width, diagonal carapace length, sixth abdominal segment length, telson length, exopod of uropodal length and endopod of uropodal length were not significantly different between sexes but showed significant difference between sourced (at 5% level); first abdominal segment length and fifth abdominal segment length showed significant difference between sexes but no difference between sourced. A significant positive correlation was obtained in between the parameters considered at 1% and 5% significant level between male and female of wild and hatchery sourced. Regression analysis was performed for all the morphometric variables and regression equations have been calculated for the variables against CL and presented in the text. All the variables showed positive linear relationship with CL.

Effect of probiotics on protease enzyme activity of *Macrobrachium rosenbergii* in different stocking density

ID: 160642 Candidate Name: Jannatul Ferdose Supervisor: Momotaz Khanom

The use of probiotics in the culture of aquatic organisms is increasing with demand for environment friendly aquaculture practice. The present study was conducted from May to September, 2019 at the experimental ponds complex and three laboratories to evaluate the effect of different commercial probiotics on protease enzyme activity of freshwater prawn (*Macrobrachium rosenbergii*) at different stocking density. Three different probiotics, e.g. P1 (*Bacillus subtilis*, Bacteriophage q.s.), P2 (*Bacillus subtilis*, *Streptococcus faecalis*, *Bacillus mesentericus*, *Clostridiumbutyricum*, Bacteriophage q.s.), and P3 (*Bacillus mesentericus*, *Bacillus subtilis*, *Bacillus licheniformis*, *Lactobacillus acidophilus*, *Nitrobacter* sp., *Nitrosomonas* sp.) were used in this experiment and the three stocking density was 2, 4 and 6 per m². All the nine treatments were designated from T1 to T9, where P1 and stocking rate 2, 4 and 6/m² were denoted as T1, T2, T3; P2 and stocking rate 2, 4 and 6/m² were designated as T4, T5, T6; and P3 and stocking rate 2, 4 and 6/m² were known as T7, T8, T9. In addition, a control group without any probiotic treatment was maintained at stocking density 2/m² was the control group for the treatments with the same stocking density. Each treatment was fed commercial supplementary feed containing 29% protein twice a day. Protease activity was estimated by casein-hydrolysis method in where casein was used as substrate. In this study, no significant difference ($P>0.05$) was found among treatments and control groups at stocking density 2/m² in where T1 showed highest (1.56 ± 0.12 $\mu\text{mol}/\text{min}/\text{mg}$) protease activity that was fed P1. No significant difference ($P>0.05$) was found among treatments in where T2 showed overall highest (1.67 ± 0.00 $\mu\text{mol}/\text{min}/\text{mg}$) protease activity which fed P1. Significant difference ($P<0.05$) was found at stocking density 2/m² and 6/m² with stocking density 4/m². Protease activity was highest ($T2=1.67\pm 0.00$, $T5=1.61\pm 0.04$, $T8=1.58\pm 0.05$ $\mu\text{mol}/\text{min}/\text{mg}$) for stocking density 4/m² considering three treatments. The findings from the study revealed that the protease enzyme activity was found higher from the ponds having stocking density 4/m² and treated with P1 than that of others.

Intensification of *Macrobrachium rosenbergii* culture in probiotic treated aeration application system

ID: 160644 Candidate Name: Sayma Sadia Supervisor: Joyanta Bir

The use of probiotics in the culture of aquatic organisms is increasing with the demand for environment friendly aquaculture practice. The present study was conducted in Khulna University Fisheries and Marine Resources Technology experimental pond complex to evaluate the effect of commercial probiotics in different stocking density on growth performance of fresh water prawn (*Macrobrachium rosenbergii*). There were four experimental groups (a) control or without probiotics treated prawn (C) in with 4/m², (b) Environmental probiotic treated prawn (T1, T2, T3), (c) Both Environmental and Feed probiotic treated prawn (T4, T5, T6) and (d) Feed probiotic treated (T7, T8, T9). Each treatment had three replicates with three stocking density under each probiotic was 4/m², 8/m² and 12/m². The prawn supplemented with the probiotics showed significantly better weight gain (WG), relative growth rate (RGR), daily growth rate (DGR) and specific growth rate (SGR) than those fed the basal diet (Control) ($P<0.05$). After 150 days the highest weight gain (g) of prawn was found 20.52 ± 5.35 g in T1 with 4 /m² stocking density. The highest DGR was found as 33.10 ± 11.54 % in T1 with 4 /m² stocking density. In terms of relative growth rate (RGR) the highest RGR was found 668.6 ± 233.4 in T4 with 4 /m² stocking density. The highest SGR was found 2.21 ± 1.15 BW/day in T1 with 4 /m² stocking density. Environmental probiotic with 4/m² stocking density by was recommended for a better growth performances. The result of the study can be applied in the farmer's pond to increase the total production of prawn in

