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Genetics

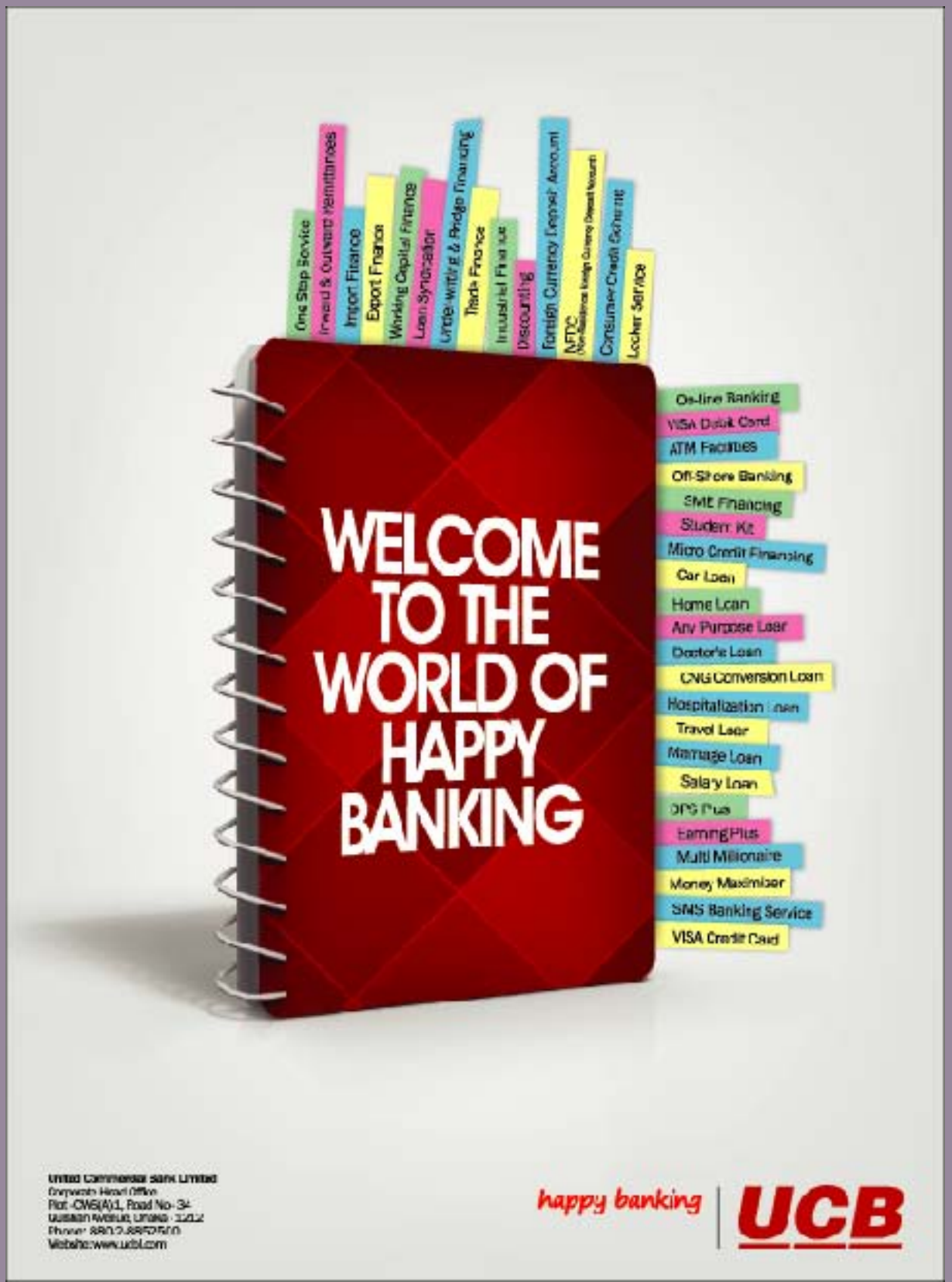
Biodiversity

Livelihood

Habitat

Post harvest

BFRF Bangladesh Fisheries Research Forum



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Editor's Column

Bangladesh Fisheries Research Forum (BFRF) is a national, non-political and non- profit professional body with the memberships from the universities, DOF, BFRI, BFDC, NGOs, private sectors other departments involved and committed to fisheries and aquatic resources development. It is an umbrella organization with missionary zeal to serve the fisheries sector through enhancing collaboration among various stakeholders. BFRF envisions promoting action, innovative and adaptive research in the fisheries sector relevant to development needs, reduction of poverty and improvement of livelihood of the people. At present, BFRF has more than 500 individual members (life and associate) from about 50 organizations - the DoF, BFRI, NGOs, private entrepreneurs and CBOs who are involved in development and research of the fish sector of Bangladesh. Since its initiation, BFRF has successfully completed and is presently carrying out a number of donor funded fisheries projects.

The Forum continues to be a very stable organization in terms of membership, service and products that the Forum offers (webpage, project reports, books, booklets, conference, training, meeting, and national, regional and global communication). However, while BFRF is on a solid footing, that does not mean it should rest on its laurels. There continues to be exciting new challenges in terms of the research needs to support the rapid development of the national and regional fisheries sector in ensuring that it grows in a sustainable and responsible manner. Hence the BFRF has important role to play in providing forums and vehicles for the discussions and communication of cutting edge research and technology.

The BFRF executive committee has been active in ensuring that the forum continues to grow and to be a nationally and regionally responsive organization. The BFRF is always committed to continue its effort in the years to come to promote and expand BFRF membership throughout the country and to offer opportunities to hold divisional and district-level conference, discussion and meeting in emerging problems and prospects of the sector. We welcome comments and feedbacks for any initiative or idea that you might have that will collectively allow us to continue to grow the Forum.

This is the first issue of the BFRF publication - Fisheries and Aquaculture News - FAN Bangladesh. In this first ever issue we focused on a number of issues within ever-changing development, research and publishing climate. We tried to include articles on culture to conservation, genetics to socioeconomics and harvest to export with a number of regular columns like - books, journals, webpages, information, conference/seminars and post cards. For the ease of many and wider global circulation, the e-version of the magazine will be available in the webpage - www.bfrf.org.

We welcome your suggestions for any content you would like us to include in the future issues of FAN-Bangladesh, as well as article submissions on topics of current interest in the national and global fisheries and aquaculture sector. We encourage all our readers to write to us with their innovative and novel views on what you think the future direction of FAN-Bangladesh should be. Thank you for your wholehearted support.

Mostafa A R Hossain

Genetics of Fish Seed Quality

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Culture of fish primarily requires the availability of good quality seed. The seed quality relates to both genetic and non-genetic aspects. The genetic aspects, of course, are the innate biological properties - the variable genes that provide the bases for various quantitative traits like growth, fecundity, disease resistance, FCR etc. The different management operations like food and nutrition, water quality and various other physical and chemical properties of the environment encompass the non-genetic aspects of quality. The non-genetic factors are important. It is, however, the genetic quality that is most desired and at the same time is most prone to be damaged in the process of hatchery management and seed production. Brood nutrition, pond fertilization, water quality etc. affect brood and seed quality, however, the process that hinders the genetic quality of the broods, if occurs, cannot be overcome, even if nutrition and pond management qualities are enhanced.

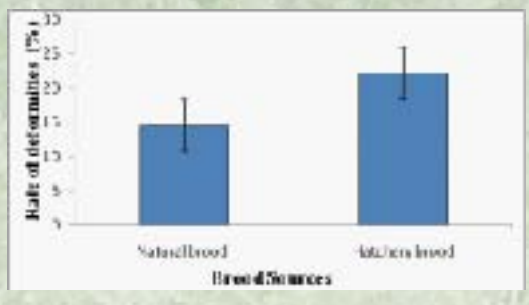
The primary source of genetic variation in the genetic materials is though mutation, the process by which the variations prevail in the population is recombination. Of the total phenotypic variance that is observed, the portion that is genetically determined is termed as heritability (h^2). In genetic quality question, it is the h^2 which is most desired for. Loss or reduction of h^2 of a certain aquacultural trait actually brings about havoc in culture performance. Culture performance is enhanced by exploitation of h^2 through genetic selection or else if there is no or little heritability present for a trait, the only option that is left for performance improvement is hybridization that exploits the dominant variations between homologous loci in specific pair mating.

Inbreeding, genetic drift, and negative selection are the factors that reduce or lose h^2, and negate the fitness and adaptive quality of fish seed produced under inappropriate conditions. Inbreeding is mating between related broods. Since the related mates share alleles through common ancestor(s), the shared alleles can form pairs in the progenies and increases the homozygosity; every natural population harbors deleterious recessive alleles. These alleles often do not quote for good proteins or even quote for harmful proteins in their carriers and this is the point that gives the worst connotation to inbreeding. The hatcheries can not maintain larger number of brood because of lack of pond facilities. The likelihood of relatedness increases if the brood number is small and thus inbreeding becomes inevitable. The homozygosity of the detrimental recessive alleles produces a general trend of lowered viability, survival, growth, and fecundity with simultaneous increase in the percentage of abnormalities. This is called inbreeding depression.

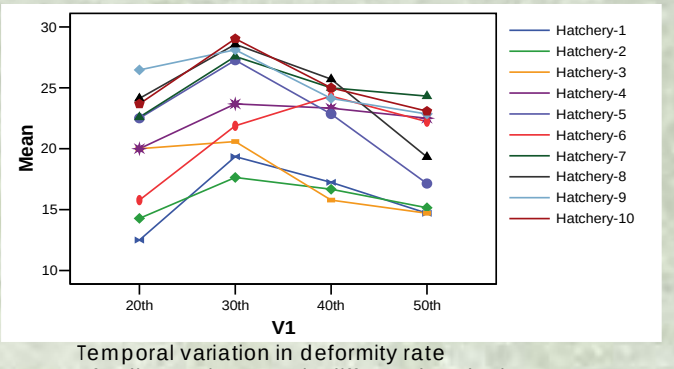
The only way to protect hatchery populations from being inbred is to maintain larger and yet unrelated breeding population. For this it is necessary to know the pedigree history of the population. When a population is finite; to avoid inbreeding to take place, the population should be described with respect to the Effective Breeding Number (N_e) that is the actual number of breeding individuals, their sex ratio, their family variance, and the mating system employed.

The effective breeding number gives an indication for the genetic stability of the population because N_e is inversely related to both inbreeding and genetic drift. With decrease of N_e, inbreeding and genetic drift increase with the consequent increase in variance of gene frequencies in the population.

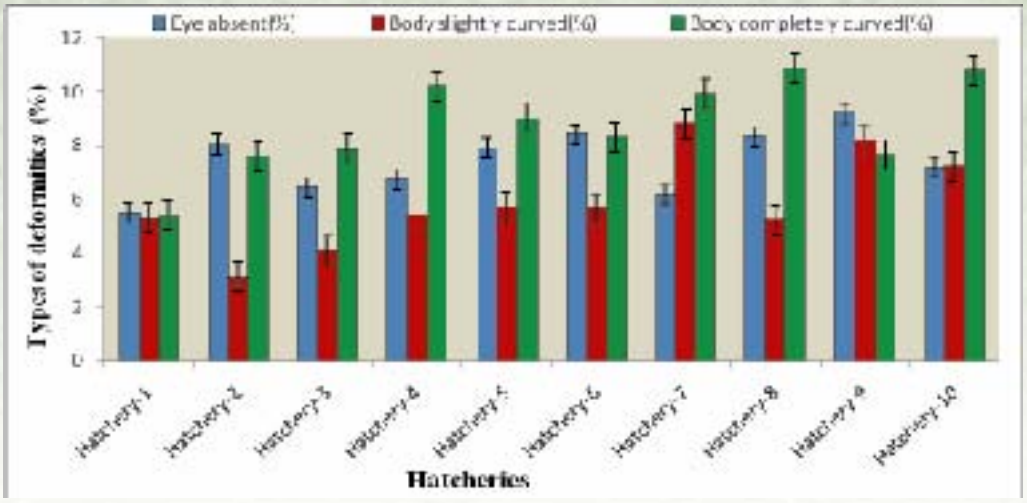
Hatchery produced seeds of the Indian major carps- rohu, mrigal and catla have slower rates of growth than the riverine seed. The difference in the growth is due to lowered genetic variability because of inbreeding in the hatchery seed. The rates of fertilization, hatching and deformity of the developing zygotes were also different for the two sources. Eggs from the hatchery broods have significantly lower rates of fertilization and hatching, while the rate of deformity was significantly higher in the developing embryos.



Deformity rates of Indian major carps between natural and hatchery broods in hatcheries of Bangladesh



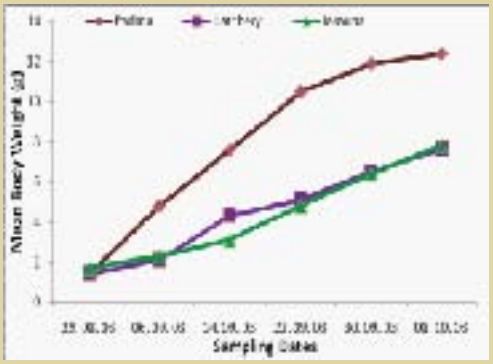
Temporal variation in deformity rate of Indian major carps in different hatcheries of Bangladesh



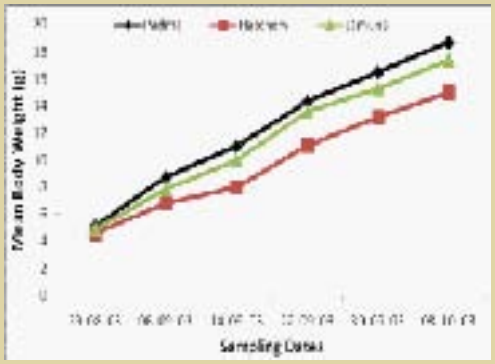
Deformity types of Indian major carps observed in different hatcheries of Bangladesh

Genetic drift is random changes in gene frequency due to some natural or man-made causes. Natural causes that might lead to the changes in gene frequency are the sudden change in the structure of population. For example due to earthquake or flooding a population may be separated where by a portion of the population is isolated from rest of the population with unequal sharing of the contents of the gene pool. Man made changes may be ascertained to the inaccurate sampling of the population during the formation of hatchery population. This mainly happens if the sample taken is small. The smaller is the sample, the greater the likelihood that inaccuracies in sampling will occur. Genetic drift is inversely related to effective breeding number. In Bangladesh the hatcheries generally maintain small number of broods, do not maintain any pedigree record of the brood, thus relatedness always becomes a factor for reduction of genetic variability. Also, because of limitations in the captive facilities; the broods maintained in small numbers potentially leads to genetic drift situation; whereby many potential genes that determine important fitness traits are automatically left out form the population causing incidences of inbreeding.

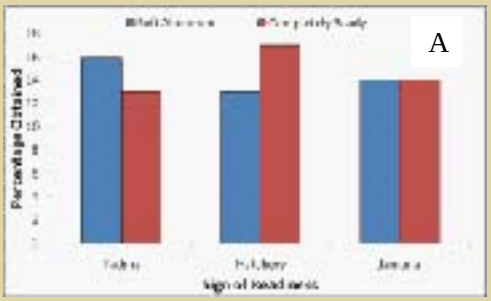
Negative selection occurs in the hatchery by the hatchery workers inadvertently. It happens every time when the hatchery workers handle their fish for breeding. Sometimes for some reasons they select the broods preferentially and thus selection takes place in favor of some traits, which are actually may not desirable ones; but this happens without their conscious.

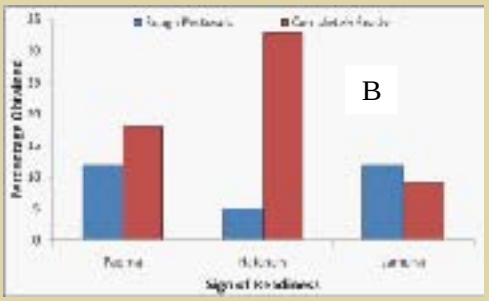


Growth rate of 3 different stocks of Rohu



Growth rate of 3 different stocks of Mrigal





Comparative breeding readiness of mrigal: A) male B) female in 3 different stocks

Fish Genetics

Reseacrhers in Karnataka, India demonstrated that the hatcheries inadvertently breed slow growing and late maturing individuals. Similar situations occur in the hatchery populations of rohu, mrigal and catla in Bangladesh. A growth test comparison between hatchery and natural seed of the three species showed that the hatchery seed had significantly slower rates of growth.

