Isolation and Biochemical Confirmation of *Aeromonas spp.* and *Pseudomonas spp.* Bacteria from Wild Mud Crab

ID: 160606 **Candidate Name: Ragib Noor Tonmoy** **Supervisor: Md. Rashedul Islam**

Mud crab (*Scylla olivacea*) is one of Bangladesh's most promising coastal species for aquaculture diversification. Mud crab has received less attention because to its short culture cycle and low sensitivity to disease outbreaks. As this species' culture is widely practiced with low input supplies, mortality has become more common in recent years. This study was carried out to investigate the load of pathogenic Aeromonas spp. and Pseudomonas spp. those are liable causing disease in mud-crab and further mortality particularly when brought to culture system. Sample were collected from depots of Bagerhat District and analyzed in the fish pathology laboratory. Several biochemical tests including salinity tolerant, KIA, TSI and MR-VP were performed to indentify colonies. Aeromonas spp. varied from (1.717×10^6 – 6.87×10^6) cfu/mL and had a dark red core with a lighter red outside layer, with many colonies that took more nutrients being reddish. Pseudomonas spp. greenish colonies, on the other hand, ranged in size from (1.084×10^6 –5.35×10^6) cfu/mL, with some being yellowish. Every sample was associated with *Aeromonas hydrophila, Aeromonas caviae* and *Pseudomonus aeruginosa*. Whereas *Aeromonas hydrophila* were dominant. Infections with bacteria in crab results in death, cuticular lesions, necrosis, muscle opacity, gill-discoloration, delayed development, loose cuticle, etc. According to the findings, the bacterial load on crabs were significant enough to cause disease outbreak while introduced in captive culture condition as other associated factors might trigger the chances for intensity of infection. Therefore, intensive study on health management of mud crab is crucial for the sustainability of this valuable sector.

The Impact of *Bacillus* sp. Probiotic on Disease Symptoms and Survival of *Macrobrachium rosenbergii* Challenged with *Vibrio Parahaemolyticus*

ID: 160615 **Candidate Name: Sadia Islam Dola** **Supervisor: Dr. Khandaker Anisul Huq**

This study evaluated the effect of *Bacillus* sp. probiotic on the survival of *Macrobrachium rosenbergii* challenged with *Vibrio parahaemolyticus*. One hundred and twenty freshwater prawn juveniles were stocked 12 plastic tanks (20 L water capacity) that contained 10 experimental prawn juveniles in each tank under four experimental groups (e.g. negative control (NC), positive control (PC), *Bacillus* sp. (probiotic) treated *M. rosenbergii* without pathogen (T1), and prawns treated with *Bacillus* sp. (probiotic) and challenged with pathogen (T2). The result of this experiment represented that T1 (80%) and T2 (76.67%) showed higher survival compared to NC (70%) and PC (50%) respectively. Survival function of T2 showed higher cumulative survival than PC which indicated protective activity of *Bacillus* sp. against *V. parahaemolyticus*. Finally, it could be concluded that *Bacillus* sp. probiotic can be used in *M. rosenbergii* culture as an alternative disease controlling mechanism.

Effect of Size Variation in the Proximate Composition of Tuna Fish Species of Bay of Bengal

ID: 160631 Candidate Name: Umma Habiba Supervisor: Md. Rashedul Islam

Tuna is very important economically and significant source of food. The current study has been conducted to evaluate the effect of size variation on proximate composition of Tuna fish species from of Bay of Bengal. The lab work has been conducted at Fish Nutrition laboratory of Fisheries and Marine Resource Technology. The proximate composition has been determined of different body parts (Head, middle and tail portion) of tuna fish, ***Auxis thazard***. Tuna fish of 3 types of weight (1kg, 700g, 500g) has been analyzed to execute to the thesis. Protein content has been found higher in the head portion of tuna fish of weight, 700g. Highest moisture content has been found in the tail portion of tuna fish of weight, 1kg. Highest ash content has been found in the middle portion of tuna fish of weight, 1kg. Highest lipid content has been found in the middle portion of tuna fish of weight, 1kg. Average protein percentage ranges from (22.26-22.67) % and average moisture percentage ranges from (73.18- 73.74) % has been found in the 3 types of weight of tuna through the experiment. Average ash content has been found ranging from (1.43-1.57) %. Average lipid content about (1.66- 1.957) % has been found in the three types of weight of tuna fish. There are no significant differences in the protein, ash and moisture content of three types of weight of tuna fish.

Effects of Stocking Densities on Proximate Composition of *Anabas testudineus* in Biofloc Culture System

ID: 160639 Candidate Name: Arnishi Sultana Supervisor: Md. Shahin Parvez

A ninety-one (91) days experiment was conducted to determine the effect of different stocking densities on body composition of climbing perch (*Anabas testudineus*) in biofloc tank culture system. To do so, fingerlings of climbing perch with a mean initial weight of 0.80±0.02 were stocked in three different stocking densities as 300 fish /m^3 (T-300), 450 fish/m^3 (T-450) and 600 fish /m^3 (T-600) in triplicates. All the parameters of water quality were in optimum level during culture period. After harvesting, treatment wise muscle sample of fish were taken to determine protein, lipid, moisture and ash content. The highest protein content was 20.104% and it was found in T-300 and lowest protein content was 18.811% in T-450 but there was no significant ($p>0.05$) difference among the treatments. Similarly, moisture and lipid content did not vary significantly($p>0.05$) among the treatment means. However, the highest ash content was 1.408% and it was found in the stocking density of T-600 which was significantly different(($p<0.05$) from other treatments. It can be presumed that, fish in the higher stocking densities can graze more biofloc which might be act as the causing factor for increased ash content. Findings on proximate composition analysis under this study would be helpful for biofloc entrepreneur and the consumer.