Effect of commercial probiotics on proximate composition of Freshwater prawn (*Macrobrachium rosenbergii*) cultured at different stocking densities.

ID: 160645

Candidate Name: Afrin Sultana

Supervisor: Dr. Khandaker Anisul Huq

Macrobrachium rosenbergii is one of the most important cultured species in Bangladesh. The current study has been conducted to evaluate the effects of probiotics bacteria on biochemical composition of freshwater prawn of different stocking density. The field study has been conducted at pond complex-II (pond size 60m²) and lab works at Fish nutrition laboratory of Fisheries & Marine Resource Technology Discipline. Three types of probiotics (Environmental probiotics as P1, Environmental and Feed probiotics as P2 and Feed probiotics as P3) along with a control group (no probiotics at stocking of 2m⁻²) were given at three different stocking density, viz. 2, 4 and 6 m⁻². Thus meaning the total treatment were nine including a control where each group had three replication. The proximate composition of the prawn was determined by wet basis. The highest protein percentage was found in T2 (20.21%±0.165) at the stocking of 4 m⁻² whereas the lowest was in T4 (16.17%± 2.687) at 2m⁻². Although T4 contain highest lipid (4.42%±1.432) percentage and T6 contain very low amount lipid (1.38%±0.760) comparing to other treatment. Interestingly maximum moisture percentage was observed in T6 (79.86%±0.337) and lower at T3 (73.70%±1.438). There was a significant variation of lipid percentage among the treatment at different stocking densities ($P < 0.05$). However, insignificant variation found in protein, lipid and moisture between control and experimental treatment where stocking density 2 m⁻² ($P > 0.05$). Overall the study has shown that the different probiotics application at varying stocking didn't significantly affect the proximate composition (protein and moisture) of prawn.

Shrimp diseases and their possible solutions in aquaculture practiced in Bagerhat district

ID: 160649

Candidate Name: Abu Sayem

Supervisor: Dr. Ghausiatur Reza Banu

In the south – west coastal region of Bangladesh, Bagerhat is one of the most prominent district for the production of shrimp and prawn, which is popularly known as 'White Gold'. Along with the other district of Khulna region, shrimp produced in this district, faces several disease problem every year. The objective of this research was to list out the existing diseases such as WSSV, AHPND etc. and their practiced solutions in shrimp farming sector of Bagerhat district of Bangladesh. In total, forty different shrimp farms were visited to collect primary data through questionnaire interview during August to November, 2019. I also collected some secondary data from BFRI (Shrimp Research Station, Bagerhat) and from upazila fisheries office, Rampal, Bagerhat. The result showed that, at least four major diseases existed in this sector. Among those, White Spot Syndrome Virus (WSSV) was the most prominent one which covered 90% of the surveyed areas. Acute Hepatopancreatic Necrosis Disease (AHPND)/EMS was also an alarming disease for the shrimp farms of this district. Moreover, nutritional deficiency diseases such as soft-shell disease, hard shell disease was also found in the shrimp farms of Bagerhat. To prevent disease, only 7.5% of the farmers who practiced semi – intensive farming, took proper preventive measures. Depending on the symptoms, the farmers tried to recognize the diseases and after recognition, only 17% of the farmers contacted to the local govt. extension officer to control the disease outbreak. In case of feeding, 7.5% and 65% of the farmers used international brand feed (e.g., CP feed) and local brand feed respectively, where 27.5% of the farmers used no feed. As control measure of the diseases, 70% the farmers preferred immediate harvesting when disease occur.