Comparison on breeding readiness revealed hatchery seed of the three species having significantly higher rates of readiness.

This is an evidence of negative selection in favor of early maturation in smaller size broods. For the reasons of easy of handling and for saving the cost of hormones the hatchery owners select the smaller fishes at first maturity.

It is seen from the above that there shall be no selection of any sort during the process of breeding and appears that avoidance of selection often can be the best breeding method to apply in the hatcheries to protect the populations from being lowered in performance. This breeding program is called no selection method.

Rapid Detection of White Spot Syndrome Virus (WSSV) Infection by PCR Technique

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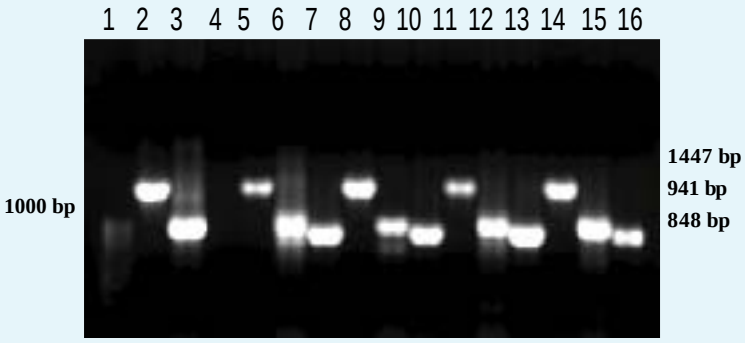
Viral diseases have long been threatening the global shrimp culture industry. White spot syndrome (WSS) has resulted in heavy mortalities and consequent production losses to the shrimp culture industry in many countries in Asia and Latin America since 1992. WSS is caused by an extremely virulent DNA virus popularly known as white spot syndrome virus (WSSV). It has a wide host range and targets various tissues. The principal clinical sign of WSS is the presence of white spots in the exoskeleton and epidermis of the diseased shrimp. All age groups and sizes of shrimps in all kinds of aquaculture systems whether extensive, semi-intensive or intensive are affected by WSSV.

WSSV causes serious economic losses because massive mortality can result in total crop damages within 3-10 days under farming conditions. WSS made its first appearance in southeastern Bangladesh in 1994 and an outbreak of disease of cultured black tiger shrimp occurred in semi-intensive farms in Cox's Bazar, where it caused losses of 50-60% of total crop. Later, the disease occurred in southwestern Bangladesh, where it severely affected small-scale farms practicing shrimp culture with low stocking density, resulting in great economic loss. The best method of preventing losses has been to exclude the pathogen from the production system. Transfer from captured wild broodstock to post larvae (PL) that are stocked in the rearing ponds has been considered as one of the major routes of viral introduction. Therefore detection of viral infection either in the brooders before using in the hatchery or PL before stocking could help avoid this problem.

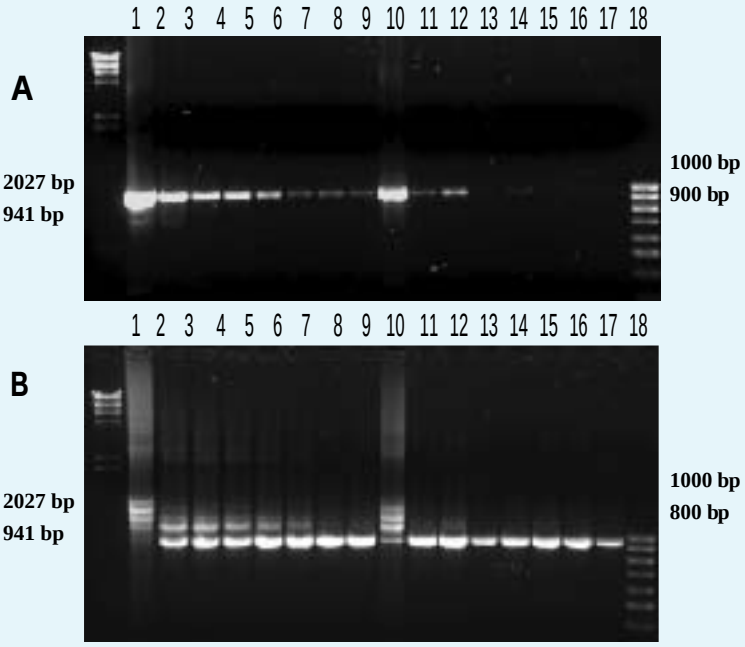
It would be important to know the level of infection in the broodstock, so that the risk of producing infected larvae could be assessed. The prevalence of WSSV infection in broodstock of shrimp can be assessed using polymerase chain reaction (PCR) - a very simple and efficient technique.

To examine the virus infection, tissue can be collected without killing the shrimp. A small piece of tissue (approx. 50 mg) may be cut from the pleopod/uropod of the adult shrimp. For post larvae (20 to 30 PL) should be enough for DNA extraction. For extraction of DNA the sample needs to be homogenized in extraction buffer (100mM Tris. HCl, 10mM EDTA, 250mM NaCl and 1% Sodium Dodecyl Sulphate) and digested overnight with proteinase-K. DNA sample is purified with phenol: chloroform: isoamyl alcohol extraction and precipitated by ethanol and centrifugation.

The primer-pairs 146F1/146R1 5´-ACT ACT AAC TTC AGC CTA TCT AG-3´ 5´-TAA TGC GGG TGT AAT GTT CTT ACG A-3´ and 146F2/146R2 5´-GTA ACT GCC CCT TCC ATC TCC A-3´5´TAC GGC AGC TGC TGC ACC TTG T-3´ have been developed from the sequence of WSSV that amplify 1447 and 941 bp fragment respectively. The PCR reaction can be one-step or two-step. One-step PCR reactions are performed using one pair of the primers. In nested or two-step PCR, the amplified products of first step PCR by primer-pair 146F1/146R1 served as the template DNA for the second step PCR by 146F2/146R2.



Detection of WSSV in *P. monodon* collected from two hatcheries by one-step PCR with primer pairs 146F1/146R1 (lanes: 2, 5, 8, 11, 14) and 146F2/145R2 (lanes: 3, 6, 9, 12, 15). 143F/145R primer pair is decapod specific and was used to check the quality of DNA and reproducibility of PCR technique (lane: 7, 10, 13, 16). Lanes 2-16 represent DNA template of WSSV infected shrimp (lane 4 contained no DNA template, negative control); Lane 1: Molecular weight marker (100 bp DNA ladder).



Sensitivity analysis of PCR. A: represents one-step PCR reaction and B: represents two-step PCR reaction. Lanes 2-9 and 10-17 represent serial dilutions of a positive sample. Template DNA concentrations: Lanes 2 and 10, 100ng; 3 and 11, 2ng; 4 and 12, 1ng; 5 and 13, 0.5ng; 6 and 14, 0.25ng; 7 and 15, 0.125ng; 8 and 16, 62.5 pg; and 9 and 17, 42 pg. The figures show that the intensity of band (PCR signal) is reduced with decreasing template concentration. Lane 1: Molecular weight marker (? DNA Hind III digest). Lane 18: Molecular weight marker (100 bp DNA ladder).

After completion of PCR, 2.5 µl loading dye (0.25% bromophenol blue, 0.25% xylene cyanol and 30% glycerol) should be added to each PCR tube, mixed well, centrifuged briefly and then loaded into the wells of the submerged 1.4% agarose gel. Suitable DNA molecular weight markers (? DNA Hind III digest and/or 100 bp DNA ladder) are needed to load on either side of the gel. The gel should then be observed on a UV-transilluminator and photographed by a digital camera (Gel documentation System).

If the PCR works properly and the samples are infected with WSSV, then two bands of 1447 for 146F1/146R1 & 941 bp for 146F2/146R2 will be observed on the gel. It is suggested to add an extra reaction as negative control to check any contamination during the PCR operation. We found such specific bands always when the symptoms of WSS were visible in the shrimp. We also found some positive signals in shrimps having no visible symptoms of WSS. It means that certain level of infection is required to cause the WSS symptoms. We also compared the sensitivity between one-step and two-step PCR and for that purpose same samples with same dilutions were used and found that two-step PCR was much more sensitive than one-step PCR). Through sensitivity analysis, we could optimize the PCR technique and optimization of PCR is necessary to assess the quality of a brood or PL stock. It would be important to know the level of infection in the brood stock, so that the risk of producing infected larvae could be assessed. It is recommended to keep every shrimp in a separate container until the examination is completed. A brood shrimp showing positive signal in the PCR should immediately be discarded. Utmost care should be taken to avoid any sorts of contamination otherwise a negative sample may also be wrongly detected as a positive one.

Sharks - a Threatened Biodiversity in the Coastal Waters of Bangladesh

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Sharks are long-lived aquatic animals that exhibit slow growth, late maturity, low fecundity and productivity, and high natural survivorship for all age classes. They are valuable and versatile fisheries resources of the sea. Apex predators, such as large sharks, also play an important role in maintaining healthy marine ecosystems. Not only the meat and fins but even the skin and internal organs of sharks are used for human consumption among tribal people in Bangladesh. Shark fin, appreciated in Chinese cuisine, is a valuable product derived from shark fisheries. It is not clear whether new directed shark fisheries have developed in response to new market demands. The social and economic importance of sharks is increased by the fact that fisheries based on these species are often not regulated, and therefore have proven an accessible alternative when other fish species are depleted, restricted or seasonally unavailable.

Shark fishery in Bangladesh

Shark fishery in Bangladesh is a non-targeted fishery. Fish Act has no restriction on harvesting of sharks, while Forestry Act restricts it. Sharks are mainly caught by artisanal fishery with drift gill nets used for catching hilsa shad and Indian salmon and also by set bag nets, long lines and trammel nets. These gears are used onboard a wooden mechanized boat and sharks are harvested mostly as by-catch. However, now-a-days the shark fishing activities have been accelerated due to abundance of under sized sharks in southern Bay of Bengal coast. Some large sharks are captured in fishing nets and the fishermen carry them to the landing sites. Sharks are also harvested as a by-catch of 'Lakka Jal' (large meshed gill nets used for catching Indian Salmon) in Chittagong and Cox's Bazar coast.

In recent years, fishermen are actively and desperately catching dogfish sharks (*Rhizoprionodon acutus*) in the southern coast, of Kuakata. Sawsharks are also harvested by the fishermen. Three landing centers of sharks are identified in Patuakhali-Barguna region. The largest one is in the Khajura Fish Drying Area, Patuakhali. Some are landed at the mouth of Goura khal near Mohipur Bazar, Kalapara, Patuakhali. Another landing center is in Patharghata of Barguna district. The fishermen harvest dogfish shark from November to April. Peak season of dogfish shark harvesting is observed in February to March. Major gear is the drift net.

IUU fishing of sharks in Bangladesh coast

The unsustainable international trade in sharks, fins, and derivatives, and the illegal, unreported, and unregulated (IUU) fishing of sharks for the fin trade pose a global threat to wild populations of sharks and to their associated ecosystems. On 2 March 2009, at the Rome meeting of the FAO Committee on Fisheries (COFI) a group of NGOs brought attention to the dismal record of shark conservation efforts: "Ten years since adoption of the Shark International Plan of Action (IPOA), most fishing nations have not completed national plans of action or imposed basic fishing limits for these particularly slow growing animals. Regional Plans of Action have not been developed, shark fisheries data remain inadequate, and most finning bans are too lenient."

A total of 18 shark species are listed as endangered and ten listed as critically endangered on the IUCN Red List. It is estimated that 75 to 100 million sharks are killed each year for their fins only and the number is growing annually by 6%. The bodies of these sharks, without their fins, are thrown back into the sea where the sharks bleed to death. Finning also hinders the collection of species-specific data, making it very difficult to estimate population sizes, monitor catches, landings, and trade in sharks and shark derivatives. Hammerhead, short fin mako, blue, sandbar, bull, silky and thresher sharks are the most sought after in the huge black market for fins in South-Asian markets. Some of the IUU fishing of sharks in Bangladesh coast are highlighted below -

December 2004, Cox's Bazar

A 7 m long and 1 m wide whale shark, *Rhincodon* was accidentally entangled in drift gill net along Cox's Bazar coast, which was then deliberately brought in the shore. The approx. weight of the shark was about 2000 kg.

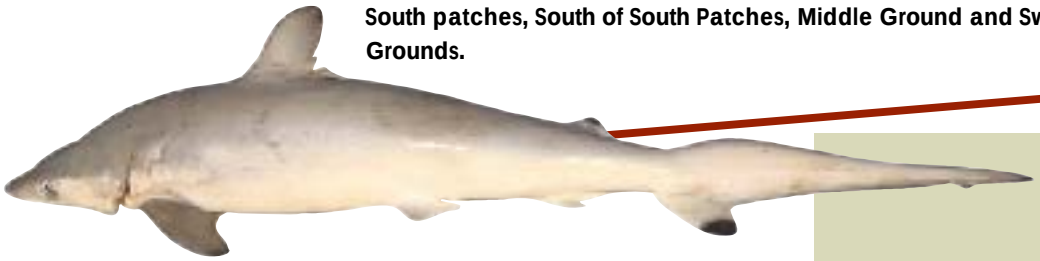
March-June 2005, Patuakhali

About 200 fishing trawler deliberately caught under sized shark and rays during the end of fishing season in southern coast of Bay of Bengal. Fishermen landed about 30 sizable shark daily and then transported them to Chittagong for further processing.

August 2006, Sundarbans

About 8-10 m long sawsharks were reported to be caught regularly by the fishing boats in Sundarbans coast.

- **Fish Act has no restriction on harvesting of sharks, while Forestry Act restricts it.**
- **Mostly small sized sharks, skates and rays are caught in Bangladesh because of the gear limitations.**
- **Catch of giant sized sharks are very rare and in most cases accidental.**
- **Sharks are mainly caught by artisanal fishery with drift gill net, set bag net, long lines and trammel nets.**
- **Sharks are also harvested from the four identified fishing grounds such as, South patches, South of South Patches, Middle Ground and Swath of No Grounds.**



December 2006, Cox's Bazar

An 8 m long and approx. 4000 kg Australian shark [*Carcharhinus* spp.] was accidentally entangled in set bag net of FV Rashidia in the deep sea of Cox's Bazar coast, which was bitten and brought in the shore. According to the statement of crews of FV Rashidia, in a month they caught about 5 such shark each weighting 1500 to 2000 kg.

It was reported that four large whale shark - Rhincodon weighing 1500-3000 kg each were forcefully killed by the fishermen in the Cox's Bazar coast. Fishermen acknowledged the fishing of large number of undersized sharks in Bay of Bengal.

January-February 2008

A 7 m long (weight 1500 kg) whale shark was caught by crews of FV Salma, which was sold at Tk 60 thousand. At least 2 similar size whale sharks were sold in a week in the Fishery Ghat of Cox's Bazar.

The Bangladeshi Coastguard and officials of Sunderbans Forest Division recovered 8 sharks from 4 fishing trawlers in the Sunderbans east coast. Each of the sharks was about 2 m long and weighed over 50 kg. At least 50 shark processing centres were reported to have sprung up in the southern coast areas. Traders from Chittagong go to Barguna and Patuakhali to encourage fishermen catch sharks. Presently at least 2000 fishermen are working in 250 trawlers, and are involved in catching and processing of sharks. Fishermen illegally catch 3000-4,000 young sharks per night in these areas.

December 2010

Fishermen actively harvested young shark of 20-25 cm size and sun-dried them in the Kuakata, Patuakhli. About 1000-3000 such sharks are landed by each fishing boat. Young sharks (15-20 kg each) are caught during high tide in 15-20 km deep sea.

