Effect of commercial probiotics on the pro-phenoloxidase activity in Freshwater Prawn (*Macrobrachium rosenbergii*)

ID: 190631 Candidate Name: Md. Fahad Al Zobayer Supervisor: Joyanta Bir

MS in Aquaculture

The current study has been carried out to evaluate the effects of probiotics on the pro-phenoloxidase (Pro-PO) enzyme expression in the freshwater prawn (*Macrobrachium rosenbergii*). Almost equal sized (0.5 g) post larvae (PL) of prawn were collected from the hatchery and reared in grow out ponds and randomly assigning them into 9 treatment groups and 1 control. Three commercial probiotics (P1, P2 and P3) were applied at three different stocking densities (4/m2, 8/m2 and 12/m2) with a control of no probiotics. Therefore, the entire research was designed with 9 treatments (T1, T2, T3, T4, T5, T6, T7, T8 and T9) including a control (C), where each treatment was triplicated. The post larvae (PL) of prawn were reared up to three months, and haemolymph was collected from experimental prawns at an interval of 30 days. During the analysis of pro-PO activities, significant differences among probiotics-supplemented treatment groups and control group at the same stocking density (4/m2) where the pro-PO activity of T1 treatment group fed with P1, was found to be significantly higher than T4 (P=0.033) and T7 (P=0.002). The study also revealed that the combined effect of probiotics and stocking density had a significant impact on assay 1 and assay 2. Highest pro-PO activity was found in T1 group fed with P1 at the stocking density of 4/m2 and the lowest activity was found in T9 group at the stocking density of 12/m2. The results obtained from the growth performance studies suggested that *M. rosenbergii*fed with P1 represented a significantly (P<0.05) higher growth rate than did the control. Among the three probiotics, P1 revealed higher growth in T1 than that of the other treatments, where the stocking density was 4/m2 and the lowest weight gain found in T9, where the stocking density was 12/m2. Thus, the study found that the P1 and P2 provided better result among the three probiotics, which might be the functioning of highest number of beneficial bacteria. It also appeared that the use of this probiotic was most effective when the prawn PLs were reared in lower stocking densities. Thus, the result obtained from the present study suggested that the growth performance, and pro-PO based immune response of *M. rosenbergii* could be improved through application of P1 and P2 probiotics in appropriate stocking densities.

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

ID: 190632 Candidate Name: Md. Sayeed Abu Rayhan Supervisor: Professor Dr. Muhammad Yousuf Ali

MS in Fish Genetics and Biotechnology

Bangladesh government has set the minimum legal size of Hilsa (Tenualosailisha) as 25 cm, which was 23 cm in the recent past. The minimum legal size allows the adults to mate and spawn at least once before their capture and contribute to the new recruitment of the population. However, the size may need revision through proper scientific study, because they set the size on the basis of eye observation and size of some berried females. The fecundity and egg size are two important parameters in population study and study of reproductive behaviour of the species. A study was undertaken to estimate first sexual maturity of Hilsa and to see if fecundity and size of eggs varies between two adjacent lobe and among different parts of each lobe. For maturity analysis, a total of 393 specimen of Hilsa were collected from seven distinct locations of Bangladesh from August 2019 to July 2020. In order to observe fecundity and size variation a total of 25 random samples of 36.2±3.7 cm in length, 640±219g in body weight were used. We clearly

estimated the size at maturity (M50) of female Hilsa as 31 cm total length (50-50 chance of being mature or immature). A significant variation was found in egg sizes between the left and right lobes of the fish ($t(24)=2.42$, $p=0.024$), and among the parts of the same lobe ($p=0.03$). However, egg size did not vary with length and weight of Hilsa (for egg-size vs. fish length $r=-0.009$, $p = 0.966$; and $r= 0.132$ and $p= 0.530$ for egg size vs. body weight). From the fecundity study, we observed average egg count from left lobe, right lobe and total fecundity of each individual Hilsa as 3.75±1.6 lac, 3.71±1.7 lac and 7.45±3.3 lac. A strong correlation between length, weight and total fecundity of Hilsa ($r= 0.7$ and $p = 0.000$ for total fecundity vs. body weight; $r= 0.6$ and $p= 0.004$ for of total fecundity vs. length) was also found. No significant variation was observed in fecundity between left and right lobe ($p=0.687$) and among three parts of a lobe ($p=0.398$ for two lobe and $p=0.805$ for parts of lobe). Our findings recommend that size at maturity for female Hilsa as 31cm total length and suggest studying maturity for male fish in further study. In addition, size of eggs vary between two lobe and among different parts of lobe and eggs from middle part were bigger in size than the other parts. The study suggests that sample from three different parts of gonad is not mandatory while studying fecundity and reproductive biology since fecundity does not vary significantly between two lobe and parts of lobe. However, for making any inferences on egg-size, the parts of the lobes should be taken in consideration. The findings of our study would definitely help in proper conservation and management of the national fish of Bangladesh in general, and contribute in the study of reproductive biology in particulars.