Effect of Stocking Density on Growth Performance of Climbing Perch *Anabas testudineus* in Biofloc System

ID: 170602 Candidate Name: Afia Anjum Supervisor: Sudip Debnath

Stocking density is considered as one of the crucial aspects for optimizing water quality and feed management in biofloc system. *Anabas testudineus* is one of the commercially important aquaculture commodities for its high nutritious value and consumer demand. Information on *A. testudineus* reared in biofloc system is scarce, especially stocking density data is lacking. Therefore, *A. testudineus* (mean initial weight of 0.80 g) was reared in a biofloc system for 91 days under three different stocking densities, 300 (T-300), 450 (T-450), and 600 (T-600) fish m^{-3} in triplicates. Fish were fed at 3% of their body weight and water quality parameters were intensively monitored. All water quality parameters were in optimum ranges throughout the experiment. Fish in all treatments showed positive allometric growth ($b > 3$) and the length-weight relationship were significant ($R^2 > 0.95$, $p < 0.05$). After 91 days feeding trial significant difference was observed in final weight (g), weight gain (g and %), daily growth rate (g d^{-1}), SGR (% d^{-1}), and FCR. Treatment T-300 and T-450 showed similar growth pattern ($p > 0.05$) while fish in treatment T-600 had significantly poor growth ($p < 0.05$). There was a tendency towards a significant difference in yield (kg m^{-3}) among the treatments ($p = 0.072$). In conclusion, the stocking density of 450 fish m^{-3} resulted in the highest yield (8 kg m^{-3}). The findings of this study revealed that higher stocking density seriously impaired the overall growth performance of *A. testudineus.* More studies should be conducted with solid management to determine the appropriate stocking density in BFT for *A. testudineus*.

Physicochemical Water Quality Parameters of Mud Crab Fattening Farms in Debhata Upazila

ID: 170603 Candidate Name: Md. Sohag Ali Supervisor: Dr. A F M Hasanuzzaman

This study deals with the understanding of different physicochemical water parameters in Mud crab *Scylla olivacea* fattening farms. The water samples were collected from the three Mud crab fattening ponds located in the village Aatshotobigha under Debhata Upazila of Satkhira district of Bangladesh. The study was conducted during the period of September to December, 2020. In-situ measurement and sample collections were done at every new moon of the respective month. Water quality parameters: temperature, dissolved oxygen (DO), pH, ammonia, nitrite, nitrate, salinity, hardness which are thought to be significant in relation to the growth of *Scylla* spp. were measured during the study period. The water temperature was found to be between 19.7℃ to 34℃. The pH of the water ranged from 7.2 to 9. The water salinity varied from 1 ppt to 7 ppt. The values of DO, ammonia, nitrite, hardness was found to vary between 5.5 mg/l to 8,9 mg/l, 0.05 mg/l to 0.6 mg/l, 0 to 0.065 mg/l, 675 mg/l to 1050 mg/l respectively. In case of nitrate, the value was found to be 0. Slight variations in water quality parameters were noticed within different ponds. Most of the water parameters varied significantly in relation to months. Altogether, the water quality in the study ponds was found within the acceptable limit for Mud crabs; but salinity range is not within the optimal level for Mud crab production.

Nitrogen, Phosphorus and Potassium Level in Soil of Mud Crab Farms in Debhata Upazilla

ID: 170606 Candidate Name: Md. Habibur Rahman Supervisor: Dr. A. F. Md. Hasanuzzaman

The study was conducted to find out the level of nitrogen, phosphorus, potassium and p^H in the soil collected from the Mud crab farms of Debhata Upazilla of Bangladesh for period of four month (September 2020 to December 2020). Three farms were selected for this investigation. There were two independent variables (farms and month) and four dependent variables (p^H, nitrogen, phosphorus and potassium. In September, p^H was recorded in the range of 5.4 to 6.8, 6.3 to 6.9 in October, in November 6.3 to 6.4, 6.3 to 6.4 in December. Nitrogen level was recorded as trace to low in September, trace to trace-low in October. Trace to low in November, and trace to low-medium level in December. Phosphorus level was as low to medium in September, low-medium to medium-high in October, low to medium-high in November and nearly low-medium in December among three farms. Potassium level was as medium to high in September, almost high in October and medium to high in November and high level of potassium was in December. The findings of this study indicates the soil of the farms were slightly acidic, and was less fertile in terms of nitrogen content.

Characterization and Homology Modeling of Grey Mullet Alpha-amylase Using *in silico* Analysis

ID: 170607 Candidate Name: Bijoy Biswas Supervisor: Dr. Md. Golam Sarower

Alpha amylase is an essential enzyme used in carbohydrate metabolism by the hydrolysis of glycosidic bonds. This enzyme is widely distributed in natural world such as in plant, animals, fungi and bacteria. Amylase have a lot of industrial applications including starch and its derivative industries like, detergent, textile, bakery, food and drug industry. To understand primary, secondary and tertiary structure of alpha amylase, composition of amino acids, basic physiological characteristics; viz., pI, molecular weight, instability index, GRAVY, phylogenetic tree were determined by *in silico* approach. We retrieved amino acid sequence of grey mullet alpha amylase from NCBI and used Clustal Omega for multiple sequence alignment and building phylogenetic tree. The 3D structure of this protein was generated using Swiss-Pdbviewer 4.1.0 tool by homology modeling and the 3D model revealed total 10 helix region, and 13 strands and 23 loops were present in alpha amylase of grey mullet. Dialdehyde starch was used as a model substrate to evaluate the alpha amylase activity and achieved docking score was -4.8 Kcal/mol. This negative docking score represents the binding affinity of alpha amylase with dialdehyde starch is strong and existing . His116, Arg210, Asp212, Glu248, His314 were the active sites bind through hydrogen bond and Tyr77, leu177, Ala213 were the active sites bind through hydrophobic bond with dialdehyde starch . By measuring docking score of alpha amylases with various substrates we can choose the best fit feed or drug substrates for grey mullet.