National Plan of Action for the Shark Fishery (NPOA Shark)

The shark fishing in Bangladesh has been growing at an alarming rate because of the IUU fishing and absence of MCS.. Moreover, data and information about the fishery is very scanty. Thus, foremost priority of management of the fishery should be accumulation of data and information and development of National Plan of Action (NPOA). Although the number of countries adopting National Plans of Action (NPOA) for sharks is increasing slowly and the European Union (EU) and Pacific Islands Forum Fisheries Agency (FFA) have, or shortly will have, Regional Plans of Action for Sharks; most shark stocks remain unmanaged. Very little catch data is recorded at the species level, in part, because finning makes species identification incredibly difficult, and IUU fishing makes accurate stock assessment impossible. Numerous shark stocks around the Bay of Bengal are overfished. There is an extraordinary amount of IUU fishing and trade in sharks, fins and parts. As a result, entire populations of sharks and rays are in threat of disappearing.

A very large proportion of IUU fishing for sharks is carried out with the specific intention of harvesting fins. Most of it appears to involve finning - removal of the fins and discarding of the carcasses at sea. While strengthening national and regional prohibitions on shark finning will clearly not be sufficient to eliminate IUU fishing fo sharks. The fact remains that, if shark fishermen are required to land sharks at port with fins attached to shark bodies, the incentive to fish illegally for sharks would be greatly reduced. Regional BOBLME project have a plan to conserve sharks in Bay of Bengal and also to implement NPOA Shark in the region.

The Riverine Habitat Deterioration and Fish Biodiversity Loss in Northwest Bangladesh

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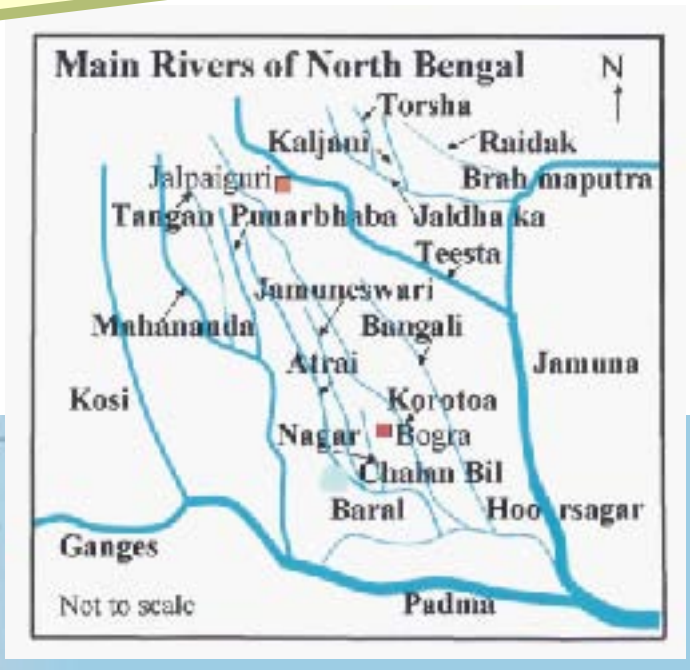
Dinajpur district is located in a flat alluvial plain covers an area of 3438 km^2 and traversed by the Atrai, Punarvaba, Dhepa, Choto Jamuna, Ichamoti, Gorbheswari (Gabura) and Kankra rivers. The Atrai, largest (390 km approx.) river of Dinajpur, is originated in West Bengal and bifurcates northwest of Chirirbandar and unites again at the southwest.

All the rivers harbor a large number of freshwater fishes, and more importantly some of the threatened endemic fishes throughout the year. The fishes in three rivers the Atrai, Punarbhaba and Dhepa were investigated from December 2005 to December 2010 by extensive travelling to local fish markets and different fishing sites, and fishermen's experience on fish catch. Moreover, fish species availability were also investigated through fishermen group discussion and key informants interview. Specimen were collected over the last five years from different fishing sites and fish markets to serve the objectives- specimen collection for departmental laboratory and different research projects.



A total of 1,786 fish samples from the rivers were collected and identified with the help of reference textbook and websites. Among the collected specimen, a total of 74 species from 20 families has been identified of which 63 species were indigenous and 11 were exotic. The fact stresses our attention is that 28 endemic threatened fishes (according to IUCN red list of fishes), these are at the verge of extinction have been found in these rivers.

The availability of freshwater fishes has greatly reduced in these rivers in terms of catch volume and abundance due to the destruction of fish habitat. The massive riverbed siltation, reduced and narrowing of water flows, water withdrawal for irrigation, agricultural runoff, indiscriminate and overuse of pesticide, fishing by poisoning, and various anthropological activities are recognized as the major causes of fish habitat destruction. Intense and recurrent drought along with global environmental change has worsened the agro-ecological system of the region, making the juxtaposition of land and water resources critical. Furthermore, overflow of the perennial ponds during flood introduces exotic fishes to the rivers, makes the natural environment all the more critical for the native species. During the dry season, catchment area of the rivers at some places become limited, and fishing continues until the last individual is caught.

The declining trend of fish biodiversity in the rivers of Dinajpur is severely affecting the traditional fishers' livelihood. Some of them are seeking alternative livelihood, whereas some are stick to their age old tradition and are in peril. Siltation of these transboundary rivers is the impact of dam construction, and water abstration in the upstream as well as the impacts of climate change induced drought in the region. Therefore, local actions are needed for conservation of these endemic fishes, and adaptation of these poor fishers as well as global initiatives to protect the transboundary rivers, and mitigation of the climate change.

Research projects funded by Bangladesh Fisheries Research Institute (BFRI), University Grants Commission (UGC) and the Ministry of Science and Information & Communication Technology (MoSICT) are in progress in Faculty of Fisheries, Hajee Mohammad Danesh Science and Technology University to investige the riverine fish biodiversity status, reproductive biololgy of crticially endangered fishes and to establish community based fish sanctuary in the Atrai river basin of Dinajpur. Along with these projects, authors are hopeful to design and implement more projects to establish a guideline for the management and conservation of riverine fishes of Bangladesh.

POSTCARD

Postcard from Texas

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Under the Islamic Development Bank's scholarship, I went to Texas A&M University, USA as a postdoc fellow to research on climate change, sea level rise and adaptation to find the ways to rehabilitate the climate refugees of coastal and inland fishing communities of Bangladesh. In the first meeting with the departmental colleagues and supervisor we decided to concentrate on adaptation process as it is well-known that Bangladesh is one of most vulnerable countries to climate change in the world. In addition to my research activities in Texas A&M, I took part in undergraduate teaching and field work with the departmental colleagues. I attended the post graduate lecture and practical classes in the ecosystem science and management department especially pertinent to GIS, remote sensing and ecology. I visited the University's latest indoor and outdoor research facilities, libraries, indoor games, gym, swimming pools and athletic track. During my short stay I attended the Climate Information for Managing Risks (CIMR), the first CIMR symposium at Royal Carabe Hotel, Orlando organized by Florida University on 24-27 May 2011 and presented a paper on impact of climate change and possible adaptation measure in Bangladesh. With the invitation from a friend, I visited North Dakota State University to see their teaching, research and academic activities. There I visited North America's largest green house with all sort of modern research facilities and talked to the researchers regarding their research and explored the possibility of collaboration with BAU.

Other than the lab work I went for fishing in every week from early March to end of June at the Somerville Lake in Beach Creek State Park, Texas and managed to catch many fishes in each trip. We caught 93 fishes in one day weighing around 80 kg. During my stay, I went for camping, rafting in the Comal River near Austin and visited Dallas, Houston, New York and the "Mall of America" the largest mall in the United States in Minneapolis. I visited Disney Land and enjoyed dolphin and killer whale show at the Sea World in Orlando, Florida. I also attended Tabligue Jamat for three days twice in Houston and Arlington and met lots of Bangladeshi Muslim there. With the help of Dr. Faridi I managed to attend all the Bangladeshi community's family function in Texas. I also joined in the Muslim society function at College Station, Texas and exchanged views with the Muslims from all over the globe. I organized several dinner parties at my residence with the Muslim brothers. In all aspects my trip to USA was a very fruitful one.

Matshaya Rani Sanctuary in the River Old Brahmaputra

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Matshaya Rani Sanctuary in the River Old Brahmaputra

A fish sanctuary - named the Matshya Rani was established with the participation of the local fisher families in the old Brahmaputra near the BAU campus under the BFRF-DFID funded research project. The main objectives of the sanctuary were the conservation of fish and non-fish aquatic animals in the old Brahmaputra and upliftment of the livelihood of local fishers. The additional aim was to introduce the concept of conservation through establishing fish sanctuary to the students of the Faculty of Fisheries, BAU and the local fishers, as there is no fish sanctuary close to the BAU campus. Management strategies of this sanctuary were developed through fishers' participation for enhancing production, maintaining biodiversity of fish and other aquatic flora and fauna and improving the livelihood status of the poor fishing households. The setting up of the 200 m x 25 m sanctuary was started in January 1, 2007 after necessary permission from the BAU and Mymensingh district authority. The locally collected bamboo and tree branches were used as sanctuary materials. The local fishermen were barred from fishing inside and in the close proximity of the Matshya Rani. In 2010, a total of 42 fish species were recorded inside the Matshyarani. Considering the number of individual under different species recorded, golda chingri was the highest followed by chotka chingri, kanchan punti and punti. Average lengths and weights of the fishes were recorded and increasing trend of length and weight indicated the presence of ample fish-food organism and suitable habitat for foraging and breeding inside the sanctuary. A number of endangered and critically endangered fishes were also observed in the Matshya Rani during the sampling period. Eight different types of non-fish aquatic organisms were recorded such as aquatic insects, snail, mussels, tadpoles, crabs and bivalve. From the present study, it is revealed that the diversity of fish and other aquatic organisms increased in the river due to the setting up of the sanctuary. Therefore, it can be concluded that a fish sanctuary is an important fish management tool which effectively helps to conserve the biodiversity of the fish and other aquatic organisms if managed properly.

The River Brahmaputra and Matshya Rani

The Brahmaputra is one of the largest rivers in the world, with its basin covering areas in Tibet, China, India and Bangladesh. The catchments of this mighty river is about 5,83,000 km^2 of which about 47,000 km^2 lies in Bangladesh. It has four major tributaries: the Dudhkumar, Dharla, Tista and the Karatoya-Atrai system. The massive siltation has threatened the existence of this important river and it is gradually being turned in to a canal. The river once the blessings for the Bangladesh providing fishing, communication and irrigation facilities are now drying up. The fishers who have been living beside the river are facing difficulties and hardship due to lack of fish in the river. All along Bangladesh Agricultural University (BAU) campus, Mymensingh town, Sutiakhali, Fatema Nagar and Gafargaon, the Brahmaputra is becoming empty of fish. The causes of reduced abundance of fish are over-fishing, reduced flooding, siltation, agricultural and industrial pollution etc. This has severely affected the traditional fishers' livelihood and forced them to seek jobs in other sectors. The complete drying up in many parts of the river Brahmaputra is a common scenario during lean season, which is detrimental to fish populations.

Where perennial tributary like the old Brahmaputra has been transformed to seasonal waters due to several manmade and natural factors, establishing a fish sanctuary (refuges where fish are protected during the dry season - can enhance the benefits of water management) even in a small scale can help to restore the fish habitat and ecosystem biodiversity. The restoration of fish sanctuaries in the deeper parts of the river where fish survive during dry season and grow and attain maturity for spawning in the next monsoon- is particularly important. At the onset of early monsoon rains, these fish dispersed on the river and release millions of eggs. Under the BFRF-DFID funded research project a fish sanctuary was established with the participation of the local fisher families in the old Brahmaputra near the BAU campus. The sanctuary was named as Matshyarani Fish Sanctuary. Along with the view of conservation of fish and other aquatic animals in the old Brhmaputra and upliftment of the livelihood of local fishers, the additional aim of the Matshyarani was to introduce the concept of conservation through establishing fish sanctuary to the students of the Faculty of fisheries, BAU and the local fishers, as there is no fish sanctuary close to the BAU campus. Management strategies of this sanctuary were developed through people's participation for enhancing production, maintaining biodiversity of fish and other aquatic flora and fauna and improving the livelihood of the poor fishers.

Setting up of Matshya Rani and sampling

Before establishing the sanctuary, all the professional fishers, boatmen and local people living around the river (both side) were contacted and they were made aware about the intention of the project - the proposed sanctuary in a series of meetings and focus group discussion. A series of meetings were held to discuss and form the management and fishing rules and guidelines that all fishers eventually followed. The site of Matshyarani is selected closed to a popular river ghat used by the students and the people of neighbouring villages so they can observe the sanctuary activity and have a positive thinking towards conserving fish diversity. The sanctuary area is about 200 m × 25 m. Water depth increases up to 30-50 ft (9.14m-15.24 m) during monsoon month and goes down to 10 ft (3.04 m) in dry months. About five hundred bamboo (muli bansh) poles were collected from local market. Branches of five tamarind trees and five sheora trees were placed at the bottom of the sanctuary to create proper and enough shelter for the fishes. The Matshyarani was officially inaugurated on February 14, 2007. During inauguration the sanctuary was decorated with colorful banners posters and festoons. The inauguration was widely covered by many national dailies.

Monthly sampling was done inside (in a randomly selected 10 m x 10 m area) and surrounding areas of the sanctuary for the diversity of fish and other aquatic animals and the livelihood status of the fishers. Sample was also taken of fish catch at 1 km distance in both side of the sanctuary (up and down) for monthly fluctuation of fish catch, the gear used, and number of boats, CPUE, number of fishermen involved in active fishing and the daily duration of fishing for each fisherman and socioeconomic status of fishers. Before catching the fish and other animals, the area (10 m x 10 m) was covered with fine meshed net, the tree branches were removed and the organisms were caught. The length and weight of collected animals were taken, their numbers counted and then carefully released into the sanctuary.

Fish and non-fish diversity in Matshya Rani

In 2010, a total of 42 fish species and 8 types of non fish organisms were recorded inside the Matshya Rani. Among the species golda chingri, chotka chingri, kanchan puti and punti were mostly abundant. Among the fish group the most abundant were minnows, catfish and loaches, followed by barb, eel and parchlet. The three most common freshwater prawns were also available in the Matshyarani. The lesser available fish groups were carp, goby, puffer and needle fish. In the year 2007, a total of 24 fish species were found inside the sanctuary. Among them, the fish group minnows dominated followed by catfish. In the year 2008, 31 species were recorded from different treatments viz. 31 from inside Matshya Rani and 25 and 24 species from 1 km upstream and down stream of the sanctuary. Among the 31 species recorded, the fish group catfish, loaches and minnows dominated followed by barb and prawn. In the year 2009, a total of 35 fish species were recorded from different treatments viz. 38 from inside Matshyarani and 18 and 23 species from 1 km upstream and down stream respectively. Among them catfish, barb, eel and prawn were mostly abundant. In the year 2010, a total of 42 fish species were recorded and barb, eel, minnows and prawn were mostly abundant. The highest number of fish species were found in the year 2010 (42) followed by 2009 (35), and 2008 (31). The lowest number fish species were found in the year 2007. Four types of aquatic insects were identified during sampling in the randomly selected 100 m^2 area inside the sanctuary. Their number gradually increased over the sampling months. The availability of backswimmer and water scorpion were higher than other two insects - water strider and water spider. Some other unidentified aquatic insects were also found inside the sanctuary. After setting several water hyacinth refuges inside the sanctuary the congregations of the aquatic insects increased.

The presence of frog and crab inside the sanctuary were also notable. After the establishment of the sanctuary, the abundance of the aquatic birds increased not only inside the sanctuary but also in the surrounding areas. Several kingfisher and Indian grey-white heron nests were observed inside the sanctuary on the water hyacinth refuge, bamboos and tree branches. Indian white heron and pankouri (cormorant) were also seen catching fish inside and in the surrounding areas of matshyarani. In addition several eagles were observed sitting on sanctuary bamboos and nearby large trees used to catch fish from sanctuary. Several aquatic weeds of Angiosperm group were observed inside the sanctuary. Except kachuripana (water hyacinth), *Eichhornia crassipes*, other aquatic weeds occurred naturally in the sanctuary. To create and shelter for the fish species, five (5 m diameter each) water hyacinth circles were created inside the sanctuary. Among the naturally occurred aquatic weed, the presence of topapana - *Pistia stratiotes*, Kutipana- *Wolffia arhiza*, khudipana- *Spirodela* sp. and keshordam - *Ludwigia adscendens* were notable.