Effect of probiotic bacteria on the growth of other potentially beneficial bacteria in the gut of *Macrobrachium rosenbergii*

ID: 190634 Candidate Name: Kishur Kumar Das Supervisor: Joyanta Bir

MS in Aquaculture

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 evironmental 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.

Growth study, biochemical composition and economic analysis of Asian Seabass (*Lates Calcarifer*) in cage culture

ID: 190636 Candidate Name: Palash Tahabildar Supervisor: Professor Dr. Md. Golam Sarower

MS in Fish Processing and Quality Control

Asian seabass Latescalcarifer (Bloch, 1790) is one of the most commercially important species all over the world, but aquaculture of this species is relatively new in Bangladesh. Culture of this species both commercially and experimentally has been paid an attention due to its acceptance, high demand and commercial value. Thereby, a 105days long study was conducted to determine the effects of live feed on growth and evaluation of biochemical composition of Asian seabass (Latescalcarifer) in cage culture. Three different treatments were formed on the basis of feed. The fishes were fed with no feed, minced tilapia and trash shrimp in Control (C), Treatment 1 (T1) and Treatment 2 (T2), respectively. Growth performance of juvenile seabass (initial mean body weight, 27.93±2.86) fed with minced tilapia and trash shrimp made a significant variation (p0.05) change in the ash content among the treatments. A higher cost/gram fish production was recorded in the control group due to lack of growth, while the lowest cost/gram production was observed in fish fed with minced tilapia. This study concluded that the fish fed with minced tilapia made higher revenue than others but in case of growth trash shrimp feed was the best.

Salinity induced physiological alteration in Giant Freshwater Prawn (*Macrobrachium rosenbergii*)

ID: 190638 Candidate Name: Chadni Biswas Supervisor: Dr. Md. Lifat Rahi

MS in Fish Genetics and Biotechnology

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 *Pilaglobosa* inhabiting 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. Its becomespreety sure that *P. globosa*is 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*)

ID: 190643 Candidate Name: Faria Kanok Supervisor: Professor Dr. Khandaker Anisul Huq
MS in Aquaculture

The present study was conducted to evaluate the effect of three locally available ingredients like molasses, rice bran and maizea powder additional carbon source on proliferation of beneficial bacteria in fresh water prawn farm.. The experiment aimed to identify three beneficial bacteria (probiotics) species *Bacillus spp, Chlostridiumspp, Lactobacillus spp*and their load in the ponds. In the control pond no additional carbon source was applied except feed containing 28% protein. The research was designed with 9 treatments T1, T2, T3, T4, T5, T6, T7, T8, T9 using molasses, ricepolish, maize powder, molasses+ricepolish, molasses+maizepowder, ricepolish+maize, molasses+ricepolish+maize, molasse+aquaclear respectively. The study showed that, all the 9 treatments with additional carbon source showed higher probiotics content than control; and it was significantly difference ($p<.05$). It was also observed that *Bacillus spp*was highest in T2 (7.202±.023), T3 (7.1987±.039) and T4 (7.236±.0088). *Lactobacillus spp*is found highest in T1 (4.01± .037) and T4 (4.111±.0259) *Chlostridiumspp*is found highest in T3 (4.27±.0162), T4 (4.21± .016), T6 (4.15± .053). It could be suggested that locally available high carbohydrate containing ingredients like molasses, rice bran and maize powder can be used to increase beneficial bacteria in the prawn farm.