Effect of *Clostridium* sp. Against *Vibrio parahaemolyticus* Causing Disease Symptoms and Survival of *Macrobrachium rosenbergii*

ID: 170610 Candidate Name: Md. Juwel Haque Jony Supervisor: Dr. Khandaker Anisul Huq

To determine effect of *Clostridium* sp. (probiotic) against *Vibrio parahaemolyticus* (pathogen) on disease symptoms and survivability of fresh water prawn (*Macrobrachium rosenbergii*). The experiment was carried out in the wet laboratory of FMRT Discipline using 12 plastic tanks (20L each) with four treatments namely negative control (NC- prawn and feed), positive control (PC- prawn, feed, pathogen), T_1 (prawn, feed, probiotic) and T_2 (prawn, feed, pathogen, probiotic). PC treated with pathogenic *Vibrio parahaemolyticus* at a level of 4ml/20L water, whereas T1 treated with probiotic at the level 2ml/20L water. In T2 both pathogen and probiotic present at a level of 4ml/20L and 2ml/20L respectively. Ten juvenile prawn were used in each treatment which was replicated thrice and culture for 18 days. This experiment showed that the survival rate of prawn in NC, PC, T_1 and T_2 were 75%%, 50%, 75% and 75% respectively. Probiotic *Clostridium* sp. can reduce pathogenic effect of *Vibrio parahaemolyticus.*

Identifying Peak Breeding Season and Observing Length-weight Relationship, Condition Factor and Dressing Percentage of Hilsa (*Tenualosa ilisha*) Across the Natural Habitats in Bangladesh

ID: 170611 Candidate Name: Md. Shohanur Rahman Supervisor: Dr. Muhammad Yousuf Ali

A study was carried out to determine peak breeding season, length-weight relationship, condition factor and dressing % of Hilsa shad (*Tenualosa ilisha*) collected from seven locations of Bangladesh. A total of 217 samples were examined. The peak breeding season was identified by observing the monthly variation in Gonado-Somatic Index (GSI). October was identified as the peak breeding season of Hilsa. Two peaks of GSI were observed, one in February-March and the another in October which is the indicator of peak breeding time. The highest peak of GSI (12.1) was observed in October. The length-weight relationship was determined as log weight (g) = -1.505+2.718 log length (cm). A negative allometric growth was observed, as the slope b was <3. The Fulton`s condition factor (CF) was estimated as 1.17±0.2 from the combined data, ranging from 0.6 to 1.9. There was significant difference in CF among the stocks ($F_{(6,210)}$= 8.76, $p<0.05$). The highest and lowest CF was observed in Patuakhali (1.3±0.4) and Cox`s bazar (0.9±0.1) respectively. The dressing percentage was observed as 61.5±2.6 from the combined data, ranging from 54.3 to 68.4. The highest and lowest dressing % was observed in Chandpur (73.8±2.3) and Rajbari (68.5±3.8) respectively. Significant differences in dressing % was only observed between Rajbari and other locations ($F_{(6,210)}$= 12.30, $p<0.05$).The findings of the study would contribute to further biological studies and fixing banning period of Hilsa (*T. ilisha*).

Spatial Distribution of Particulate Organic Carbon and Its Relation with Current and Oceanic Nino Index in the Northern Bay of Bengal

ID: 170613 Candidate Name: Fatema Tuz Zahura Anti Supervisor: Dr. Muhammad Abdur Rouf

Particulate Organic Carbon (POC) is a type of oceanic carbon that is involved in a variety of biogeochemical process as well as has an impact on equally organic as well as inorganic carbon cycle. The goal of this research is to find out the spatial distribution of POC in three different regions (onshore, midshore, and offshore) and its association with current vector and major climatic event Oceanic Nino Index (ONI) in the northern part of BoB. Moderate Resolution Imaging Spectroradiometer (MODIS) Aqua satellite level-3 data of POC was used in this study. Current vector data were obtained from APDRC LAS8.6. POC has found highest (146.08±110.39mgm^{-3},) during post monsoon(November-February) in onshore region in the northern BoB characterized by very light northeasterly current with anticyclonic gyre , mild temperature, dry weather, and lower SST .The lowest amount of POC (53.50± 27.45mgm^{-3}) was found in the offshore region with the southwesterly current during pre-monsoon (March–May). POC was greatly influenced by the current vector which has the greatest contribution on the variation of POC. POC was found positively related with current vector and Oceanic Nino Index (ONI). There was no correlation found between current speed and POC but a significant positive relation (r=0.7) found between POC and ONI in the northern BoB.

A Comparative Analysis of the Proximate Composition of *Macrobrachium rosenbergii* Reared in Pond Using River, Pond and Hatchery Produced Post-larvae

ID: 170614 **Candidate Name: Muhsina Binta Morshed Supervisor: Md. Shahin Parvez**

The purpose of this study was to compare the proximate composition of *Machrobrachium rosenbergii* juveniles reared in the pond using PLs of different available sources found in Bangladesh. To do so, similar sizes of PL's were procured from three different sources viz. PL of river, hatchery and pond, and the PL's were stocked in different earthen pond. Moreover, another PL population of mixed source was collected. Following acclimatization and nursing, all the four sources of PLs were stocked separately in grow-out ponds assigning four different treatments (T1 river, T2 hatchery, T3 pond and T4 mixed) at 1000 PL/decimal density in triplicates for a 120-days culture providing a commercial feed. After harvest, protein, lipid, ash moisture content in the juveniles from the PL's were determined. The highest protein and lipid contents were found in the juveniles of river sourced PL (T1). The highest content of ash and carbohydrate was found in hatchery produced PL (T2) and highest moisture content was found in mixed PL (T4). There was a significant variation between males and females in case of protein, lipid, ash, moisture and carbohydrate. The proportion of protein and ash were higher in female prawns than in males. In contrast, the proportions of lipid, moisture and carbohydrate contents were higher in male prawns when compared with females. It can be concluded from the findings that, river sourced PL's would be the best option for grow-out stocking in terms of protein content in its muscle.