Fish species found in the Matshyarani in 2010, 2009, 2008 and 2007

Name of fish	Scientific name	2010	2009	2008	2007
Baila	*Glossogobius giuris*	■	■	■	■
Baim	*Mastacembelus armatus*	■	■	■	■
Balichata	*Acanthocobitis botia*		■		
Bamos	*Ophisternon bengalense*	■			
Bhagna	*Labeo ariza*	■	■		■
Bheda	*Nandus nandus*	■	■	■	
Boal	*Wallago attu*	■	■	■	■
Common carp	*Cyprinus carpio*				■
Chanda	*Chanda nama*	■	■		
Cheka	*Chaca chaca*	■		■	■
Chela	*Salmostoma phulo*	■	■	■	■
Chep Chela	*Chela cachius*	■	■	■	■
Chirka	*Macrognathus pancalus*	■	■	■	■
Chotka Chingri	*Machrobrachium malcolmsonii*	■	■	■	■
Creek Loach	*Schistura beavani*	■			
Dhela	*Osteobrama cotio*	■		■	■
Gang Gutum	*Lepidocephalichthys irrorata*	■	■	■	■
Golda Chingri	*Machrobrachium rosenbergii*	■	■	■	■
Gulsha	*Mystus bleekeri*	■	■	■	■
Gutum	*Lepidocephalichthys guntea*	■	■	■	■
Jat punti	*Puntius sophore*	■	■	■	■
Kalibaus	*Labio calbasu*	■			
Kanchan Punti	*Puntius conchonius*	■	■	■	
Kankila	*Xenentodon cancila*	■	■	■	■
Kanpona	*Aplocheilus panchax*	■	■	■	■
Katari Chela	*Salmostoma bacaila*	■	■		■
Kholisa	*Polyacanthus fasciatus*	■		■	■
Kuche Chingri	*Machrobrachium rude*	■	■	■	■
Kuchia	*Monopterus cuchia*	■	■		
Kutakanti	*Hara hara*	■	■	■	
Mola	*Amblypharyngodon mola*	■		■	■
Napit Koi	*Badis badis*	■	■	■	
Nuna Bele	*Brachygobius nunus*	■	■		
Panga	*Pangio pangia*	■	■	■	
Panga	*Pangio oblonga*	■	■		
Potka	*Tetraodon cutcutia*	■			
Punti	*Punius puntio*	■	■	■	
Ranga Chanda	*Parambassis ranga*	■	■	■	
Rani	*Botia dario*	■			
Reba	*Cirrhinus reba*		■	■	
Savon khorka	*Schistura savona*	■	■	■	
Tara baim	*Macrognathus pancalus*	■	■	■	
Tengra	*Mystus vittatus*	■	■	■	■
Tepa	*Tetraodon patoka*		■	■	
Tit Punti	*Puntitus ticto*	■	■	■	■
Torrent Catfish	*Amblyceps mangois*	■	■	■	

Positive attitude of fishers

From the very beginning the general attitudes of all stakeholder groups toward establishing a sanctuary in the Old Brahmaputra were very positive and encouraging. Initially local fishermen did not have the idea about the sanctuary. They thought that the idea of a new sanctuary was just like a commercial katha fishery and university authority wanted to catch fish from that katha annually depriving them from catching fish from the river. However, after several FGDs, they finally realized that, fish would never be caught from the proposed sanctuary. They also realized that, the new sanctuary was very different from the commercial kathas and this would only help their causes in increasing both qualitative and quantitative biodiversity of fish and other aquatic animals. In the FGDs, the participation of the fishers was satisfactory. The fishers actively took parts in the discussion and helped with their idea and indigenous traditional knowledge. All the fishers in the area helped in sanctuary establishment with tree branches, bamboos and with physical labor. After the establishment of the sanctuary, they actively participated in managing and guarding the sanctuary. They strictly followed the rules of fishing/no fishing. Not only that, the outsider and non-professional fishermen who tried to catch fish very close to the sanctuary, were barred by the local fishers. The local fishing households were great help in guarding the sanctuary during night time. The fishermen also helped in conducting the survey on fish catch and others outside the sanctuary.

Fish diversity

It was found that the number of fish species and other non-fish organisms increased in the Matshya Rani over successive months in 2010. The number of fish species also increased from the previous years of 2009, 2008 and 2007. In addition, the presence of other aquatic organisms in the sanctuary were also satisfactory. The findings ensured the positive impact of Matshyarani both on the abundance of fish species and number of fishes and other aquatic organisms qualitatively and quantitatively.

End note

It was very timely and important step to establish a fish sanctuary - the Matshya Rani in this part of the river. The sanctuary has proved its positive impact on a significant biodiversity improvement on both fish species and other non fish aquatic organisms over the last four years. Many of endangered and critically endangered fishes reappeared in the Brahmaputra after establishing the Matshya Rani in the Brahmaputra. Sanctuary as an important fisheries management tool is used world-wide for the conservation, protection and restoration of fish species. From the present study, it is revealed that the diversity of fish and other aquatic organisms increased in the river Brahmaputra. Therefore, it can be concluded that a fish sanctuary is an effective fish conservation tool. It helps to conserve the fish and other aquatic biodiversity of Bangladesh if it is managed properly. The model of Matshya Rani would definitely inspire other people of the country to follow the same, and eventually wetland restoration and biodiversity conservation would be taken up as part of the national fisheries policy in Bangladesh as a priority basis. Establishing more sanctuaries like the Matshya Rani in rivers and beels of the country will not only help to sustain the riverine fish biodiversity, it will also give fish proper ecosystem to thrive, live on and to breed with an eventual contribution in the total fish production of the country and poverty alleviation and nutritional security of the poor people of Bangladesh.

Formation of Different Morphotypes in Male Golda *(Macrobrachium rosenbergii)*

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The giant freshwater prawn (*Macrobrachium rosenbergii*) is one of the most important crustacean species produced in inland aquaculture in many tropical and subtropical countries worldwide. The natural distribution of *M. rosenbergii* extends from Pakistan in the west to southern Vietnam in the east, across Southeast Asia, south to northern Australia, New Guinea, and some Pacific and Indian Ocean islands. There has been a very rapid global expansion of freshwater prawn farming since 1995. This is mainly because of the huge production of China but, in the last few years, because of a rapid take-off of farming in India and Bangladesh also.

Bangladesh has a unique and favorable environment for prawn culture. Presently *M. rosenbergii* is commercially cultured in the coastal districts of Khulna, Bagherhat, Satkhira, Cox's Bazar, Jessore, Narail, Gopalganj and Noakhali and these areas have become the centers of prawn farming in Bangladesh. There is a great potential for successful freshwater prawn culture in the numerous ponds of Bangladesh. This species grows faster in suitable environmental conditions and attains marketable size within 6 months, while carps require at least a year. *M. rosenbergii* has been disseminated widely around the world and in at least 43 countries, the species is being used for both research and commercial culture purposes. Little attention, however, has been paid to date to the genetic attributes of cultured stocks of this species. After many years of culture essentially with unimproved stocks, decline of productivity have become an increasing concern for the culture industry. A number of factors may contribute to productivity declines, including high levels of inbreeding due to sourcing brood stock directly from grow-out ponds, and selection of breeders based on their readiness to spawn that often involves early maturing small females. This latter practice is likely to cause an indirect, negative response on weight at final harvest. The culture potentials of this species are also hampered because of creation of several morphological variations (morphotypes) of male populations. Surprisingly, while *M. rosenbergii* culture because of faster growth rate has expanded rapidly, genetic approaches to improve stocks of cultured lines have not yet been widely implemented. Thus, there is the need for systematic breeding programs through different genetic means in the future to improve economically important traits in this species. Significant productivity advances have been achieved via selective breeding programs in aquaculture over the last 10 years, particularly in a number of finfish species. At present prawn culturists in Bangladesh have been facing a severe problem of slower growth performance in culture condition. It is presumed to be due to reduced genetic variability of the seeds produced from hatcheries. That is why farmers are still interested on the natural seed which is causing a serious damage of biodiversity.

In nature, 3 different morphotypes of golda males have been characterized. These are: blue-clawed males (BC), orange-clawed males (OC) and small males (SM) based on colour and claw length. The BC males are the largest males having very strong and thick chelate legs. Due to male territory formation different morphotypes (size variation) occur in the ponds. Farmers obtain reduced production due to size variation in males (only 5-10% males become BC in ghers, 20-30% males are OC and remaining males are SM). This is because they stock at 2:1 or 3:1 or even 5:1 female: male ratios in their brood banks. As a result, presumably only BC males mate with several females; the remaining males do not get the chance to transfer their genetic material to the next generation. This is an act of inbreeding under hatchery situation. The gravid females from the brood banks are then used in the hatcheries for seed production to meet the demand of the prawn farmers. As a result, genetic variability is reduced. Use of 1:1 or 1:2 sex ratios providing with shelter in the brood banks could be a plausible solution providing chances for all the males to find out their potential mates in order to increase genetic variability of the seeds.

Taking the male morphotype problem in consideration, a research has been undertaken on the assay of variability of different morphotypes of golda cultured under different sex ratios applying RAPD technique using PCR in the Fisheries and Marine Resource Technology Discipline, Khulna University. The research is aimed at finding out solution for production of genetically variable PL of this species for better growth performance. This research is being funded by the Ministry of Science and Information & Communication Technology (MOSICT), People's Republic of Bangladesh. Under the program, efforts will be made to survey the different brood banks and natural stocks of the species especially in some important areas having hatcheries had established for some years. Strains/stocks will be collected from various locations of the country. The stocks will be kept in different experimental ponds with different sex ratios. The DNA samples of seeds produced from different treatments will be tested for genetic distinctness employing PCR techniques using known primers. Beside this, the growth performance of the PL produced from different treatments will also be tested. Genetically obtained distinct stocks will be maintained as separate lines in the ponds of Khulna University campus.

OAA other aquatic animals

Argulus

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Argulus (class Brachiura) is a common ectoparasite of freshwater fish and is known as 'fish louse'. The body is oval, flattened and disc shaped. There are two large suckers, characteristic of the group. The parasite swims using four pairs of legs. They have paired moveable compound eyes and a median ocellus. The antennules have a large terminal hook. The various hooks, barbs and suckers that *Argulus* use to attach to the skins and fins of fish and feeds on blood by inserting stylet into the fish flesh causing further damage. Reddish lesions on fish body develop where the *Argulus* has been feeding and may become infected with bacteria or fungus. In addition to physical damage affected fish are subject to stress which often leads to secondary parasitic infestation by white spot or costia.

The fish louse is common in aquaculture and wild fishes of Bangladesh and easily overlooked because of its transparency and smooth outline. It can be found on just about any freshwater fish including carps perch, minnows, trout catfishes and bream. The adult *Argulus* is visible without magnification measuring up to 10 mm diameter. Skin irritation, loss of balance, swimming in a zig-zag, jumping in the water and rubbing body on hard objects to try to dislodge the parasites are the common symptoms. Serious infestation can cause fish to become lethargic. Bleeding is also observed around the bite.

The effective treatment is organophosphate which is banned in many countries. Other treatment measures are i) dylox solution @ 0.25 ppm for 24 hours, ii) ammonium chloride (NH_4Cl) solution @ 1.0 -1.5% for 15 minutes, or table salt @ 1.25% for 15 minutes, iii) dichlorvos solution @ 0.2 mg L^{-1} for 24 hours, every week for 4 consecutive weeks, iv) table salt @ 1.5% or 15 ppm per litre for 15 - 30 min can kill most of the parasites and remove gill mucus and v) potassium permanganate ($KMnO_4$) @ 2-5 mg L^{-1} for 24 hours. As prevention, incoming water should be treated along with treating of fish before release. Strict quarantine measures should be followed, fish of different age group should be separated and dissolved oxygen concentration should be increased.

Threatened Fish Biodiversity of Dingapota Haor in the North-East Bangladesh

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Dingapota (about 8000 ha) is the largest haor (a vast saucer-shaped low floodplain area) of Mohangonj Upazilla under Netrokona district. The haor contains 10 to 12 feet water for about 5-6 month. Dingapota is rich in indigenous fish species, particularly during monsoon. Water level starts to decrease in December after rainy season is over and a lot of fishes are caught at that time. Many of the threatened fish species of the country which are not found in other waterbodies are often available in Dingapota and other neighbouring haors. A survey was conducted during December-May 2011 in the Dingapota haor to assess the diversity of threatened fish species. Data were collected using pre-tested structural questionnaires, field visit and interview with fishermen and finally cross checking the primary data from different secondary sources. Field survey was carried out in twelve spots under 5 Unions of Mohongonj Upazilla adjacent to Dingapota haor.

From Dingapota haor, a total of 33 threatened fish species were recorded during the investigation period - 11 under Siluriformes, followed by Cypriniformes (10), Perciformes (6), Mastacembeliformes (2), Osteoglossiformes (2), Synbranchiformes (1) and Anguilliformes (1), including 13 vulnerable, 15 endangered and 5 critically endangered fish species. Twenty-one, out of a total 54 threatened fish species of Bangladesh as described by IUCN were not found during the study.

Regarding the availability of vulnerable fish species in the Dingapota haor, 8 were available, 5 rarely available and one was not available. Available vulnerable fish species were *Cirrhinus reba*, *Puntius ticto*, *Sperata aor, Mystus cavasius, Nandus nandus, Chanda nama, Parambassis ranga, Macrognathus aral* and rarely available species were *Notopterus notopterus, Anguilla bengalensis, Ailia coila, Monopterus cuchia* and *Channa orientalis*. Regarding the availability of endangered fish species in the Dingapota haor, 8 were available, 7 rarely available and 13 not available. Available endangered fish species were *Chitala chitala, Labeo calbasu, Labeo gonius, Osteobrama cotio, Rasbora rasbora, Sperata seenghala, Channa marulius, Mastacembelus armatus* and rarely available species were *Labeo bata, Botia dario, Botia lohachata, Ompok bimaculatus, Ompok pabda, Chaca chaca* and *Badis badis*. *Barilius bendelisis, Barilius vagra, Bengala elanga, Chela laubuca, Crossocheilus latius, Raiamas bola, Batasio tengana, Ompok pabo, Silionia silondia, Dermogenys pusillus, Microphis deokata* and *Ctenops nobilis* were not recorded during the study period from Dingapota haor. Regarding the availability of critically endangered fish species from the Dingapota haor, 1 was available, 4 rarely available and 7 not available. Available critically endangered fish species was *Puntius sarana*- available in huge quantities. It seems that this species is not critically endangered any more. Rarely available critically endangered species were *Rita rita, Clupisoma garua, Eutropiichthys vacha* and *Bagarius bagarius*. These species have become very rare in the study area and were found only in specific spots. *Labeo boga, Labeo nandina, Labeo pangusia, Tor tor, Pangasius pangasius, Sisor rhabdophurus* and *Channa barca* were not recorded during our study from the Dingapota haor.

Indigenous fishes from the Dingapota haor with good availability were *Labeo rohita, Catla catla, Cirrhinus mrigala, Labeo calbasu, Puntius ticto, Puntius sophor, Gudusia chapra, Anabas testudineus, Clarias batrachus, Heteropneustes fossilis, Chitala chitala, Channa punctatus, Channa striatus, Macrognathus aculeatus, Mystus cavasius, Mastacembelus armatus, Corica soborna, Esomus danricus, Chanda nama, Lepidocephalus guntea, Colisa fasciatus, Salmostoma bacaila* etc. Fishermen were found to fish in the haor during June to November and January to February. Variety of fishing gears and methods were used to catch fish. A total of 10 types of nets, 8 traps, 6 hooks and lines, 4 wounding gears and 2 other gears were recorded in Dingapota haor. The nets used in Dingapota haor were current jal, punti jal, khora jal, dharma jal, thela jal, khepla jal or jakhi jal, ber jal, moi jal, bor jal and chabi jal.