Effect of locally available carbon sources on the growth performance of *Macrobrachium rosenbergii*

ID: 190644 Candidate Name: Preanka Rani Ghosh Supervisor: Professor Dr. Khandaker Anisul Huq
MS in Aquaculture

This study was conducted to evaluate the effect of locally available carbon sources on the growth performance of *Macrobrachium rosenbergii*. The prawns were provided with locally available ingredients as a source of carbon. Experiments were conducted with five different diets as a source of carbon like rice bran, molasses, maize, aqua clear –s. carbon source of control, T1, T2, T3, T4, T5, T6 ,T7 and T8 were respectively quality feed, molasses, rice bran, maize,(molasses + rice bran),(molasses+ maize),(rice bran +maize), (molasses + rice bran + maize),(molasses + aqua clear –s). Each experiment with three replication was carried out in the pond complex of Khulna University. Juveniles were fed twice a day for a period of ten weeks. Results indicated significant ($P<0.05$) differences on growth performance of prawn. The growth performance of T6 was significantly higher than control and other treatments.T5 showed slight variations on growth performance compare to T6 but very high variation in control. Treatment treated with rice bran and maize as a good carbon source showed resulted in higher. Reason behind this is the utilization of carbon. Findings indicate that the ingredient locally available heaving high carbon sources could be quite flexible and used successfully for the growth of fresh water prawn juveniles (*M rosenbergii*).

Salinity based molluscan abundance and diversity in Sundarban mangrove forest

ID: 190646 Candidate Name: Mohammad Mohaiminul Islam Supervisor: Professor Dr.Muhammad Yousuf Ali
MS in Aquaculture

Population structure helps to properly conserve and mange a species. To observe morphometric variation in the population of three isolated stocks of mud crab (*Scylla olivacea*) across the coastal regions of Bangladesh, a land-mark based univariate (ANOVA) and multivariate analysis (MANOVA) were conducted with 150 crab samples (106 male and 44 female) collected from Satkhira, Khulna and Cox's Bazar. A univariate analysis revealed that out of 5 morphometric characters and 20 morphometric truce measurements, all morphometric measurements and 18 truss measurements significantly differed at least two location of the study ($P<0.05$). There was significant difference in % of carapace length $F(2,147) =8.72$, $p<0.05$). The highest percentage (74%) was observed in Khulna stock and the lower percentage (71.9%) was determined in Satkhira stock.

There was significant difference in % of frontal length $F(2,147) =7.95$, $p<0.05$). The % of carapace length of sample of Khulna and Satkhira are not significantly different but the % of carapace length of sample of Cox's Bazar are different from Khulna and Satkhira. The highest percentage (44.1%). We also observed significant difference in % of left and right anterolateral carapace length $F(2,147) =13.69$, $p<0.05$). The multivariate shape analysis revealed that the population of mud crabs from Satkhira were relatively diverse from that of Khulna and Cox' Bazar, while Khulna and Cox's Bazar exhibited similar type of morphometric variability. The findings from the study will assist in fixing up the banning time and thus protecting the mother crabs; and will assist in formulating police to conserve and protect juvenile crabs in the sense that the minimum legal capture size of crabs will allow the adults to mate and spawn at least once before their capture.

Detection of Tilapia Lake Virus (TiLV) and Infectious Spleen and Kidney Necrosis Virus (ISKNV) in infected farmed Tilapia (*Oreochromis niloticus*) fishes by clinical signs assessment and PCR techniques

ID: 190651 Candidate Name: Aminul Islam Supervisor: Professor Dr. Md. Golam Sarower
MS in Fish Genetics and Biotechnology

Tilapines are important for the sustainability of ecological systems and also serve as the second most important group of farmed fish worldwide. Significant mortality of wild and cultured tilapia has been observed recently for many viral diseases. Tilapia lake virus (TiLV) and infectious spleen and kidney necrosis virus (ISKNV) diseases have been emerged to be the important viral diseases of farmed Nile tilapia (Oreochromisniloticus), causing impediment towards the expansion of aquaculture production. The etiological agents of TiLV and ISKNV diseases are RNA virus and DNA virus, respectively. This study was performed to assess the clinical signs and detect the contamination of TiLV and ISKNV in infected farmed tilapia fishes. Twenty five infected farmed tilapia fishes, five from each farm were collected of five farms. PCR targeting segment-1 of the virus was developed to detect TiLV. For ISKNV detection, PCR targeting the major capsid protein (MCP) of megalocytiviruses yielded an amplicon with high sequence identity to infectious spleen and kidney necrosis virus (ISKNV) genotype II. A minor analogous of clinical signs of infected farmed samples with reported clinical signs of TiLV and ISKNV were noticed, namely mild exophthalmia, slight darkening, mild scale loss, medium scale protrusion, mild skin redness and pale or yellowish clinical signs. No TiLV and ISKNV were detected by PCR in the infected farmed tilapia fishes. This study confirmed that the farmed tilapia fishes were not infected by these two viruses. So, further investigation is required to detect others causative agents of that infected farmed fishes to prevent massive mortality.