Effect of *Lactobacillus* sp. on the *Vibrio parahaemolyticus* Causing Disease Symptoms and Survival of *Macrobrachium rosenbergii*

ID: 170616 Candidate Name: Mst. Anika Khatun Supervisor: Dr. Khandaker Anisul Huq

This study aimed to evaluate the effect of probiotic *Lactobacillus* sp. on the *Vibrio parahaemolyticus* causing disease symptoms and survival of *Macrobrachium rosenbergii*. The experiment was conducted in 20L plastic tanks with 10 prawn juvenile and same level of feeding for 18 days, under different treatments, that is, negative control (NC- prawn and feed), positive control (PC- prawn, feed, pathogen), T1 (prawn, feed, probiotic) and T2 (prawn, feed, pathogen, probiotic). PC treated with pathogenic *V. parahaemolyticus* at a level of 4ml/20L water, whereas T1 treated with probiotic at the level 2ml/20L water. In T2 both pathogen and probiotic present at a level of 4ml/20L and 2ml/20L respectively. The results of this experiment represented that the survival of *M. rosenbergii* was found highest (80%) in T2 compared to T1 and others treatments, which was lowest (40%) in PC. The probability of survival for negative control (NC), T1 and T2 was more time extended compared to positive control (PC). Loss of appetite, slow growth, lethargy, melanisation, loss of appendages, black and yellow spot on body caused by *V. parahaemolyticus* found in PC. Hence, *V. parahaemolyticus* might have putative virulence activity to *M. rosenbergii*, and probiotic might have an impact on reducing their virulence activity and increasing the immunity of *M. rosenbergii.*

Isolation and Biochemical Confirmation of *Vibrio* spp. from Wild Mud Crab

ID: 170617 Candidate Name: Arifa Islam Supervisor: Md. Rashedul Islam

Mud crab (*Scylla olivacea*) is the most prospective coastal aquaculture species because of its availability and export value in numbers of international markets. However, mud crab health management has received less attention from researchers, and as a result, there is a distinct lack of description of their pathogens when compared to other commercially exploited crustacean and finfish. The present study was carried out to investigate the bacterial flora namely *Vibrio* spp. of wild mud crab *Scylla olivacea* which were collected from a depot of Bagerhat District and the main source was the Sundarban. The densities of total *Vibrio* spp. like colonies were counted. Both green and yellow colonies were isolated from culture media- *Vibrio parahaemolyticus*, *Vibrio mimicus* and *Vibrio vulnificus* presented green color colonies and *Vibrio alginolyticus* and *Vibrio cholerae* presented yellow colonies. The abundance of green colonies were maximum $5.1x10^6$ (cfu/gm) than yellow colonies $4.6x10^6$(cfu/gm). Among the green colonies, highest colony count was found for *Vibrio parahaemolyticus* ($5.1x10^6$ cfu/gm) following *Vibrio mimicus* ($2.85x10^6$ cfu/gm) and *Vibrio vulnificus* ($2.45x10^6$ cfu/gm). Among the yellow colonies, colony count of *Vibrio alginolyticus* was maximum about $4.6x10^6$ cfu/gm than *Vibrio cholerae* $4.2x10^6$ cfu/gm. Several biochemical tests were performed to identify colonies at species level. According to the findings of this study, the bacterial loads on wild crabs were significant enough to cause disease outbreak while introduced in captive culture condition and trigger chance of infection Therefore, intensive study on health management of mud crab is crucial for the sustainability of the valuable sector.

Composition, Abundance and Diversity of Zooplankton in the Rupsha River and Poshur River

ID: 170618 Candidate Name: Nabila Nawshin Supervisor: Dr. Muhammad Abdur Rouf

Zooplankton-based studies have become a significant area of research among plankton biologists as a responsible entity for climatic change. The goal of this study was to identify measure abundance and create diversity index of found zooplanktons in Poshur and Rupsha River. A total of 7 orders of zooplankton were recorded in this experiment. The orders are Copepod, Cladocera, Ctenophora, Rotifer, Ichthyoplankton, Crustacean zooplankton, and Protozoans. Crustacean zooplankton is the most dominant group in both sampling sites, whereas the Protozoan zooplankton are the least abundant. The average zooplankton of filtered of was water filter is 708 individuals per liter and 808 individuals per liter in sampling Rupsha and Poshur river respectevly. Shanon-Weiner diversity index of Zooplankton in Rupsha and Poshur river were 1.7614 1.686. Our study showed diversity in zooplankton abundance in two different coastal rivers. Although they are spatially different, the diversity index demonstrates a similar pattern in the abundance of Zooplankton in two rivers.

Intra-specific Morphometric Variability of Gold Spot Mullet, (*Liza parsia)* Across the Coastal Regions of Bangladesh

ID: 170619 Candidate Name: Sanjana Fariha Supervisor: Dr. Muhammad Yousuf Ali

The present study focused on the determination of morphometric variation of Parse, gold spot mullet (*Liza parsia*) collected from Barishal, Patuakhali, Khulna, Satkhira and Chattogram districts of Bangladesh. A total of 150 species from five different locations were collected during years 2020 and 2021 to explore the population structure and to estimate shape variation. Eight morphometric characters were examined and the univariate analysis (ANOVA) showed that there were significant differences ($p<0.05$) of all morphometric measurements among the five stocks of *Liza parsia*. The length-weight relationship was also observed and the value of 'b' ranged from 1.9 to 3.1 which indicated negative and positive allometric growth respectively. Highest b value was found in Satkhira ($b>3$) and the lowest was found in Barishal ($b<3$). Multivariate analysis showed that there was variation in morphological characteristics among five different stocks of *L. parsia*. However, no stock was completely isolated from the other stocks except Barishal. The discriminant function analysis (DFA) showed that the samples were allocated into their right locations with 87% accuracy. This high range of variation among five locations was observed due to different geographic location, genetic and environmental variation. The findings of this study are very important for *Liza parsia* for its proper management and conservation and also for the researcher by providing necessary information.