The questionnaire survey summarized that the fish biodiversity of Dingapota is declining day by day. The main reasons for decline of biodiversity and overall availability of fishes, according to questionnaire survey and data collected from fishermen and other people adjacent to Dingapota haor were siltation, indiscriminant fishing, fishing brood fish and fry during breeding season, use of illegal fishing gears, filling-up of connection between river and haor, use of katha fishing and faulty leasing system of Jalmohol. Considering the findings of the survey, the following recommendations can be suggested for overall development of biodiversity status of Dingapota haor.

- Use of illegal fishing gears like current jal should be prohibited.
- Fish acts should be properly implemented.
- Fish sanctuary should be established at different points of the haor and be maintained properly.
- Indiscriminate use of insecticides, pesticides and herbicides should be controlled in crop fields and in and around the haor vicinity.
- Critically endangered fish species should be introduced from other haors, if possible.
- Katha fishing should be prohibited.
- Flood control embankment, roads or such structures should be constructed with proper planning so that fish species could move easily through the structures.
- Public awareness - especially fishermen's awareness should be created on fish conservation.
- Jalmohal leasing system should be modified.
- During breeding season of fish, alternative livelihood of fishermen should be arranged to keep them away from fishing brood fishes.
- Setting-up beel hatchery, beel nursery and direct release of fry in haor should be carried out.

Habitat

Fisheries for Society: Way to Poverty Alleviation and Nutritional Security in Noakhali Coast

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In the coastal area of Noakhali, depletion of marine and riverine resources like fish poses a serious threat to people's long-term livelihoods. For example, Hilsha fishing is a major seasonal source of income in the coastal villages. However, since the mid 1990s the catch of Hilsha has been declining at an alarming rate. Declining fish supplies have led to an increase of selling prices also at the fisherman level. As for the net impact of "lower supplies and higher prices" for them, the answers were mixed, in that some fishermen stated that the price increase has somehow compensated for smaller catches, whereas others indicated that the decline in supply was so sharp that a price compensation was not possible.

Seasonality

The livelihoods of the poor stakeholders of coastal villages are at a very high exposure to seasonal fluctuations. The fishers as well as the peasants, rickshaw pullers, petty traders etc. of the coastal villages are quite vulnerable to seasonal fluctuations, as the coastal life is characterized by a high degree of seasonality and uncertainty. Along the coast, the peak fishing season starts during late May and continues up to early November and the catch is relatively thin at the beginning and towards the end of this period. In this season the fishers catch mainly Hilsha in the Bay of Bengal and the adjacent Meghna estuary mainly using gill nets and engine boats. In every month of this peak season, there is again a peak week (locally called Jo) of catch followed by a lean week of catch (locally called dala). That is, peak fishing only takes place during half of the major season.

Seasonality in livelihood options of fishing community at Noakhali coast

Activities	Months											
	J	F	M	A	M	J	J	A	S	O	N	D
Hilsha fishing												
Goby fishing												
Bombay duck fishing												
Long line fishing												
PL collection												
Inland fishing												
Aquaculture												
Fish drying												

The goby (locally called Chewa) fishing is prominent for about 5 months (early November to late March) in Noakhali coast as well as nearby Hatiya Island. The fishermen catch mainly Bombay duck (locally called Lotia) and a few other species of estuarine fishes during the following 4 months (mid-November to late February) with estuarine set-bag net (ESBN) and small engine-boats in the Meghna estuary, near shore regions, creeks and tributaries. The ESBN-season is considered as part of the lean season. There is also a "peak week followed by a lean week" syndrome in this lean season. As a consequence, their catch is further marginalized by 50% even in this lean season. They virtually cannot fish anything in the sea for 3-4 months (April to July) partly due to non-availability of fish and partly for taking preparation (net mending or weaving, boat repairing and finance mobilization) for the ensuing major season (for hilsha) as well as fishing restriction by the government. Moreover, the catch per unit effort has been declining day by day and the fishermen are getting a scanty amount of fish, and consequently a reduced income, even in the peak season. In addition to the fishing season, seasonality also forms part of many other aspects of villagers' livelihoods, including demand for wage labour, access to credit, and occurrence of diseases.

Livelihoods of poor

The visible signs of poverty

- The houses of the poor are very small and in a poor condition, which is likely to result in bad health. Many of the poor fishers live in simple semi-permanent bamboo and grass houses occupying no land beyond that on which the house is built;
- Due to the expenses involved, the poor only own very few clothes and what they wear is often old and dirty;
- They can only manage one meal a day, based on a limited diet (e.g. rice, onion and green chili);
- They lack financial resources, including savings and only limited access to informal credit (locally called dadan);
- With their low social status, they get harassed by influential people;
- The poor only own very small properties and they do not own any land;
- The poor lack education or cannot manage to send their children to school; and
- To earn a livelihood, poor women normally make mats, sew or weave nets, husk paddy, work as maids, or beg.

The causes of poverty

- As a result of the dadan chain, they cannot free themselves and are constantly indebted. The dadandars (moneylenders) try to keep the fishermen indebted. If a fisherman has a good catch, the moneylenders just take part of the catch without any payment;
- Because they have outstanding loans, they cannot save any money;
- Robbers steal their nets and catches and sometimes even kill crew members;
- In the case of Hindus, they have no access to services, as they belong to a low caste (locally called jaladas).
- Natural disasters such as erosion, salinity intrusion and cyclones, causing destruction of livelihoods assets;
- Accidents or deaths of husbands or sons when they are fishing;
- Serious illness, and old age, preventing people from work;
- Many children. In the case of many boys the homestead land would be divided. In the case of girls, the family has to pay substantial amounts of money for dowry;
- Lack skills and education to enter any other occupations;
- Men do not allow the women to go outside and work because of social insecurity. The men only want their wives to involve in household activities; and
- Declining fish catches is resulting in low income.

Suggestions on the way to move out of poverty

- Access to money to invest in small businesses such as dairy farming, aquaculture, poultry, small industry through employment creation;
- Support to have free education services for up to secondary level;
- Also skill training is required. However, it is also mentioned that skills alone are not sufficient if there is no capital to start a business.

Constraints to move out of poverty

- Inferiority complex of the community (indicated by Hindu communities)
- Women are always engaged in domestic chores
- Lack of skills
- Lack of financial assets
- Lack of unity in the community
- Lack of social security for them as a minority group

Possible sectoral role

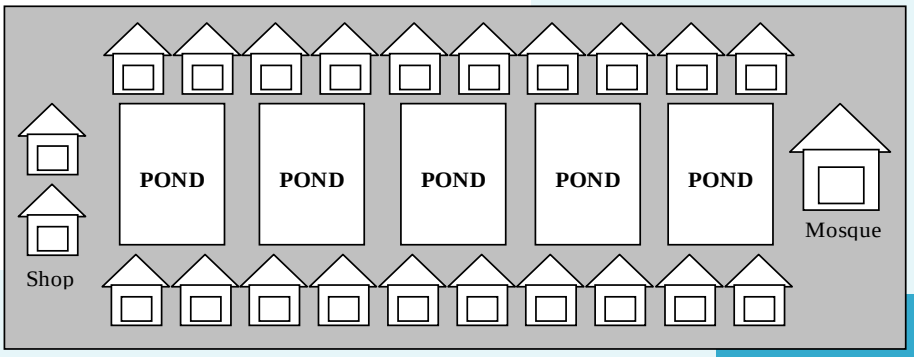
Aquaculture activities are one of many approaches to reduce fishing pressure, and its intensification can even add to fishing pressure. There should therefore be a clear limit to how much aquaculture intervention can be introduced. In relation to the introduction of aquaculture activities, marketing network and environmentally friendly production technology need to be assured.

Prawn culture is capital-intensive and relatively high-tech for poor people. However, carps and tilapia may offer shorter pay-back periods that is essential to poorer producers. Investment in the production of sustainable aquaculture inputs, e.g., local supply of good quality fingerlings produced in a hatchery, and the availability of fish feed, is key to sustainable development and would benefit from collaborating with the private sector, perhaps mediate initially through service providers. Certification and regulation of sustainable wild collection and of the aquaculture industry could provide jobs and income to local fishermen (and hence incentives to protect coastal resources), and could support a market niche and/or price premium for properly collected and cultured fish/prawn.

With over-exploitation and depletion of traditional wild-caught fisheries, livelihoods of villagers are becoming increasingly focused on developing aquaculture. Many residents consider aquaculture among the most suitable options for additional livelihoods and have raised concerns about access rights to areas suited to aquaculture development. Options might include components of the sustainable rearing of carps, tilapia, catfish, silver barb and prawn.

Impact on rural livelihoods

Fish farming can generate an average income that is higher than any other typical agriculture practice. The local community reported that most of the households could not able to produce sufficient food for the whole year. The increased cash flow in the household from aquaculture may provide the opportunity for more investment in productive resources and assets as well as increased security for coping with crises such as natural calamities and illness. As a result, food insecurity will be decreased, more children will go to school, more people can afford better medical care, they have more clothes and/or better clothes than in the past, and housing conditions will improve. The expansion of fish farming in Noakhali coast may also intensified the demand for labour and will change household roles. Women will be actively involved in fish farming, particularly in preparing feeds and gardening in the pond dikes. They will also become active in marketing garden produces. The intensification of their economic role will increase their workload but has to be positively affected the status of women in village society. Some cluster villages was observed during the field visit and it is expected to establish more cluster villages, where the landless people settled with excellent social harmony.



A typical cluster village at char land of Noakhali coast

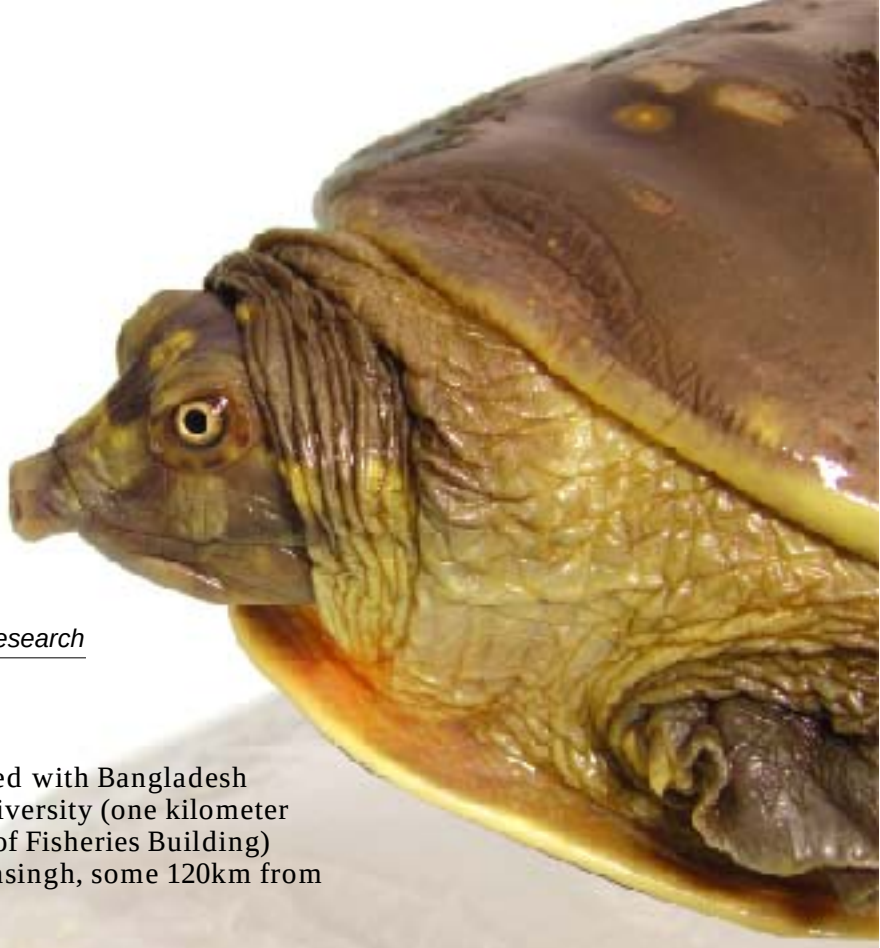
Socioeconomy

Growing the own fish saves household expenditures on fish; coastal dwellers spend a substantial part of their income (5-10%) on fish. Farming the fishes therefore, saves money as well as on bartering of production. Product selling brings in cash. The local administration, development authority, investors, donors, NGOs and sectoral organizations can play a crucial role in stimulating micro-enterprise development related to coastal aquaculture.

Community based aquaculture is an economically viable, ecologically sound and socially acceptable allied activity as the main dietary protein for the rural poor. The socio-economic benefits derived from aquaculture expansion provide the provision of nutritive foods contributing improved life style to the poor, income generation and employment opportunity, diversification of fish production and create scope for foreign exchange earning through export of high-valued products. This is the only way to increase rural economy through the development of primary production sector and overcome malnutrition to improve the health condition of the coastal rural people.

Fish Museum and Biodiversity Center FMBC

conservation through education and research



FMBC is affiliated with Bangladesh Agricultural University (one kilometer west of Faculty of Fisheries Building) based in Mymensingh, some 120km from Dhaka

The museum boasts an impressive collection of riverine fishes and other aquatic fauna and exhibits on extinct fossil

It aims is to create an educational centre that focuses on Bangladesh's rich cultural history of fisheries and to raise awareness on the conservation of aquatic fauna

The centre offers people of all ages free access to information as well as museum exhibits

FMBC can be visited with prior contact on every Friday and Saturday (10.00-12.00 morning and 14.00 - 17.00 afternoon).

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New Ice Box in Fish Transportation and Trade Reduces Post-harvest Loss in Bangladesh

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Due to lack of adequate low cost ice box and icing, fisheries in Bangladesh suffers from serious post-harvest loss during the last decades. Lackof ice box and ice not only deteriorate the quality of wet fish but also cause a serious economic loss for the rural fishers and processors. A low-cost ice box was introduced among the poor fish traders of Cox's Bazar, Chittagong, Kuliarchar, Daudkandi and Satkhira several years back to ice fish during transportation and sale, to preserve the unsold leftover fish overnight for next day selling as premium quality fresh fish and to preserve ice block for several days in remote and inaccessible areas where ice is scarce. Introduction of low-cost ice box has been found very useful and profitable to the fishers and traders. Within 5-6 years of its introduction in Cox's Bazar, the low-cost ice box has been spread throughout the major cities and fish markets of the country. Up-scaling of ice box technology is so intense that now almost all the country's fish sellers are being found to have at least one low-cost ice box behind him to preserve his fish. This situation is very common in Bangladeshi fish market now. One very useful adaptation of the low-cost ice box introduced is the use of large sized ice box in transportation of fish on truck from landing centers to secondary fish markets in metropolitan and other cities. Fishes have long been transported in split bamboo made baskets kept one-top-another on the truck that suffered huge post-harvest loss due to inadequate icing in un-insulated fragile basket and also due to heavy pressure exerted from the top basket to the bottom.

With the introduction of new ice box, this problem has been mostly resolved since the steel-framed large ice box one top another on the truck can withstand the pressure from the top without damaging the fish and the fish can be kept in adequately iced condition in insulated box. These are the fruits of works done in a FAO funded and Department of Fisheries regulated ECFC project operated in Cox's Bazar during 2000-2006 and the follow up works of several projects like, BFRF, ProSCAB and FAO-post-harvest loss reduction fish project where the present author was the Principal Investigator.