Landmark-based morphometric variations of Hilsa (*Tenualosa ilisha*) in different stocks of Bangladesh

ID: 190652 Candidate Name: Md. Mirazul Islam Supervisor: Professor Dr.Muhammad Yousuf Ali

MS in Fish Genetics and Biotechnology

Stock identification is an interdisciplinary field that involves the recognition of self-sustaining components within natural population. The concept of stock separates the population into groups with different growth rates and reproductive dynamics, irrespective of genetic similarities. Morphometric differences among stocks of a species are recognized as important tool for evaluating the population structure and identifying stocks. Thereby, the present study was carried out with seven different stocks (Barguna, Barishal, Cox's Bazar, Chalna, Kuakata, Chandpur and Rajbari) of Bangladesh to analyze landmark-based morphometric measurements of Tenualosailisha. A total of 217 samples were collected where the range of standard length was from 19.954 to 43.768 cm and the weight range was from 139 to 1592 g. The main aim of this experiment was to evaluate the population status and to identify the variation among the stocks. Seven morphometric characters and twenty five truss distances were measured by using the landmark based morphometric variations and truss network system. Five morphometric characters namely standard length, dressing percentage, head length, highest body width, condition factor, were found to be significantly different (p0.05). This study was a preliminary step to identify the changes among the seven stocks T. ilisha which could be a significant reference for formulating further conservation and management action plans of this species in Bangladesh.

Study of water quality parameters of crab farms based on time and associated management system

ID: 190653 Candidate Name: Jayanta Biswas Supervisor: Md. Rashedul Islam

MS in Coastal and Marine Science

The present work emphasized on the study of water quality parameters of crab farms based on time & associated management system. pH (Using pH meter),Temperature (Thermometer), Salinity (Refractometer), Dissolve oxygen (DO) (Winkler method), Biological oxygen demand (BOD) (5 day BOD technique), ammonia–nitrogen (NH_3-N) (Nessler Method), nitrite-nitrogen (NO_2-N) (Ultraviolet Spectrophotometric Screening Method) and nitrate (NO_3--N) (Ultraviolet Spectrophotometric Screening Method) were monitored at the water chemistry lab during the experimental period. Some of the important analytical methods in some cases with some modification were set up in the Water Chemistry Research Laboratory of Fisheries and Marine Resources Technology (FMRT) Discipline. Collecting data was stored, explored and analyzed (One way ANOVA test) by using Microsoft Excel (2010), SPSS and Microsoft Word program to present results and discussion. The average value of temperature (^{0}C) 21.18±2.68, salinity (ppt) 5.90±.26, pH 7.82±.08, BOD (mg/L) 1.68±.12, Nitrite (mg/L) .20±.04, Nitrate (mg/L) .19±.0036.

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

ID: 190654 Candidate Name: Fahmida Rahman Supervisor: Professor Dr. Ghausiatur Reza Banu

MS in Fish Genetics and Biotechnology

Vibriosis is one of the most prevalent shrimp diseases caused by bacteria belonging to the genus Vibrio. 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. This study aimed to know the present scenario of diseases caused by V. parahaemolyticus at Satkhira. To combat the disease, the antibacterial effect of the olive leaves extract in inhibiting the growth of Vibrio spp (V. parahaemolyticus) was also analyzed. The average load of V. parahaemolyticus from three different farms was 18.3×10 4, 4.41×10 4, 1.46×104 CFU/ml. Both acetone and ethanol extracts of Oleaeuropaea were analyzed for the antibacterial activity against V. parahaemolyticus which were determined by agar plate dilution method. From the process, the result was found that the effective concentration for acetonic extract of O. europaea was 2 mg/ml, whereas, ethanolic extract of it was effective at 3 mg/ml. It was observed that acetone found as a better extraction agent than ethanol for O. europaea. So, acetone extract of O. europaea might be used as alternative way to prevent the pathogenic disease of EMS/AHPND which is caused by V. parahaemolyticus. However, this plant based chemical is required to go through a thorough toxicity analyses before it can be safely applied to aquaculture practices.