Ecological and Social Impact of Fish Fry Collection in Rupsha River

ID: 170621 Candidate Name: Tanzera Khatun Supervisor: Dr. Mst. Muslima Khatun

Rupshariver is located in the central part of Khulna district. Most of the people living along the river are associated with fish fry collection. Excessive collection of fish fry from wild sources has a devastating effect on environment and also on aquatic resources. The Rupshariver faces a gradual decrease of fish fry because of over exploitation. The stress of aquaculture over environment starts with the collection of fish seed, because the natural water body is till now the main source of aquaculture stocking materials. Most significantly parshe, vetki and pabda species are destroyed as bycatch species. Only 10% species they collect and the rest 90% is bycatch. January, February and March are the peak season for fry collection. To get the socioeconomic patterns of fry collection about 20 collectors were interviewed from four harvesting sites. Most of the fry collectors are school going children and women. In September 2000, Bangladesh government imposed a ban on wild fry collection. Thousands of people involved in fry collection are ignoring the ban. There is an apprehension that strict implementation of the banning ordinance may displace the people who depend upon the income from catching the larvae. This paper analyzes the larvae collection, market demand, livelihood strategy of fry collectors, impact on biodiversity, user options for fisheries management and role of various stakeholders empirically. Results show that economic status, banning ordinance, credit systems and lack of coordination of service-providing agencies all have important influence on fry collection in the riverine area.

Study of Some Biological Aspects of the Freshwater Mud Eel (*Monopterus cuchia*)

ID: 170622 Candidate Name: Jerin Tasnim Supervisor: Dr. Muhammad Yousuf Ali

The present study was carried out to investigate the length-weight relationship, condition factor, proximate composition and few morphometrics of *Monopterus cuchia*. A total of 13 samples (weight 103±29 g and length 38.7± 3.6 cm) were subjected to analysis. All the precise measurements were taken using ImageJ software. The protein, lipid, ash and moisture contents was determined using AOAC (1980) method respectively. The length-weight relationship was estimated as log(weight g)=2.148 log(length cm)-1.410. A negative allometric growth was observed, as the slope b was <3. The Fulton's condition factor (CF) was estimated as 0.2±0.04, ranging from 0.1 to 0.3; while the relative condition factor (Kn) was estimated as 1±0.2, ranging from 0.7 to 1.7. The head length was observed as 7.9 ± 0.8% of the total body length. The PreOrL (pre-orbital length), the Dis.2-3 (distance between the two eyes), the Dis.1-2 (distance from the snout to the 1st eye) and the Dis.1-3 (distance from the snout to the 2nd eye) were determined as 27.3+6.4%, 28.1±5.2%, 28.2±6.6% and 27.6±5.1% of the head length. The analysis of proximate composition revealed that the protein and lipid contents were found to be 16.3±0.3% and 1.70±0.1% respectively; whereas the moisture and ash contents were 78.3±0.2% and 3.2±0.2% respectively. The findings of the study would definitely contribute to further biological studies of the Mud eel *Monopterus cuchia*.

Growth Performances of River, Pond and Hatchery Produced Post-larvae of *Macrobrachium rosenbergii* Reared Under a Low Input Pond Management Technology

ID: 170623 Candidate Name: Md. Nahidul Islam Supervisor: Md. Shahin Parvez

Seed quality is an important factor for any aquaculture production system. Therefore, the present study was conducted to evaluate the growth performance of available sources of *Macrobrachium rosenbergii* post-larvae (PL). To do so, similar sizes of PL's were procured from three different sources viz. PL of river, hatchery and pond, and the PL's were stocked in different earthen pond. Moreover, another PL population of mixed source was collected. Following acclimatization and nursing, all the four sources of PLs were stocked separately in grow-out ponds assigning four different treatments (T1 river, T2 hatchery, T3 pond and T4 mixed) at 1000 PL/decimal density in triplicates for a 120-days culture providing a commercial feed. All water quality parameters during the study were recommended ranges and there was no significant difference among the culture ponds of different sources of PL. At harvest, weight gain, absolute growth rate (Grabs), specific growth rate (SGR), feed conversion ratio (FCR), yield and survival rate were found to be significantly highest in the juveniles of river sourced PL (T1) which was followed by the juveniles of pond sourced PL (T3), though those attributes were not significantly differed among hatchery, pond sourced and mixed sourced PL's. Therefore, river sourced PL is highly suggested to stock in grow out culture system. If the river sourced PL is not available, pond reared PL would be better option compare to hatchery or mixed PL.

Infection by *Macrobrachium rosenbergii* Nodavirus (*Mr*NV) Associated with Extra Small Virus (XSV), Agent of White Tail Disease (WTD) in *Macrobrachium rosenbergii*: A Review

ID: 170624 Candidate Name: Sumaia Sidratin Muntaha Supervisor: Dr. Ghausiatur Reza Banu

Macrobrachium rosenbergii is the most important cultured freshwater prawn in the world and it is now farmed on a large scale in many countries. Generally, freshwater prawn is considered to be tolerant to diseases but a disease of viral origin is responsible for severe mortalities in larval, post-larval and juvenile stages of prawn. This viral infection namely white tail disease (WTD) has been first reported in the island of Guadeloupe in 1995. Two viruses, *Macrobrachium rosenbergii* nodavirus (*Mr*NV) and extra small virus-like particle (XSV) have been identified as causative agents of WTD.Clinical signs observed in the infected animals include lethargy, opaqueness of the abdominal muscle, degeneration of the telson and uropods, and up to 100% within 4 days. This review focuses on the pros and cons of WTD causative agents and the available diagnostic methods to detect WTD including RT-PCR, dot-blot hybridization, in situ hybridization and ELISA. Key aspects of *Macrobrachium rosenbergii* nodavirus infectivity, including (i) the viral binding targets, (ii) utilization of proteins in promoting infectivity and intracellular migration, (iii) replication mechanisms and (iv) co-infection with the extra small virus have also been included in this review. This review focuses identification of the most useful strategies for an outbreak such as vaccination and immunostimulants including the description of other available preventative measures. Finally, recommendations have been enlisted in this review to evaluate critical gaps in research including development of immortalized prawn cell models, elucidation of time-resolved protein changes post-infection and development of therapies to treat infections to mitigate economic losses during outbreaks.