Design and operation of low-cost ice box

Two types of ice boxes were designed- ice box for preservation of fish and ice box for transportation of fish.

a. Ice box for preservation of fish

This is comparatively a smaller ice box that contains 40-50 kg fish with ice. The inside and outside walls of the box (30" x 24" x 18") are made of galvanized iron (GI) sheet. A one inch layer of cork-sheet (Styrofoam plate) is placed in between the two walls to make the box insulated. The lid of the box is made in the same way. To drain out ice-melt water, a water beep cock is fixed at the bottom of a side wall.

b. Ice box for transportation of fish

Initially a bigger sized ice box, named 'community ice box' having a size of 6' x 3' x 3' was designed, keeping 4 to 5 chambers inside of the box, in order to be used by 4 to 5 community fish traders in the fish markets for preserving fish and ice blocks. Later, to transport fish on truck, the design was changed by reducing the size to 3' x 2.5' x 2' and fixing the GI sheet box within an iron angle and flat bar frame to make it abrasion and pressure resistant while loading and unloading on the truck. All edges and side corners of the box are fixed with angle bars to give such strength. The materials required for manufacturing this box are - GI sheet, cork sheet, iron angle bar, flat bar, rope, hook, lock, etc. Further changes in the design have been made by the fish traders of different regions as per requirements and necessity. For example, the traders of Mymensingh- Netrokona use a box of 36" x 24" x 22", while in Satkhira, it is 38" x 28" x 25" and in bhairab is 36" x 24" x 22" and 24" x 18" x 18". Large box contains 250 to 280 kg fish with ice during winter and 2200-220 kg fish during summer. Small box contains 120-150 kg fish with ice in winter while 80-120 kg in summer. New entrepreneurship development Most of the fishes from major landing and marketing centers of the country are being transported by this large ice box now. This can be easily recognized and understood in and around big auction markets in metropolitan cities like Kawran Bazar, Jatrabari, etc. Huge numbers of entrepreneurs have been developed to produce and market these ice boxes. A huge number of unemployed youths for example, from Enderson Road of Cox's Bazar, Shambhugonj and Mohongonj of Mymensingh, Vairab of Kishoregonj, Zatrabari and Rampura of Dhaka, Gopalgonj and Satkhira town, etc. have been engaged in this income generation activities. The cost of

Type of ice box	Size (inch)	Price (Tk)
For preservation of fish	30 x 24 x 18	2,500- 3,500
For transportation	38 x 28 x 25	6,500-7,000
	36 x 24 x 22	6,000-6,500
	36 x 24 x 20	6,000-6,500
	24 x 18 x 18	3,500-4,500

Conclusions

Because of easily available low priced material and easy to use, the wet fish trading technology have become very much popular among the fish traders and transporters country-wide. It was observed from the field study that the low cost ice box technology has been up-scaled throughout the country and post harvest loss of wet fish is reduced from 28% in 2003 to 12% in 2010, which saves a sum of about Tk. 8,000 crores annually.

Fish File

Actinopterygii Perciformes Mugillidae

Sicamugil cascasia Hamilton, 1822

Synonum: Mugil cascasia, Liza cascasia

Common Name: Yellowtail Mullet

Local name: Kechi Kholla, Chhoto Kholla, Kucha Kholla, Kachki Bata

Collection: Jaria, Netrokona, April 27, 2005-Preserved in Fish Museum & Biodiversity Center, BAU, Mymensingh, Bangladesh

Biodiversity: Critically endangered

Key character: Much smaller than Mugil sp. Head flat above. Lateral line absent. Two dorsal fins - first one spiny (4 spines) and second one soft. Opercle with a strong spine. Ctenoid scale. Slightly protruded eye. One yellow spot near caudal fin.

Natural habitat: Demersal, potamodromous Freshwater river, haor, baor and beels of Bangladesh, also available in India and Pakistan. Rivers - the Brahamputra, the Ganges, the Jamuna, the Indus, the Tribeni and the Sind. Generally live in school at running water of the upper rich of the river.

Morphometric	cm	Meristic	Number
TL	7.5	D1	IV
SL	6.2	D2	I 8
HL	1.8	P1	14
EL	0.5	P2	I 5
BD	1.6	A	III 8
		C	20

Curtesy: FMBC, BAU, Mymensingh

Quest for Antioxidants in Fishes

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Many people do not know the real culprit within the body that often cause the health problems. They are the free radicals that are responsible for various diseases generally affecting the elderly people such as cancer of different types, aging and other metabolic disorders including diabetes, coronary artery disorder, stroke and metabolic disorders related to thyroid hormone. Free radicals are the byproducts of the body's normal metabolic reactions. Body utilizes carbohydrate and fat as energy source to produce ATP - the fundamental fuel of the body. During ATP production the free radicals are formed containing a lone pair of electrons which is highly reactive. Some defense mechanism already exists in different species of animal kingdom including human being as the body's normal protective functions. The protection is usually achieved by enzymes such as SOD (Super Oxide Dismutase), Catalase, Glutathione Peroxidase etc. In addition to the enzymes some other components also produce antioxidant activities including vitamin A, C and E, Selenium, Melatonin etc.

The production of free radical may increase with increase of metabolic rate as in case of adults compared to adolescents. Another problem is the depletion of antioxidant enzyme and substances that show antioxidant activity with aging. Some external factors can also induce the production of free radicals such as UV radiation, stress, emotion factors etc.

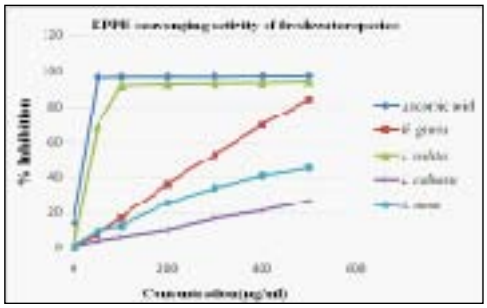
The antioxidant, now-a-days, is a widely known term and is highly beneficial to health. The availability of antioxidant enzymes and other constituents to prevent oxidation is replenished by our day to day food intake. To reduce damages in the body due to oxidation by the free radicals at 40s of our life, for example, choice of food is an important factor. Foods rich in antioxidant components should be taken regularly. If it is difficult to obtain proper quantity of antioxidant from foods, supplementation is necessary to combat the deadly free radical weapons.

Presence of high level of antioxidant compounds in different food items

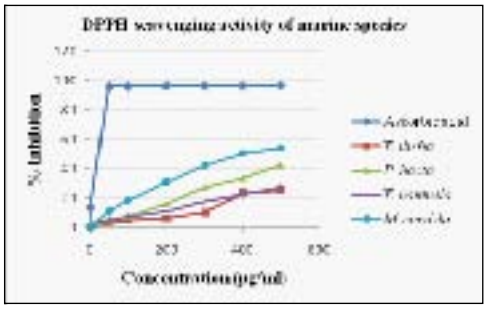
Antioxidant compounds	Foods containing high levels of these antioxidants
Vitamin C (ascorbic acid)	Fresh Fruits and vegetables
Vitamin E (tocopherols, tocotrienols)	Vegetable oils
Polyphenolic antioxidants (resveratrol,	Tea, coffee, soy, fruit, olive oil, chocolate,
flavonoids)	cinnamon, oregano
Carotenoids (lycopene, carotenes, lutein)	Fruit, vegetables and eggs.
a-tocopherol and ubiquinone	Fish (marine fish)

It is well evident and scientifically established that plant is a good source of antioxidant. Extensive work has been done on various plants for evaluation of antioxidant components and isolation of the active constituents.

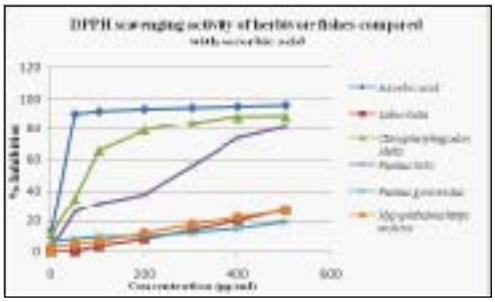
Under an ongoing research in Khulna University, different indigenous fish species of Bangladesh are being analyzed to study the presence of antioxidant components. The species surveyed were grouped on the basis of their habitat types viz., marine, brackish water and freshwater and food habits viz., herbivore, carnivore and omnivore. Various methods are available to evaluate the antioxidant activity of samples. In this study the DPPH (2, 2-diphenyl--picryl-hydrazyl) - a stable free radical scavenging activity test method has been adopted to detect antioxidant/free radical neutralizing capacity of fish species of different habitats and food habits. Sixteen species were assayed for antioxidant activity with regard to habitat type. These were *Tenualosa ilisha, Trichiurus lepturus, Pomadasys hasta, Taenioides anguillaris, Megalaspis cordyla and Polynemus paradiseus from marine habitat* and *Amblypharyngodon mola, Glossogobius giuris, Labeo rohita, Gibelion catla, Oreochromis niloticus, Oreochromis mossambicus, Labeo calbasu* and *Cyprinus carpio* from freshwater habitat. Similarly 15 species were subjected for antioxidant component rating depending on their food habits and these were *Labeo bata, Hypophthalmichthys molitrix, Puntius ticto, Puntius gonionotus* and *Ctenopharyngodon idella* from herbivore group; *Chitala chitala, Channa punctatus, Channa striatus, Sperata aor* and *Notopterus notopterus* from carnivore group and Mackerel, *Anabas testudineus, Rhinomugil corsula, Pampus chinensis* and *Scatophagus argus* from omnivore group. Among the fishes surveyed, some showed potent antioxidant activity in vitro. Both qualitative and quantitative assays were done. The qualitative assay was based on thin layer chromatographic method. DPPH was sprayed on the chromatogram and light yellow spot on purple background indicated the presence of antioxidant constituents. Quantitative evaluation was done by DPPH scavenging activity in terms of IC50 (concentration at which 50% of the free radical is inhibited). In quantitative assay the freshwater fish species were found to possess comparatively higher antioxidant component than the marine species in terms of IC50. The rohu, Labeo rohita had the highest antioxidant constituents with IC50 at about 4µg/ml. Other freshwater species showing moderate antioxidant activities included *Glossogobius giuris* (IC50 about 292 µg/ml), *Amblypharyngodon mola* (IC50 about 520 µg/ml), and *Gibelion catla* (IC50 about 538 µg/ml). The marine species, *Megalaspis cordyla*, for example, showed the mild antioxidant activity with IC50 value about 408 µg/ml. Similar analyses were carried out in herbivore, carnivore and omnivore fishes and all were found to possess moderate



Percent inhibition of DPPH free radical by fresh water fish species and ascorbic acid



Percent inhibition of DPPH free radical by marine fish species and ascorbic acid



Percent inhibition of DPPH by herbivore fish species and ascorbic acid

to mild antioxidant activity. The lowest IC50 value 154.45 µg/ml was obtained in *Ctenopharyngodon idella* under herbivore group.

In carnivore group, comparatively lower IC50 values were found in *Channa striatus* and *Channa punctatus* (327.69µg/ml and 346.32µg/ml respectively). In the omnivore category, out of the five species tested, *Anabas testudineus* showed the lowest IC50 value about 327.69µg/ml. This is the first study to evaluate the presence of antioxidant activity in food fish species in Bangladesh. Fish being a common food items in the diet of the people of Bangladesh, knowledge on the availability of the precious components - the antioxidants, in food fishes helping to get rid of the causes of various diseases in the human body can be proved very important.

BdFISH: an Online Platform for Sharing Fisheries Information

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Bangladesh Fisheries Information Share Home (BdFISH) is an online platform for sharing fisheries information to all especially those are interested in fisheries. BdFISH was established in the year of 2007 by a team consisted of some committed teachers and students of the Department of Fisheries, University of Rajshahi. Though initially the activities of BdFISH was confined to the website (www.bdfish.org) only, later, in course of time, BdFISH became involved in many other activities for disseminating fisheries information to an wider range of people.

Bangladesh is rich in biodiversity with her large numbers of fish and other fauna and flora, vast areas of open, closed and semi-closed water-bodies and other resources like manpower, equipments, institutions, industries etc. Moreover, the environmental condition and geographical location of the country is suitable for fish and other aquatic organism as well as favorable for aquaculture. In this backdrop, fisheries science and technology plays a vital role for management and conservation of fisheries resources and development of aquaculture. We think information sharing is one of the best tools for developing fisheries science as well as the sector. People who are interested in sharing fisheries information may join BdFISH team and contribute for development.

Activities

- Publishing websites:
- BdFISH (en.bdfish.org)
- BdFISH Bangla (bn.bdfish.org)
- Publishing a wall magazine entitled 'Fisheries Window'
- Developing fisheries related documents
- Organizing other information sharing events like discussion, debate, quiz, photography etc.

Web Page

BdFISH website (en.bdfish.org) contains almost all types of fisheries information (resources, biology, aquaculture, management, technology, trade, events, publication review etc.) with special emphasis on Bangladesh fisheries. It is the first Bangladesh fisheries based online information sharing website launched in Bangladesh and already proved its excellence by drawing attention of wide range of people from different parts of the world. BdFISH Bangla (bn.bdfish.org) was developed for providing opportunities to to people who are interested in sharing information in our mother tongue, Bengali. This site is not a Bengali version of BdFISH site. It is rather an independent Bangla internet site.

To create strong communication and coordination among the peoples interested in fisheries aspects an open group of BdFISH was created on popular social website Facebook. BdFISH is going to publish the first fisheries e-magazine in Bangladesh entitled 'Bangladesh Fisheries E-Magazine'. The team is also working for broadcasting Fisheries News (Audio) on BdFISH websites.

'Fisheries' Window is a wall magazine published in the Department of Fisheries, University of Rajshahi by the BdFISH Team on regular interval. The magazin covers different categories of fisheries features, photographs, quiz, poetries, research findings etc. Third issue of the magazine has already been published.

Now-a-days, information and communication technology is much advanced. BdFISH is trying to improve the sharing of fisheries information among the interested people. BdFISH team cordially invites students, teachers, and research, extension and development personnel to share their ideas, views, research findings, innovations, inspiration, proposal and suggestion for development including profiles and activities relevant to fisheries. All activities of BdFISH are non-commercial, non-profitable and voluntary. Since money is the key factor to make such efforts, any kind of donation for BdFISH is well appreciated.

Impacts

National and international communications among the fisheries scientists are developed. Organizations taking part in development of fisheries sectors are seeking assistance from BdFISH for better implementation of their programmes. Students, farmers and entrepreneurs are also found to be benefited through receiving responses to their specific queries from BdFISH.

For more information please visit our sites. You may also email to us (contact@bdfish.org) without any hesitation.