Effects of salinity on physiological-genetic changes in the Giant Freshwater Prawn (*Macrobrachium rosenbergii*)

ID: 190655 Candidate Name: Md. Abdul Kadir Zilany Supervisor: Dr. Md. Lifat Rahi

MS in Fish Genetics and Biotechnology

Environmental salinity levels play a vital role in organismal physiological status including growth, immunity and survival. Any change in aquatic salinity level can impose a major limiting effect on aquaculture production because of stress on organisms. The present study was conducted to investigate the salinity induced physiological (oxygen consumption and hemolymph osmolality) and genetic (expression pattern of two hemolymph regulatory genes) in the giant freshwater prawn (M. rosenbergii) under three different experimental salinity levels (0‰, 6‰ and 12‰) for a period of 10 days. Prawns reared at 6‰ and 12‰, showed significantly higher ($p < 0.05$) oxygen consumption, hemolymph osmolality and expression pattern of two hemolymph regulatory genes (CCP and DH). The highest levels of oxygen consumption, hemolymph osmolality and gene expression changes were obtained at 12‰. Moderate levels of oxygen consumption, hemolymph osmolality and genetic (gene expression pattern) were obtained at 6‰ treatment while the lowest levels of physiological-genetic changes were observed at 0‰ (control salinity). Findings of this study demonstrate the adverse effect of salinity stress on the oxygen consumption, hemolymph osmolality and gene expression

Annual trend of particulate organic carbon in the Bay of Bengal using satellite data.

ID: 190656 Candidate Name: Zareen Afroje Sumana Supervisor: Professor Dr. Muhammad Abdur Rouf

MS in Coastal and Marine Science

Particulate Organic Carbon (POC) is an important form of oceanic carbon form, taking part in various biogeochemical processes and influencing both organic and inorganic carbon cycles. This study aims to investigate annual variability of POC and its association with sea surface temperature (SST), chlorophyll (Chl-a) and wind vector as well as to validate satellite data with insitu measurement data. Satellite remote sensing offers new means of quantifying POC concentration over large oceanic areas. From moderate resolution imaging spectroradiometer (MODIS) aqua satellite, we derived 18-year data of POC concentration in the surface waters of the Bay of Bengal, BoB. Level 3 MODIS aqua satellite data of POC, SST and Chl-a were used in this study. Wind speed and direction data were collected from WINDSAT satellite. The 18year time series of BoB average surface POC concentration display significant long term trends. The annual mean surface POC concentration was highest in the year of 2004 (180.58mgm-3) and lowest in 2018(126.83mgm-3). The annual POC of BoB (2002-2019) ranged from 126.83mgm-3 to 180.58mgm-3 and average POC was observed as 153.84±11.17 mgm-3. The study revealed a declining rate of POC from 2002-2019 and the rate of change was -1.12mgm-3 yr-1. A weak inverse relationship was found between POC and SST. Chl-a showed a moderate positive relation with POC. Wind vector do not display any relationship with annual POC. This study revealed that Chl-a concentration is more associated with POC than SST and wind vector. A strong positive relation (r = 0.74) was found between in situ and MODIS aqua derived POC data. Further detailed investigation is required to observe the association of other parameters with POC.

Estimating by-catch species composition during crablet collection from coastal rivers in Khulna region of Bangladesh.

ID: 190658 Candidate Name: Avijit Kundu Supervisor: Professor Dr. Muhammad Yousuf Ali

MS in Coastal and Marine Science

By-catch composition is an indicator of species richness of a river which also depicts the degree of species destruction by the fishers. In Bangladesh most of the by catch species during crablet collection are discarded on the shore or taken home by the fishermen as a mean of extra income. For proper management and regulation in an open water fishery, it is essential to know the status of by-catch composition. How many species are being destroyed during the harvest of a target Species. In light with this aim, a study was conducted to assess by-catch species composition and abundance of by-catch during crablet collection from the Shibsa river of Nalian and Mandurpalta river (upper part of Shibsha river) of Chalna under Khulna district in Bangladesh. Samples were collected from February 2020 to October 2020 using mosquito-net and casting net one full tide (approximately 3-4 hours) during the full moon and new moon of every month. The study showed that a total of 47 species under 23 families are destroyed by the crab hunters as a by-catch. Among the available by-catch fishes, the most dominant species were Parse (Liza parsia), Chotabele (Glossogobiusaureus) and Datina (Pomadasys hasta); among the crustaceans, the Tiger shrimp (Penaeusesculentus), Chalichingri (Metapenaeusbrevicornis) and Harinachingri (Metapenaeus Monoceros) were most abundant. The minimum size of Parse, Datina and Chotabele were 1.3, 0.58, 0.84 cm and respectively, while the maximum size were of the same were recorded as 12.3, 5.7 and 10.9 respectively. Abundance of by-catch composition was affected by the geographical position and nearness to the Sundarbans mangrove forests. Relatively more species were observed in Nalian than in Chalna. We recorded a total of 47 species in Nalian and 40 species in Chalna. Overall species richness of by-catch species were observed maximum in April to June, and the lowest in JulyAugust. This study revealed a glimpse of species richness in the respective areas of the study and give an account species destruction during crablet collection. The findings of the study will definitely help in taking strategies for the conservation and management of biodiversity in the region.