Impact of Salinity Stress on Selected Physiological Traits of *Labeo rohita* (Hamilton, 1822)

ID: 170627 Candidate Name: Ahisha Siddika Supervisor: Dr. Md. Lifat Rahi

The Indian major carp, Rohu (*Labeo rohita*) is the most popular freshwater aquaculture species that is intensively farmed in Bangladesh. The aquaculture of this species is mainly restricted to coastal ponds and Ghers, and also in areas that may experience salinity intrusion. As a freshwater species, salinity level can influence growth, survival and many different biological aspects of Rohu. The present study was conducted to investigate the effects of four different salinity levels (0‰, 1‰, 2‰ and 3‰) on some selected biological traits of Rohu (*Labeo rohita*) for a period of 60 days. Experimental salinity levels were found to affect experimental Rohu individuals differently. The highest levels of growth and survival performance ($P < 0.05$) were observed in the control group (0‰). Salinity stress/treatments caused growth retardation and higher mortality rate. With the increasing salinity levels, the oxygen consumption rates were also increased. However, in each salinity treatment (1‰, 2‰ and 3‰), the oxygen consumption rate increased significantly ($P < 0.05$) as the trial progressed with salinity stress. The number of total blood cell showed rapid increase with salinity change, and was found to be the highest at 3‰ salinity on 60th day. Other treatment groups also showed increased number of blood cells. Initially (at 2nd to 3rd days) with salinity increased the total blood cell number decreased but as experiment progressed it increased with salinity levels. This result indicates that the potential farming of *Labeo rohita* is in low salinity or 0‰ salinity level and high salinity would probably represent a stress factor for the *Labeo rohita*.

Women Involvement in Mud Crab Fattening and Culture Activities in Southwest Coastal Region

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The present study was carried out to observe women contribution in mud crab fattening and culture activities in southwest coastal region. A total of 52 respondents were surveyed through face to face interview involving semi-structured questionnaire. The study found that most of the women's (69.44%) family consisted of 4-6 members and it was noticed that the majority (97%) of respondent households own pond where they cultured crab. The majority (86.11%) of the respondents had less than 50 decimal pond area for culturing crab. About 30% women earned money from total family member. From this study, it was found that most of the women had 11-15 years of experience of being involved in crab culture related activities. The majority (88.89%) of the women supplied feed in crab pond (2 times) and they were highly involved in supplying feed. The majority (50%) of them collected feed from local market while 11.11% from Gher and the remaining 30.55% collected feed from both market and Gher. The present study revealed that the participation of women in crab sector is considerable in terms of their various supporting roles related to crab feeding and culture activities though their participation is less than that of male participants.

An *in silico* Structural, Functional and Phylogenetic Analysis with Three-dimensional Protein Modeling of lipase enzyme of *Cyprinus carpio*

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Lipase is an essential enzyme used in lipid metabolism by catalyze the hydrolysis of triacylglycerol (TAGs) to glycerol and fatty acids (FAs). This enzyme is widely distributed in natural world such as in plant, animals, fungi and bacteria .Lipase have a lot of industrial applications including starch and its derivative industries like, detergent, textile, bakery, food and drug industry. To understand primary, secondary and tertiary structure of lipase, composition of amino acids, basic physiological characteristics; viz., pI, molecular weight, instability index, GRAVY, phylogenetic tree were determined by *in silico* approach. We retrieved amino acid sequence of *Cyprinus carpio* lipase from NCBI and used Clustal-Omega for multiple sequence alignment and building phylogenetic tree. The 3D structure of this protein was generated using Swiss-Pdbviewer 4.1.0 tool by homology modeling and the 3D model reveals total 10 helix region, and 21 strands and 29 loops were present in lipase enzyme of *Cyprinus carpio*. P-nitrophenyl butyrate was used as a model substrate to evaluate the lipase activity and achieved docking score was -5.8 Kcal/mol. This negative docking score represented the binding affinity of lipase with p-nitrophenyl butyrate was strong and existing. Tyr136, Ile236 and His283 are the active sites bind through hydrophobic bond. By measuring docking score of lipase enzyme with various substrates we can choose the best fit feed or drug substrates for *Cyprinus carpio*.

Total Bacterial Load and *Vibrio* spp. Load of Mud Crab Collected from Fattening Farms in Debhata Upazila

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The study was conducted to determine total bacterial load and *Vibrio* spp. load in Mud crabs collected from the fattening farm of Debhata Upazilla, in Satkhira District for a period of four months (September to December) during the new moon. The Mud crab samples were collected from three different crab fattening farms of Satkhira District. The mixed samples gill, hepatopancreas, muscle and skin were used for analysis. The total bacterial count (TBC) of the Mud crabs ranged from $3.0\times10^4 \pm 0.71$ cfu/g to $1.3\times10^7 \pm 0.0048$ cfu/g and the total *Vibrio* spp. count (TVC) ranged from $2.0\times10^2 \pm 0.24$ cfu/g to $2.7\times10^3 \pm 0.18$ cfu/g. which contained under diseases producing rate. The highest load of total bacterial and the lowest load of *Vibrio spp*. were found in December and September. There were no significant difference ($P>0.05$) of total bacterial load among this three farms and the months. The highest VBC was found in the Mud crabs from the farm-3, and the lowest in the Mud crabs from the farm-2. However, the load of *Vibrio*spp. counted in this study was less than the *Vibrio* load pathogenic to Mud crab.

Present Status and Future Potential of Formulated Feed in Mud Crab Sub-sector

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The study was focused to investigate the current feeding management of mud crabs, as well as, the prospect of artificial feed for mud crabs in Bangladesh. The study was carried out through the collection of scientific papers, extensive discussion with personnel involved, interviews with farmers and field observations in the five villages of Shyamnagar and Kaligonj upzillas under Satkhira district. Most crab farmers provided fresh feed which consisted primarily of Tilapia and occasionally of carp fish, marine trash fish, shell fish and eel fish (locally called Kuchia). They spent an average of 45 to 50 Tk/ Kg on small sized Tilapia or other trash fish from the local market. They mentioned that there was sometimes a scarcity of crab feed, such as Tilapia or other wild species that creates deterioration of water quality and unsatisfactory crab production. The scarcity of Tilapia and other wild species is a source of stress for biodiversity. Most crab farmers in Shyamnagar and Kaligonj upzillas had no experience with formulated feed, but they showed a keen interest in it and wanted to use it if it is more cost effective than what they are currently using. The availability of a large number of aqua feed companies in the country, as well as, their established marketing network and farmer base, the development and marketing of formulated feed for mud crab should be feasible if additional research and development is conducted. As different feed ingredients and labor are plentiful in Bangladesh at low cost, there is a huge opportunity to produce more and more cost effective nutrient rich formulated feed for the mud crab sub sector in Bangladesh.