Web Page

Net for Knowledge & Information

Web Page

General information on any topic
www.wikipedia.org
www.banglapedia.org
www.ask.com

Fish taxonomy, nomenclature and related information
www.itis.gov
www.fishbase.org
www.eol.org
www.planetcatfish.com
www.iczn.org

Maps
www.google.com/earth/index.html
www.wikimapia.org
www.maps.yahoo.com
www.sparrso.gov.bd

Organizations

National

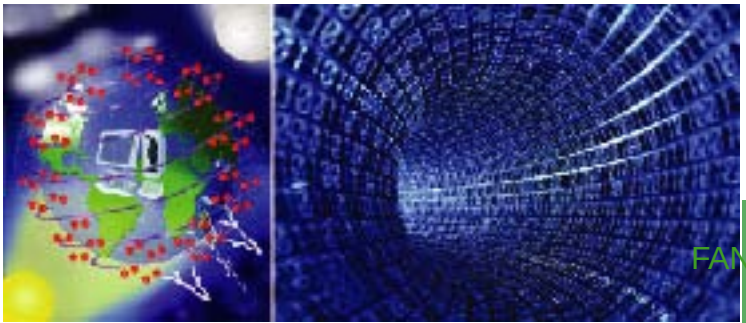
Bangladesh Fisheries Research Forum (BFRF) www.bfrf.org
Bangladesh Fisheries Research Institute (BFRI) www.fri.gov.bd
Bangladesh Livestock Research Institute (BLRI) www.blri.gov.bd
Department of Fisheries (DoF) www.fisheries.gov.bd
Soil Resource Development Institute (SRDI) www.srdi.gov.bd

International

Danish International Development Assistance www.um.dk/en/danida-en
Food & Agricultural Organization www.fao.org
Network of Aquaculture Centres in Asia-Pacific www.enaca.org
United Nation www.un.org
United Nations Development Programme www.undp.org
United Nations Environment Programme www.unep.org
WorldFish Center www.worldfishcenter.org

NGOs

BRAC www.brac.net
CARITAS www.caritasbd.org
COAST www.coastbd.org
PROSHIKA www.proshika.org
SHUSHILAN www.shushilan.org



Universities

which include fishereis education & research

National

Bangladesh Agricultural University (BAU) www.bau.edu.bd
Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) www.bsmrau.edu.bd
Chittagong University (CU) www.cu.ac.bd
Dhaka University (DU) www.univdhaka.edu
Hajee Mohammad Danesh Science & Technology University (HSTU) www.hstu.ac.bd
Jessore Science & technology University (JSTU) www.jstu.edu.bd
Khulna University (KU) www.ku.ac.bd
Noakhali Science & technology University (NSTU) www.nstu.edu.bd
Patuakhali Science and Technology University (PSTU) www.pstu.ac.bd
Rajshahi University (RU) www.ru.ac.bd
Sher-e-Bangla Agricultural University (SAU) www.sau.ac.bd
Sylhet Agricultural University www.sylhetagrivarsity.edu.bd

Overseas

Arizona State University www.asu.edu
Asian Institute of Technology www.ait.ac.th
Auburn University www.auburn.edu
Copenhagen University www.ku.dk/english
Hokkaido University www.hokudai.ac.jp
Kagoshima University www.kagoshima-u.ac.jp
Kyoto University www.kyoto-u.ac.jp/en
Kyushu University www.kyushu-u.ac.jp
Louisiana State University www.lsu.edu
Mie University www.mie-u.ac.jp
Nagasaki University www.nagasaki-u.ac.jp
Nagoya University www.nagoya-u.ac.jp
North Carolina State University www.ncsu.edu
Oregon State University www.oregonstate.edu
Osaka University www.osaka-u.ac.jp
Stirling University www.stirling.ac.uk
Texus A&M University www.tamu.edu
Tokyo University of Marine Science & Technology www.kaiyodai.ac.jp
Tokyo University www.u-tokyo.ac.jp/index_e.html
Universiti Putra Malaysia (UPM) www.upm.edu.my
Universiti Sains Malaysia (USM) www.usm.my
University of British Colombia www.ubc.ca

piece of information on fish

the tiniest & the largest

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Fish range in size from the 8 mm (just over ¼ of an inch) *Paedocypris progenetica* to the 16 m (51 ft) whale shark

the tiniest fish

The tiniest vertebrate of the world is *Paedocypris progenetica*, a fish of the carp family lives in forest swamps in the Indonesian island of Sumatra. It is the world's smallest vertebrate or backboned animal. An adult fish reaches only 7.9 mm (0.32 inch) in total length. After attaining maturity the fish have the appearance of larvae and have a reduced head skeleton, which leaves the brain unprotected by bone. The fish is usually found in pools of acid water in tropical forest swamp, nonetheless it can live through even extreme drought by seeking refuge in the last puddles of the swamp. The males have a little clasp underneath to help fertilize eggs and the females have room to carry just a few eggs. Many of the miniature relatives of *P. progenetica* may already have been wiped out. The tiniest fish are at great risk of extinction due to the rapid destruction of Indonesian peat swamps for oil palm plantations. In 1997 the peat swamps were damaged by large forest fires and they are still threatened by logging, urbanization and agriculture. Several populations of *P. progenetica* have already been lost.

the largest fish

The world's largest fish species whale shark, *Rhincodon typus* of Rhincodontidae family is actually one of the most docile and graceful creatures in the ocean which was first sighted in South Africa in 1828. The only member of the Rhincodon genus, whale sharks are found in tropical ocean waters throughout the world, but are particularly prolific in the waters surrounding the Philippines, the Gulf of Mexico and Western Australia. Measuring over (16 m) 50 feet long, weighing over 30 tons each, with skin 10 centimeters thick, they have hundreds of teeth in their meter-long mouths, with their wide, flat heads, speckled grey and white torsos, and three characteristic ridges on their sides. Gliding slowly through the ocean, these blissful giants use their entire bodies to propel themselves through the water, reaching average speeds of around 5 kilometers an hour. Whale sharks live long having a lifespan of 70 years. They have been noted to live since 60 million years ago.

Although it is, by virtue, a shark; but like whales, it is a filter feeding fish surviving largely on plankton and krill. With around 1,000 individually identified whale sharks worldwide, the IUCN has listed the whale shark as 'vulnerable', meaning - whale sharks in the wild are at risk of extinction in the medium-term future. The main threat is from harpoon fishing as the slow-moving fish is a relatively easy catch.
Photos & information - Internet

the largest fish

fish information

Department of Fisheries - at a glance

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Department of Fisheries (DoF), Bangladesh was established in the undivided Bengal of the British India in 1908. In 1910 the DoF was abolished through merging with the Department of Agriculture. Again as per recommendation of Mr. T. South Well, the DoF became an independent organization in 1917. The DoF was abolished again in 1923. After a long gap, following the recommendation of Dr. M. Ram Swami Naidu, the DoF was revived in May 1942. Since the inception of the then East Pakistan (now Bangladesh) the DoF has been continuing as a frontline public sector organization for fisheries development in the country. After the independence of Bangladesh in 1971, the Central Fisheries Department of the then Pakistan was merged with the DoF of Bangladesh in April 1975. Later on in 1984 Central Marine Fisheries Department was merged with the DoF as a Marine Fisheries Wing.

DoF is under the administrative control of the Ministry of Fisheries and Livestock. The Department is headed by a Director General, who is assisted by four Directors (one reserve) and two Principal Scientific Officers (equivalent to Director). Countrywide there are 1,553 technical officers of different levels and supporting staffs in the DoF. They render their services to achieve the mission of DoF. There are administrative set-ups at division, district and upazila levels headed by Deputy Director, District Fisheries Officer and Senior/Upazila Fisheries Officer, respectively. In addition there are three Fish Inspection and Quality Control Stations of DoF in Khulna, Chittagong and Dhaka. DoF also has Marine Fisheries Station, Fisheries Training Academy, Fisheries Training and Extension Centers and Fish Hatcheries. DoF has some wings to render its services like- Inland Fisheries, Marine Fisheries, Fisheries Resource Survey System (FRSS), Fish Inspection and Quality Control (FIQC) and Training.

Main mandate of DoF is to disseminate improved aquaculture technologies through training and demonstration and to render extension advisory services to the stakeholders. A national fisheries policy has been adopted to make the aquaculture and fisheries management eco-friendly and sustainable. For fisheries resources conservation, management and maintenance of quality of fish and fish products a number of major ordinances and rules are being enforced. National Fisheries Strategy has been developed and approved by the MoFL in 2006. In addition to the routine activities DoF is implementing several development projects aiming at boosting up fish production and conservation of fisheries resources. In 2010-2011, a total of 20 investment projects, 2 programs and 2 technical assistance projects are under implementation.

Campaign for boosting fish production and resource management, Fish Week/Fortnight and Jatka Conservation Week have been observed in every year. Raising awareness for the conservation of fisheries resources is also an objective of these campaigns. This year, the National Fish Week 2011 was observed during 20-26 July with the slogan "Nirapod Machhe Bhorbo Desh, Bodle Debo Bangladesh" meaning 'we will load the country with safe fish and will transform the country'.

For quick and updated information about DoF and aquaculture technologies, a website - www.fisheries.gov.bd has been launched.

Bangladesh Fisheries Research Institute : New Hope in Fisheries R & D

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The fish and fisheries are integral part of the culture and heritage of Bangladesh. The sector plays a significant role in nutrition, employment generation and foreign exchange earnings. In this perspective, Bangladesh Fisheries Research Institute (BFRI) was established in 1984 with a view to develop appropriate technologies to harness the vast potentials of the fisheries sector for food, nutrition and economic development through increasing production from all sub-sectors of fisheries. Thus, its research programme primarily aims to evolve appropriate production and management methods for sustainable growth in fish production from the country's vast aquatic resources. BFRI is designated to serve as the national resource for technical information on fisheries and to continuously generate and standardize appropriate production and resource management technologies and guidelines for country-wide extension by the Department of Fisheries and the concerned government and non-government organizations.

The mandate of BFRI is to carry out and coordinate fisheries research in Bangladesh. It functions as an autonomous body with a Board of Governors overseeing the execution of its mandate by providing necessary policy and administrative guidance. The main goals of BFRI are -

- To carry out fisheries and aquaculture research and coordinate all fisheries research in Bangladesh, and
- To assist in the development of more economic and effective methods and technologies for fish production and ecosystem management, management of fisheries and all related activities and provide improved training and research-based technology transfer.

Though the Institute was established in 1984, its functioning actually started in 1986 with the recruitment of required manpower and creation of initial research facilities. Presently the scientific manpower strength is about 80, 50% of whom are having PhDs in various fields of aquaculture and fisheries from different national and overseas universities. Since inception, the institute has been playing a key role in assisting the nation to achieve the goal of fisheries development as set out in successive development plans.

The Headquarters of the institute is located at the south-west corner of the Bangladesh Agricultural University campus in Mymensingh, which is about 120 km north of the capital city, Dhaka. The headquarters functions through its various divisions in respect of administrative development, coordination and operation of its research programs. In addition to the headquarters, there are five research stations based on ecological zone and water resources viz. Freshwater Station, Mymensingh; Riverine Station, Chandpur; Brackishwater Station, Paikgacha, Khulna; Marine Fisheries and Technological Station, Cox's Bazar and Shrimp Research Station, Bagerhat and also there are five sub-stations: Freshwater Sub-stations (2) at Jessore & Sayedpur and Riverine Sub-stations (3) at Rangamati, Santahar & Khepupara.

Organizations

Research Achievement

Fisheries researches crried out by BFRI have made a significant contribution to large growth of aquaculture through generating a number of economically viable, socially acceptable and environmentally compatible technologies being used by different category of farmers - large and small. In accordance with the Govt. priority for the development of fisheries sector, the Institute has been playing significant role in developing country's fisheries resources. BFRI so far developed about 50 improved aquaculture and management technologies aimed at increasing aquaculture production among which those found viable in farmer's field are -

- Monosex seed production and culture of BFRI super tilapia strain;
- Mass seed production technique of climbing perch (*Anabas testudineus*) and stinging catfish (*Heteropneustes fossilis*);
- Mass seed production and culture of riverine catfish (*Pangasius* spp.);
- Improved culture management of carps, catfish and shrimp;
- Polyculture of carps and prawn;
- Integrated rice-fish and floodplain fish farming;
- Fish culture in pen and cages; and
- Crab fattening.

All the technologies have been successfully transferred and disseminated to farmers and entrepreneurs in major areas of the country through training and demonstrations and distribution of extension leaflets, booklets and manuals. Recently, through adoption of these technologies in the suitable water bodies, the fish farmers have been tremendously contributing to aquaculture production.

BFRI has already fine tuned its major aquaculture technology packages on the basis of regional need and agro-ecological suitability. The institute has been continuously involved in extension of newly evolved suitable technologies in collaboration with Department of Fisheries (DoF), Universities and other GO/NGO partners. It is hoped that the national objectives of food security and poverty alleviation particularly in the rural sector would mostly be achieved by massive transfer of the generated technologies through training and demonstration all over the country involving all GO and NGOs including progressive farmers and entrepreneurs.

BFDC at a glance

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Bangladesh Fisheries Development Corporation (BFDC) is a public sector organization under the Ministry of Fisheries & Livestock. After establishment of BFDC in 1964, the country crossed the threshold of new era in the field of fisheries development in so far as the number of commercial fishing trawlers increased from zero to 141 that of mechanized fishing boats from few dozens to about 22,000, number of Fish Processing Industries from 5 to 133 and the overall increase in marine fish catch from 90,000 metric tons in 1974-75 to 5,17,282 metric tons in 2009-2010. Moreover Infrastructure development and scientific exploitation of Kaptai Lake resources in Rangamati are also being accomplished by BFDC through improved management.

Functions

The main functions of the BFDC are to help develop the fisheries sector with the following objectives :

- To take all measures for the development of fisheries and fishing industries
- To establish fishing industry
- To establish units for capture of fish and promote better organization for exploitation of fish wealth
- To acquire, hold or dispose of fishing boats, fish carriers, road and river transports and all equipment and accessories necessary in connection with the development of fishing industry
- To establish units for preservation, processing, distribution and marketing of fish and fish products
- To undertake survey and investigation of the fishery resources
- To establish institute or make arrangement for the training and research in the methods of catching, processing, transportation, preservation and marketing of fish
- To set-up organization for export of fish and fish products
- To acquire, hold and dispose of such other properties as are required for carrying out all or any of the above mentioned purposes
- To formulate schemes for carrying out all or any of the functions specified above

Pioneering role of BFDC

- Establishment of Chittagong Fish Harbour, the only Fish Harbour of the country
- Survey and study of the sea fish resources of the Bay of Bengal. The study carried out during 1966-71 identified four potential fishing grounds - South Patches, West of Elephant point, East of Swatch of no Ground and Swatch of no Ground.
- Introduction of deep sea trawlers for commercial fishing in the Bay of Bengal. The programme started in 1972 with a fleet of 10 trawlers donated by USSR.
- Mechanization of country fishing boat and Modernization of fishing units. Prior to creation of BFDC in 1964, there was no mechanized fishing unit in Bangladesh (the then East Pakistan). In 1966, BFDC with the aid of FAO and SIDA under the "Freedom From Hunger campaign Scheme" acquired and introduced a fleet of 265 mechanized boats.
- Establishment of modern fish net factories and thereby replaced cotton net by improved net made of nylon and poly-propylene twine. This venture motivated private sector to establish about 35 modern net factories in different parts of the country.

- Establishment of modern Fish Processing and Preservation Factories just after liberation of Bangladesh in Chittagong, Cox's Bazar, Pagla (Narayangonj) and Mongla (Bagerhat).
- Establishment of Chittagong Marine Fisheries Academy to train up Master Fisherman and other trawler personal.
- Improvement of management, infrastructure development and scientific exploitation of Kaptai Lake resources in Rangamati.
- Establishment of modern fish landing and distribution centres with cold store and Ice plant facilities mainly along the coastal belt.
- Popularization of seafish and small scale production of value added fish products - fish burger, finger, ball, cake, cutlet etc. from low value small marine fish.
- BFDC has long been selling formalin free Fish in Dhaka metropolitan area.

Existing units

- Chittagong Fish Harbour, Chittagong
- Trawler Fleet, Fish Harbour, Chittagong
- Kaptai Lake Fisheries Development and Marketing Centre, Rangamati
- Fish Processing and Marketing Centre, Cox's Bazar
- Fish Processing and Marketing Centre, Mongla
- Fish Processing and Marketing Centre, Pagla, Narayangonj
- Fish Landing, Preservation and Distribution Facilities Centre, Monoharkhali, Chittagong
- Fish Landing and Wholesale Fish Market, Cox's Bazar
- Fish Landing and Wholesale Fish Market, Khulna
- Fish Landing and Wholesale Fish Market, Barisal
- Fish Landing and Wholesale Fish Market, Patharghata
- Fish Landing and Wholesale Fish Market, Rajshahi
- Mahanagar Jalashoya Unit, Dhaka (Fish Culture in Dhaka City lakes)

Existing facilities

Name of the Facilities	Location	Number/ Capacity
Fish Harbour	Chittagong	1
Fish Landing & Wholesale Fish Market	Monohorkhali (Chittagong), Cox's Bazar, Khulna,Barisal, Patharghata, Rajshahi, Rangamati	7
Ice Plants	Chittagong, Cox's Bazar, Rangamati, Pagla, Mongla, Patharghata, Barisal, Rajshahi, Khulna	15/235 MT per day.
Fish Processing Plants	Chittagong, Cox's Bazar, Pagla(Narayangonj), Mongla(Bagherhat)	4
Cold Stores	Chittagong, Cox's Bazar, Pagla, Mongla	12/1630 MT
Freezing Plant (Blast and Plate freezer)	Chittagong, Cox's Bazar, Pagla, Mongla	12/48.50 MT per day
Frozen Storage	Chittagong, Cox's Bazar, Pagla, Mongla	9/1100 MT
Fish Auction Hall	Fish Harbour (Chittagong), Monohorkhali (Chittagong), Barisal, Patharghata, Khulna, Rajshahi, Cox's Bazar, Rangamati, Kaptai, Pagla (Narayangonj)	9
Insulated Fish-Van	Pagla (Narayangonj)	6
Fishing Trawler	Chittagong	(Shrimp-2White Fish-7) = 9
Marine Workshop	Chittagong	1
Dock Yard having two slipways	Chittagong	1
Slipway for mechanized boats	Patharghata	1

Organizations

The WorldFish Center

The WorldFish Center is an international, non-profit research organization dedicated to reducing poverty and hunger by improving fisheries and aquaculture; the science partner of choice for delivering fisheries and aquaculture solutions for developing countries. The WorldFish is one of the 15 members of the CGIAR Consortium. The CGIAR is a global partnership that unites organizations engaged in research for sustainable development with funders, including governments, foundations, and international and regional organizations. CGIAR research is dedicated to reducing poverty and hunger, improving human health and nutrition, and enhancing ecosystem resilience.