Seasonal variability of particulate organic carbon in the Bay of Bengal using MODIS Aqua Imagery

ID: 190660 Candidate Name: Md Rony Golder Supervisor: Professor Dr. Muhammad Abdur Rouf

MS in Coastal and Marine Science

Particulate Organic Carbon (POC) plays a vital role in the ocean carbon cycle and is linked to many important ocean biogeochemical processes. This study aims to investigate the seasonal variability of POC and its association with Sea Surface Temperature (SST), Chlorophyll-a (Chl-*a*), and wind vector in the Bay of Bengal (BoB) of Bangladesh part, as well as to validate satellite data with in-situ measurement data. Moderate Resolution Imaging Spectroradiometer (MODIS) Aqua satellite level-3 data of POC, Chl-*a*, and SST were used in this study. Wind vector data were obtained from the Wind Sat Polarimetric Radiometer satellite. Monthly averaged POC (2002-2019) was ranged from 103.08 to 184.22 mgm-3 with an average of 154.28±31.47 mgm-3. The POC was higher (181.80 ±22.34 mgm-^{3}) during the northeast-monsoon (December-February), and lower (136.56±36.24 mgm-^{3}) in the pre-monsoon (March-May). Statistically significant ($F(3,202) = 18.09$; $p<0.05$) difference of POC was found among the seasons. A very weak inverse relationship was found between POC and SST whereas POC and Chl-*a* showed a positive relationship for all the seasons in the BoB. This study revealed that the POC was very prominent with the wind vectors prevailing northeasterly in the northeast and post-monsoon and low with the southwesterly wind in the southwest and pre-monsoon. POC variability was mostly influenced by Chl-*a* than SST and wind vector for BoB. The variability of POC in BoB is mainly influenced by the monsoon effect which causes tremendous rainfall and strong wind. A significant ($p<0.05$) moderate correlation ($r=0.74$) was found between the MODIS Aqua satellite data and in-situ observation. A further detailed investigation is required to observe the association of other parameters with POC variability

Comparing quantitative phenotypic variation between hatchery and wild Mud Crab (*Scylla olivacea*) in pond culture system

ID: 190601 Candidate Name: Md. Mahmud-Al-Hasan Supervisor: Professor Dr. Md. Golam Sarower

MS in Fish Genetics and Biotechnology

For recruitment-limited, severely depleted fishery stocks, stock enhancement may become an important technique in the return of population sizes to sustainable levels. Aquaculture-reared individuals, however, may face some disadvantages upon release into the wild due to differences between natural conditions and the hatchery which might also affect the survival rate. Therefore, the present study was conducted to observe the variation in quantitative phenotypes including growth (i.e. carapace length, carapace width, abdominal width, carapace spine length, body weight) and coloration intensity among hatchery and wild reared Scylla olivacea juveniles in earthen ponds. Wild juvenile S. olivacea were obtained from the downstream of tidal rivers adjacent to Sundarban mangrove forest, Bangladesh, whereas hatchery-produced juveniles were collected from local crab hatchery. The hatchery and wild crab-lets were stocked into hapa (9 m2) in three stocking densities viz. 500, 1000, 1500 crab-lets/hapa and cultured for three weeks to determine the survivability. The juveniles were fed daily with boiled tilapia paste (5-8% of body weight) for

the first three weeks and chopped eviscerated tilapia onward to the end of the experiment (i.e. June to September). Weekly sampling was carried out taking weight and digital photography for phenotypic measurements. Water quality parameters such as ammonia, temperature, salinity, dissolved oxygen, pH and turbidity were recorded during the sampling time. These data were analyzed at the end having multivariate statistics using discriminant function for finding out possible discriminant phenotype among hatchery and wild stocks. Survival rate was varied significantly ($p < 0.05$) depending on stocking density. Growth performance was quite similar ($p > 0.05$) between crabs from the two sources in terms of observed physiological parameters. In spite of having no overall significant discrimination (30.69 %) among hatchery and wild stocks, structure matrix depicted 'ninth lateral spine height' and 'posterior width of carapace' as discriminant characteristic. Also, the RGB values were not statistically significant among hatchery and wild population. Overall, the hatchery-produced crab-lets showed similar growth performance in terms of quantitative phenotypes and coloration intensity as compared to wild ones. This finding could add value in hatchery reared crablets for stock enhancement in Bangladesh.