Effects of Stocking Densities on the Growth Performances and Proximate Composition of *Macrobrachium rosenbergii* Juvenile Cultured in indoor Biofloc system

ID: 170638 Candidate Name: Supriya Roy Tithi Supervisor: Md. Shahin Parvez

The giant freshwater prawn, *Macrobrachium rosenbergii* culture plays an important role in the economy of Bangladesh. Stocking density is one of the crucial factors in any culture system as well as in biofloc. Therefore, this study was carried to determine the effects of stocking densities on growth performance and proximate composition of *M. rosenbergii*. Prawn juveniles of similar sizes were stocked in six biofloc tanks under three different stocking densities viz., 12/m^2, 18/m^2 and 24/m^2 assigning three treatments as T1, T2 and T3 respectively, and they were cultured for 6 weeks fed with a commercial feed at 3-4% of their body weight. During the experiment, the water quality parameters in all rearing tanks were well within the accepted ranges and showed no significant differences among the treatments. After harvesting, the highest weight gain (5.72±0.32g) was found in the stocking density at 12/m^2 which was followed by the stocking density at 18/m^2. The highest yield (1425±49 kg/ha) and survival rate (80.56±3.93) was found at 18/m^2. At 5% confidence level ($p<0.05$), stocking density 12/m^2 and stocking density 18/m^2 showed similar performance in all the growth indicators determined in this study. Moreover, there were no significant effects on proximate composition due to the variation of stocking densities. Therefore, stocking density of 18/m^2 of juveniles is suggested to stock in biofloc based culture tank for higher growth and production of *Macrobrachium rosenbergii*. Further study is needed to observe the effects of stocking density on growth related attributes based on long culture period upto the marketable size of adult *Macrobrachium rosenbergii*.

Exploration of Fishery Characteristics in Rupsha River of Khulna District, Bangladesh

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Rupsha River is a suitable area for breeding, feeding and nursery grounds of many fish species. The present study was to identify the fishing gears and crafts, availability of fish species and economic status of the fishers at Rupsha, Batiaghata and Dacope sub-district under Khulna district for a period of 12 months from January 2020 to December 2020. Questionnaire Interview (QI), Focus Group Discussion (FGD) and cross checking information were performed to collect information. The investigation showed that fishermen followed 4 fishing techniques i.e. netting, angling, trapping and spearing. 14 types of the fishing gear were recorded and these were 7 gills (khepla jal, behundi jal, bata jal, khara jal, illish jal, puti jal, current jal), 3 traps (bitte, vair, kholsun), 2 hooks and lines (sip, wheel barshi), and 2 wounding gears (konch, teta) were recorded. Five types of fishing crafts were recorded like kosha, dinghi, chadni nauka, veshal dingi boat and trawler. Total 50 species of fish and shellfish were listed from the study area. Among them, 14 species were dominating, 20 species moderately available,16 species rarely available. The daily income of a fisherman was 150-200. To meet their demand and to improve their socio-economic situation, they had to borrow money from local rich man, NGO etc. The present study recommends to enhance the support from GO & NGO for the vulnerable fishers. Awareness creating training program should be conducted to the fishermen for sustainable exploitation of fishery resources to save fish biodiversity of Rupsha River.

Variability of Chlorophyll-*a* in Association with El Niño/La Niña-Southern Oscillation and Current Vector in the Northern Bay of Bengal

ID: 170641 **Candidate Name: Tamanna Fardoshi Anni Supervisor: Dr. Muhammad Abdur Rouf**

Variability of Chlorophyll–*a* and its correlation with different parameters have been used to estimate biomass or primary productivity in the oceans and understand marine ecosystem responses. This study explores seasonal and spatial variability of chl-*a* and its correlation with current vector and ENSO event across the three separate regions in the northern Bay of Bengal (BoB) by using satellite data. MODIS Aqua satellite dataset were used for chl-*a* measurement. Current vector dataset was retrieved from LAS V8.6.13. A three-month rolling mean of SST anomalies dataset supplied by NOAA Climate prediction center was used for investigating ENSO effect. The onshore region showed the highest abundance of chl-*a* (1.121 mgm^{-3}) whereas the lowest (0.136 mgm^{-3}) was observed in the offshore region. The offshore and midshore regions showed homogenous distribution. Observed chl-*a* was maximum in the onshore region with the following seasonal trends: monsoon > post-monsoon > pre-monsoon. Chl-*a* fluctuated most in post-monsoon over the shore region. Chl-*a* distribution was found higher during anticyclonic gyre formation over the northern area of BoB. A non-significant relationship ($P > 0.05$; $r = 0.03$) was found between Chl-*a* and current speed for the northern BoB. Relationship was found statistically significant ($p = 0.019$) between chl-*a* and current speed only at pre-monsoon with a weak positive correlation ($r = 0.28$). The effect of ENSO against the views of chl-*a* pattern was observed as non-significant in the northern BoB. Effect of ENSO on the Chl-*a* across the northern region of BoB requires more investigation.