Impact of some selective probiotics on soil parameters on soil sarameters in Prawn culture pond

ID: 190602 Candidate Name: Md. Sazzadul Islam Supervisor: Professor Dr. Khandaker Anisul Huq

MS in Aquaculture

The study was conducted to observe the impact of commercial probiotics application on soil parameters (pH, Electrical conductivity, Organic matter, total nitrogen, Phosphorus, Potassium and Sulphur) of prawn (Macrobrachium rosenbergii) culture pond from August 2019 to January 2020. There were three probiotics groups viz, (a) Probiotics-1 (Feed and environmental)- (P1), (b) Probiotics-2 (Feed probiotics) -(P2) and (c) Probiotics-3 (environmental)-(P3) each having aerated and non-aerated treatment and d) control- without aeration and probiotics treated pond. Stocking density was 4/m2 for all the probiotic treated and control ponds and each treatment was triplicated. Experimental pond size was 120 m2. Prawn were fed twice a day with quality feed containing protein level 28%. Soil parameters were checked in every month and continued for six months. After 180 days' pH was found to vary from (7.49±0.06) to (7.65± 0.050) which was significantly different from control pond (7.34±0.02). Significant difference was found for EC between P1, P2 and P3 (5.13 ±0.06 to 5.58 ± 0.35 ds/m) and control group (5.92±0.17 ds/m). There was significant difference between P1, P2, P3 (3.67 ±0.04 to 4.66±0.315%) and control (5.95±0.13%) in terms of organic matter. Same trend was shown by nitrogen between P1, P2 and P3 (0.183 ±0.0026 to .216±0.0036 %) and control (0.258±0.0070 %). Phosphorus was found significantly different as well between P1, P2 and P3, (8.73±0.26 to 11.12±0.81 µg/g) and control group (13.44±0.34 µg/g). Potassium and sulphur was not significantly different between P1, P2 and P3 (0.442±0.004 to 0.468±.007 meq/100g), (0.0073±0.0018 to 0.0185± 0.0100 %) and control (0.481±0.008 meq/100g), (0.481±0.008 %) respectively. In consideration of aeration, the result does not show prominent difference on pond bottom by surface aeration. Over all, soil parameters were improved by probiotics. Among the treatments feed and environmental probiotics (P2) showed the best result for ideal pond bottom. The achievement of this study can be applied in the prawn farms improving soil quality.

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

ID: 190603 Candidate Name: Md. Abu Hayat Supervisor: Professor Dr. Khandaker Anisul Huq

MS in Aquaculture

The aim of this experiment was to examine the effects of probiotic administration on water quality in prawn culture. The experiment also attempts to cover the research gaps existing in our knowledge of this administration mode, and to suggest the issues that need to be investigated in greater depth. Three probiotics (p1, p2, p3) were used containing different beneficial bacterial composition at different stocking density (4 / m2, 8/ m2, 12/ m2) of prawn. Aeration was done daily early morning for 2 hours and followed by every 6 hours after. Among the water quality parameters pH, DO, BOD, NO3, NO2, NH3 were observed. All the parameters were in acceptable range in the experiment pond. Significant difference (<0.05) of DO, BOD, NO3, NH3 were found between without probiotic (control) and probiotics treated waters. The highest pH value was found in T7 (7.84± 0.05) where probiotic-3 (P3) was used and lowest in probiotic-2 (P2) (7.6±0.124).The highest DO value was found in P1 (6.6±0.22) and lowest in P2 (4.6±0.22).The highest BOD value was found in probiotic-2 and lowest in probiotic-1.The highest NO3-N value was found in P3 (0.1471±0.005) and lowest in P2(0.1336± 0.004).The highest NH3-N value was found in P3(0.1029±0.007) and lowest in P2(0.0898±0.006).The highest NO2—N value was found in P3 (0.0662±0.008) and lowest in P2 (0.036±0.0102). But NO2-N did not show significant difference between probiotics and without probiotic(control). This may be due to the beneficial bacteria in the probiotic which has made the water quality good in prawn culture. Therefore, it could be concluded that probiotics might have positive effect to keep water parameters good for aquaculture.