Acute Hepatopancreatic Necrosis Disease (AHPND) As New Emerging Threat in Shrimp Industry Across The World : A Review

ID: 170642 Candidate Name: Rifayat Ara Anjum Supervisor: Dr. Ghausiatur Reza Banu

Acute Hepatopancreatic Necrosis Disease is an emerging problem for penaeid shrimp farming industries in South East Asia countries. Outbreaks began in cultivated shrimp *Penaeus (Penaeus) monodon*, and *Penaeus Litopenaeus vannamei* and spread progressively worldwide, although the disease's cause was unidentified. In this review aimed to know present scenario of the disease AHPND and the necessary steps to avoid AHPND spreadings. In 2009 a case definition for AHPND (as acute hepatopancreatic necrosis diseases) was first reported in Chaina and also reported in Bangladesh in 2017. The presence of atrophy and clinical symptoms include pale empty gut region, reduced growth, movable shell, and black discoloration. The pacific white shrimp, *Litopenaeus vannamei*, with the major shrimp cultivable species globally, is currently in danger by a severe disease- AHPND, which causes serious losses worldwide. It has been confirmed that the causative agent of AHPND is a bacterium that is a pathogen *Vibrio parahaemolyticus*. This bacterium currently reported has acquired plasmids that encode lethal binary toxins PirA or PirB causing rapid death of infected shrimp. Additionally, this plasmid acquired some virulence factor which is directly related to pathogenicity. Further molecular detection of AHPND bacteria using PCR has been developed, which has sped up diagnosis. This review of research progress on AHPND will serve as a useful introduction who are currently unfamiliar with AHPND, also have in etiology, epidemiology, pathogenicity, clinical signs, and also prevention and control measures will promote the production of hatchery and pond maintenance and contribute to the long-term explication of the disease's various aspects.

Intra-specific Diversity of the Silver grunt (*Pomadasys hasta*) From Three Locations of Bangladesh Based on Morphometric Analysis

ID: 170643 Candidate Name: Md. Raihan Kaiser Raju Supervisor: Dr. Muhammad Yousuf Ali

Morphometric variation is a useful tool for studying a species' population structure. The concept of stock separates the population into groups with different growth rates and reproductive dynamics, irrespective of genetic similarities. The present study was carried out to investigate the intra-specific diversity of Datina fish (Silver grunt, *Pomadasys hasta*) from three stocks, Khulna, Satkhira and Patuakhali of Bangladesh. Length-weight relationship, condition factor and few morphometries were analyzed using both univariate and multivariate approaches. A total of 105 samples were subjected to the analysis (weight (95.05 ±44.22 g) and length (16.18±2.57cm)). A total of eleven morphometric traits including standard length (SL), head length (HL), pre dorsal length (PreDL), dorsal length (DL), pre-anal length (Pre AL), pre-pelvic length (PreVL) , pre pectoral length(PrePL), pre-orbital length (PrOL), highest body depth (HBD), eye diameter (ED) and pre orbital length (PreOL) were measured. Significant differences were found in four morphometric measurements including head length ($F_{(2, 102)}$ =12.46, $p<0.05$), eye diameter ($F_{(2, 102)}$ =20.59, $p<0.05$), dorsal length ($F_{(2, 102)}$ =5.73, $p<0.05$) and pre dorsal length ($F_{(2, 102)}$ =5.34, $p<0.05$). The length-weight relationship was estimated as log(weight g) =

0.128+1.92 log(length cm). A negative allometric growth was observed, as the slope b was far below 3. The highest value of b was found in Satkhira (2.7) and the lowest value of b was found in Khulna (2.07). Multivariate analysis showed that there was variation in morphological characteristics among three different stocks of *P. hasta.* However, no stock was completely isolated from the other stocks. The discriminant function analysis (DFA) showed that the samples were allocated into their right locations with 70% accuracy. The outcomes the study be helpful for management and conservation of natural population of Datina fish (*P. hasta*) across Bangladesh.

Temperature induced Changes in Physiological Traits of Rohu (*labeo rohita)*

ID: 170644 **Candidate Name: Monirul Islam Mridul supervisor: Dr. Md. Lifat Rahi**

Temperature is one of the most important abiotic factors affecting the growth and survival rate of any aquatic species. Temperature change can also have significant effects on various physiological and biochemical aspects of fish that can adversely affect life cycle and aquaculture production commercially important species. The freshwater major carp, Rohu (*Labeo rohita*) is one of the most important aquaculture species in Bangladesh and across the entire Indian Sub-continent, has a suitable temperature range of 28°C to 32°C. The current study tested the effects of four different temperature levels (28°C, 30°C, 32°C, and 34°C) on the selected biological changes of Rohu (*Labeo rohita*). Experimental temperature levels significantly affected growth and survival performance ($p < 0.05$). The highest levels of growth and survival performance were observed at 30°C while the oxygen consumption rate, and total blood cell counts were found to be the highest at 34°C. Although the highest levels of O_2 consumption rate and blood cell counts were obtained at 34°C, the lowest level of growth and survival performance were obtained at this temperature. While 28°C was the control temperature, significantly lower growth ($P < 0.05$) was observed at this temperature compared to the 30°C treatment. Results of this study indicate that Rohu can tolerate up to 32°C temperature without any adverse effect on them but can provide maximum production performance at 30°C.

Ammonium Chloride Induced Changes in Physiological Traits of Rohu (*Labeo rohita*)

ID: 170646 Candidate Name: Shariar Kabir Zeehad Supervisor: Dr. Md. Lifat Rahi

Ammonia (NH_3) is an important component of aquatic environment that can impose severe stress on farmed aquatic species with catastrophic consequences. NH_3 imposes adverse effects on organismal growth, cellular structure and biochemical parameters of fish. The present study was conducted to investigate the effects of three different doses of NH_3 (T1=1 mg/L, T2=2 mg/L and T3=3 mg/L) on the growth and survival rates, oxygen consumption rate and number of total blood cells of Indian major carp, Rohu (*Labeo rohita*). Different doses of ammonia significantly reduced growth and survival performance ($P < 0.05$) of experimental rohu individuals. The highest levels of growth and survival performance were obtained for the control (no ammonia) group. Ammonia treatments significantly increased the rates of O_2 consumption and total blood cell counts ($P < 0.05$) compared to the control. Significant differences were also observed for the selected parameters (growth, survivability, O_2 consumption and number of blood cells) between the three ammonia treatments indicating ammonia dose specific differential stress on experimental rohu individuals. Results also indicate that ammonia can create severe stress on rohu at farming condition even at lower doses.