Present status of Mud Crab (*Scylla olivacea*) production and marketing channel in Khulna district

ID: 190607 Candidate Name: Palas Kumar Mondol Supervisor: Professor Dr. Muhammad Yousuf Ali

MS in Aquaculture

Various aspects production and marketing of mud crab (*Scylla olivacea*) were evaluated through a survey in three Upazilas under Khulna district of Bangladesh for one year in 2019. Our survey revealed that a total of 289.2 MT mud crab was produced from Khulna district of Bangladesh in 2019. The maximum mud crab production was recorded in Paikgacha Upazila (140.7 MT) while the minimum was in Dacope Upazila (70.1 MT). The production of mud crab was found to be maximum in monsoon (101.1MT) and the lowest was production found in Summer (87.7 MT). So it is clear that production difference between two Upazilas is 13.4 MT. The maximum number of crab depots were recorded in Paikgacha (20), whereas lowest was in Koyra (0 9). The maxi m u m (240) and the minimum number (90) of manpower involved in crab business at local mud crab depots were recorded in Paikgacha and Koyra respectively. M o s t of the crab depots were located on the bank of rivers and connected with the high ways in Khulna district. Three types of crab depots were recorded in the study area; Katcha (Mud-built), Pacca (Brick-built) and Semi-Pacca. The prices of mud crabs were found to vary according to the grades (size, sex and physical condition) and season as well as the demand in export market. However, the average higher prices were accounted for F l grade (female) and XL (male) throughout the year. The mud crab marketing was found to be fully export oriented and the major export markets of mud crab are China, Taiwan,

Singapore, Hong Kong, Malaysia Thailand and USA. However, some domestic market of mud crabs is prevailing in the areas based on reject crabs from the depots. The Sundarbans mangroves, tidal rivers estuaries, canals, shrimp farms are the main sources of the mud crabs from where marketable size male and female crab are harvested. Although mud crabs are harvested round the year, the peak-harvesting season was found to be June to August from shrimp ghers, November to January from the mangrove areas and tidal rivers. Small non mechanized boat, pick up, van and mini truck were found as the means of mud crab transportation from harvesting point to exporting point. The use of bus as a mean of transportation was stopped from the early months of 2019. During public transportation from harvesting point to the exporter point about 5-25% harvested crabs were found to die. The mortality rate during transportation varied with iii season. The maximum mortality occurred during summer season (13.9%) in the time of packaging and the minimum during winter season (2.15%) in the time of harvesting. Another 6-7% of harvested crabs were rejected at depot during handling due to soft- ·shell, broken leg and/or lean (poor fat) condition. The marketing channel for the mud crab, in general was found to be similar at all Upazila of Khulna district. The catchers harvest crabs from various wild sources and s e l l to the small depots or to brokers or directly to the suppliers. The marketable crabs from the small depot owner are sold to the suppliers. The exporter purchase mud crab directly from the supplier located at all the Upazila levels. A big chunk of the profit goes to middlemen or brokers. Broker act as a middleman between the catchers and the suppliers. Sometimes, the exporters directly purchase crabs in cash from the local depots by employing agents. The rejected crabs (under grade and broken claws or legs) are transferred to the local market for domestic consumption at low price. The poor health crabs are sol d to th e local fattener for fattening. After fattening they sell it out for export. The study provides value information regarding the present scenario of mud crab marketing and distribution in Bangladesh. It will assist in taking any measures or strategies for the development of crab production and marketing in the coastal region in Bangladesh.

Seasonal variation of zooplankton abundance and diversity in Pasur, Bhadra and Ichamoti river in Bangladesh.

ID: 190614 Candidate Name: Md. Alimullah Supervisor: Md. Rashedul Islam

MS in Aquaculture

The present study was carried out from during July, 2019 to November, 2019 to determine the abundance and diversity of zooplankton in Pasur, Bhodra and Ichamoti river at the edge of Sundarbans Mangrove Forest, Bangladesh. Three sampling stations in each of the Pasur, Bhodra and Ichamoti River thus a total of 9 stations were selected for collection zooplankton during both high tide and low tide. A total of 47 species of 7 distinct groups were recorded in which Copepoda were more abundant group with 12 species followed by Crustaceae with 10 species, Rotifera with 8 species, Protozoa with 6 different species while the Decapoda with only 3 species from the study area. Some species of Cladocera, Annelidae, Gastropoda is also presented as a small number but not regularly. Furthermore, almost all groups of zooplankton were found at a higher number in the monsoon whereas post-monsoon represented the lowest number of them. Thus the findings of the present study will be capable to provide information about the zooplankton distribution near the Sundarbans mangrove estuarine system.