Recognizing the opportunities that fisheries and aquaculture offer for the poor, the hungry and the vulnerable, we at the WorldFish are committed to meeting two key development challenges:

- To improve the livelihoods of those who are especially poor and vulnerable in places where fisheries and aquaculture can make a difference.
- To achieve large scale, environmentally sustainable increases in supply and access to fish, at affordable prices, for poor consumers in developing countries.

To meet these challenges our research focuses on generating and synthesizing knowledge which we then share and help apply.

From new syntheses and analysis to targeted, on the ground delivery and knowledge sharing, our technologies, products and services help to make development happen while learning how to do it better. With more than 200 staff, including 36 Ph.D. scientists, based in 8 countries across Asia, Africa and the Pacific we work in more than 19 countries around the world. Currently our regional or country offices are in Bangladesh, Cambodia, Egypt, Malawi, Malaysia (HQ), Philippines, Solomon Islands, and Zambia.

WorldFish's mission touches the lives of millions of people whose lives and livelihoods depend on fish. We are proud of our role in reducing poverty and increasing food and nutrition security through fisheries and aquaculture.

WorldFish
CENTER

Reducing poverty and hunger by improving fisheries and aquaculture

Prospects of Fisheries Resources Development in Greater Sylhet Region and role of Faculty of Fisheries, Sylhet Agricultural University

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Sylhet region or greater Sylhet is the north-eastern part of Bangladesh includes four districts - Sylhet, Maulvi Bazar, Sunamganj and Habiganj. Sylhet is a land of 360 Awliyas (the Muslim Saints). The great Saint Hazrat Shah Jalal (R) came to Sylhet from Delhi with 360 disciples to preach Islam and defeated the then Raja Gour Gobinda. Sylhet thus became a district of saints and shrines. Sylhet is also the tea granary of Bangladesh. The area is surrounded by the hills and floodplain basins which constitutes one of the most distinctive regions in Bangladesh. The physiography of Sylhet consists mainly of hill soils, encompassing a few large depressions known locally as 'Haors' caused by tectonic subsidence primarily during the great earthquake of 1762. The area covered by Sylhet division is 12,569 km², about 8% of the total land area of Bangladesh

Greater Sylhet is enriched with enormous fisheries resources. It has large open water bodies among them different rivers, haors and beels are most important. There are 197 haors in greater Sylhet region which covers 1384 km2 . Among the haors, Hakaluki and Tanguar haor are the most famous enjoying an huge interest from government, NGOs, biologists, tourists as well as international scientists. Tanguar and Hakaluki haors play an important role in fish production as they function as 'mother fishery' for the country enabling many fishermen to earn their living. There are 0.381 million hectare flood land in Sylhet which is 14.28% of the total flood land of the country. These areas are blessed with various fishes, crustaceans and mollusks which have high commercial importance both locally and internationally. Bangladesh economy is greatly benefited from the resources.

In past, the greater Sylhet was enriched with diversified fish species. However, in the recent years, numbers of fish species have been dwindling due to various reasons. According to Department of Fisheries (DOF) and different development organizations, about 130 species among total 270 freshwater fish species of Bangladesh were available in the haors of this region. However, in recent years, about 62 fish species once abundantly available in haors are now near extinct and already been locally. Some of these fishes can be categorized as endangered and critically endangered. On the other hand, in Sylhet about 21.12% (1,66,916 ha) of the total land/seasonal waterbody are fallow which is the largest in comparison with other districts. In Sylhet there are also many borrowpits, roadside canals, ditches etc. This fallow land and seasonal water bodies have huge potential for openwater fisheries management and aquaculture development in this area.

Hakaluki Haor

Faculty of Fisheries
Sylhet Agricultural University

Sylhet Agricultural University established in 2006 is situated in the western side and 6 km away from the Sylhet town. The campus is surrounded with many small and large hills and valleys that creates beautiful natural outlook and makes the university one of the most charming. Faculty of Fisheries (FoF) is the most promising and popular faculty as it is situated in such an area where there is lots of scope for the development of fisheries and aquaculture. Faculty of Fisheries under Sylhet Agricultural University started its activities from 2008. The main task of the faculty is to tone up quality and standard of higher education in fisheries and to produce quality fisheries graduate and scientists for shouldering the responsibilities of fisheries development as well as agricultural development of greater Sylhet as well as the country as a whole.

Faculty of Fisheries comprises of six departments namely Department of Aquaculture, Fisheries Biology and Genetics, Aquatic Resources Management, Fisheries Technology and Resource Utilization, Fish Health Management and Coastal and Marine Fisheries. Along with routine teaching and other activities, Faculty of Fisheries is contributing in fisheries sector of Bangladesh through different research activities funded by different organization and Sylhet Agricultural University Research System. The teachers of the faculty expect that soon research activities - both Basic and adaptive will be started at even wider scale.

To save the aquatic biodiversity the country needs intensive research activities on fish species and the other aquatic animals in this region. Development of breeding and hatchery management techniques of different endangered species, practicing of good aquaculture systems and proper management of fisheries resources in different open water bodies in this area can ensure enriched fish biodiversity and sustainable fish production. In this regard, Faculty of Fisheries of Sylhet Agricultural University can play a vital role through producing quality fisheries graduates who will lead to the revolution of fisheries sector of the country. Research activities under Faculty of Fisheries of Sylhet University in different fields of fisheries can save the fish and other aquatic animals from extinction which will help to conserve the biodiversity of haor basin of Sylhet region.

BFRF Training

Bangladesh Fisheries Research Forum arranged training programs jointly with Innovision Consulting Private Limited and KATALYST at the Bangladesh Fisheries Research Institute, Mymensingh on "The fry/fingerling production of Tilapia, Thai Koi and Thai pangas: Hatchery and Culture Management" over 9 days during15-19 April and 29 May - 01 June, 2011. The main goal of the training was to link fish hatcheries with BFRF for technical assistance in increasing productivity and quality of produced fingerlings The broad objective of the program was to improve the skill and knowledge of hatchery owners and technicians on appropriate hatchery management. If the hatchery owners and technicians can implement the knowledge of trainings in hatchery management then the fry/fingerling quality will improve. That will ultimately ensure the supply of quality fingerling at farmers' level. Specific objectives of the training were - to train up hatchery owners and technicians on the selected species (Tilapia, Thai Koi and Thai Pangus)

hatchery management and to create a strong linkage between hatchery owners and knowledge provider institution for further technical assistance.

About fifty trainees participated in the training. The trainee hatchery owners came from different parts of the country - Mymensingh, Rangpur, Bogra, Dinajpur, Dhaka, Jesore, Barisal, Patuakhali and other areas. BFRF composed and published three training manuals for the trainees. Innovision Consulting Private Limited printed the three manuals and distributed to the trainees and to the countrywide stakeholders.

The training was very fruitful and achieved its objectives. To ensure better production of Tilapia, Thai Koi and Thai pangas, quality of fingerlings has long been one of the major issues. One of the major constraints of hatchery management is lack of knowledge and skill of hatchery owners and technicians. To improve the skills of hatchery owners and technicians, the training was a successful one. The increased knowledge-base and improved skill of the hatchery owners and technicians participated in the training would have sustainable and multiplier effect in the fish seed and table fish production of the country. All the participants would employ the techniques they learnt, the skill they achieved and the knowledge they gather immediately in their hatcheries and would share with their neighbouring hatchery owners in the years to come. The training also created a strong linkage among the hatchery owners came from the different corners of the country and between the hatchery owners and knowledge providers (BFRF and the trainers) for further technical assistance. In the long run, the linkage would go a long way through technical exchange, fish seed trading and skilled manpower supply among the hatcheries of Bangladesh.

BFRF organized training on Tilapia, Thai Pungus & Thai Koi for 50 hatchery operators and farmers

Training

New Books

GENETICS OF AQUACULTURE AND FISHERIES MANAGEMENT

Genetics of Aquaculture and Fisheries Management

Author - M. S. Shah, Khulna University, Khulna
Publisher - Mrs. Zinnatun Ara Shah, Khulna
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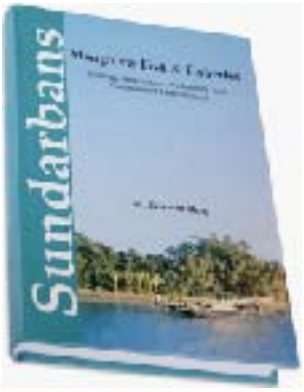
Publication Date - 2010 Binding - Softcover
Pages - 269 ISBN - 978-984-33-1708-7

The book as the name goes deals with the genetics pertinent to aquaculture and fisheries management. The book starts with an introductory chapter and a chapter on the text of basic genetics followed by a chapter on history and breeding biology and reproductive genetics. Three chapters on the issues of fish genetics of Bangladesh perspective have been included - fish genetic resources of Bangladesh, hatcheries and brood management of Indian major carps: Bangladesh context and hatchery management of Indian major carps: a case study. A chapter on aquaculture genetics review has also been included. Among the other chapters which are specifically on aquaculture and fisheries management, have been arranged in that fashion; two more chapters, one each on genetics of mutation and thermal effects have been included, and again briefly two others on cytogenetics and population genetics theories and principles have been added. A chapter on the detailed glossary of the terms used in the book has also been provided at the end. The contents have been arranged in such an order that they can easily draw the keenest attention of a potential reader in the field. Genetics is an innate biological subject and the students often find difficulties in comprehending the text books available in the market. With regard to this, it is believed that this book would go a long way in meeting the needs of the students and member on the staff of fisheries at the university level in particular, and researchers and planners in the field of fisheries, in general.

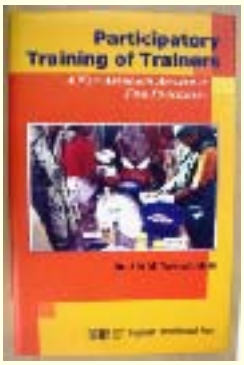


SUNDARBANS MANGROVE: FISH & FISHERIES

Ecology, Resources, Productivity and Management Perspectives

Author - M. Enamul Hoq, Bangladesh Fisheries Research Institute, Mymensingh
Publisher - Graphic Media, Dhaka
Publication Date - 2008 Binding - Hardcover
Pages - 271 pp ISBN - 984-32-1259-2

Sundarbans is the largest productive contiguous mangrove forest in the world, located in the south-western part of Bangladesh. At present it extends over 577,356 ha of which 175,724 ha is water. There are three protected areas in the Sundarbans Reserved Forest (SRF), which constitute the core area of the World Heritage Site, inscribed in 1997. The total area of the World Heritage Site is about 1,400 km^2, of which 490 km^2 is water. A large number of people of the country are dependent on fishery activity and capture fisheries of Sundarbans. The book Sundarbans Mangrove: Fish and Fisheries contained nine broad chapters namely mangrove overview, the Sundarbans mangrove, fisheries of the Sundarbans, coastal aquaculture & Sundarbans, environmental impacts & Sundarbans ecosystem, fisheries products from the Sundarbans, analysis of mangrove & SRF management, fisheries research on the Sundarbans, and code of conduct & practices for the management & sustainable use of mangrove ecosystems. The book is not confined only to the Sundarbans. Information on mangroves and related fisheries are generated from literatures of home and aboard. The basic mangrove ecology, productivity and management perspectives are included in the book as well.



Participatory Training of Trainers

A New Approach Applied in Fish Processing

Author - A K M Nowsad Alam, Bangladesh Agricultural University, Mymensingh
Publisher - Bangladesh Fisheries Research Forum (BFRF)
Printer - Bengal Con-print, 68/5 Green Road, Dhaka
Publication Date - 2007 Binding - Hardcover
Pages - 328 ISBN - 984-32-2717-4

The book describes a new training approach developed and introduced for conducting training of trainers (ToT) for the GO-NGO extension workers of Cox's Bazar, where most of the marine fish are landed and processed through small-scale processing enterprise. The ToT was brought into the field and made effective avoiding classroom based approach of delivery. A self-facilitated fully participatory training technique was applied. In addition of the principles and applications of the new ToT, the book also covers the best possible choice of appropriate fish processing technologies mainly suited for small-scale processors. These include post-harvest handling and distribution of fish, icing, sun-drying, smoking, salting, fermenting, packaging and quality control of domestic fish products. Adaptable improved techniques of fish handling, preservation and processing and low-cost, sustainable and user/environment friendly technologies developed by participatory stakeholder-based methods have also been included in this book. The new ToT technique and improved fish handling and artisanal fish processing methods described here would be of immense value to the trainers and extension workers of post-harvest handling and fish processing and would help the fishers/small-scale processors as well as the development partners, students, researchers and teachers in minimizing post-harvest loss of fish and ensuring quality of the products.

BE AWARE - POISONOUS POTKA Fish Facts

Around 100 Bangladeshi die every year after eating potka fish.

The potka (tapa, tapora) fish contain-Tetrodotoxin, also known as "tetrodox" is a potent neurotoxin with no known antidote.

The toxin is also known as Anhydrotetrodotoxin, 4-epitetrodotoxin, tetrodonic acid and TTX.

Fish poisoning by consumption of potka is extremely serious.

Particularly during monsoon the skin, gut, liver, gonad of potka is full of toxin.

Tetrodotoxin is roughly 10 times more poisonous than potassium cyanide.

25 milligrams of tetrodotoxin would be expected to kill a person weighing 75 kg.

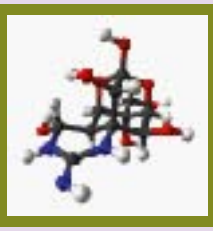
Some organs of the potka can contain levels of tetrodotoxin sufficient to produce paralysis of the diaphragm and death due to respiratory failure

Symptoms typically develop within 30 minutes of ingestion, but may be delayed by up to four hours; however, death might occurred within 17 minutes of ingestion

Paresthesias of the lips and tongue are followed by sialorrhea, sweating, headache, weakness, lethargy, ataxia, incoordination, tremor, paralysis, cyanosis, aphonia, dysphagia, seizures, dyspnea, bronchorrhea, bronchospasm, respiratory failure, coma, and hypotension.

Gastroenteric symptoms are often severe and include nausea, vomiting, diarrhea, and abdominal pain. Cardiac arrhythmias may precede complete respiratory failure and cardiovascular collapse.

information : wikipedia.org
photo : mostafa a r hossain



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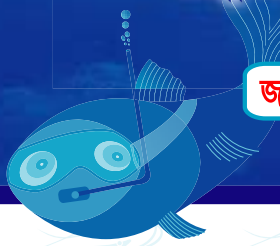

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Location: China
Contact: hintermeeting@gmail.com

Aquaculture America 2012
www.was.org
February 29 - March 02, 2012
Location: Las Vegas, Nevada, USA
Contact: worldaqua@aol.com

India International Seafood Show
www.indianseafoodexpo.com
February 29 - March 02, 2012
Location: Chennai, India
Contact: info@indianseafoodexpo.com

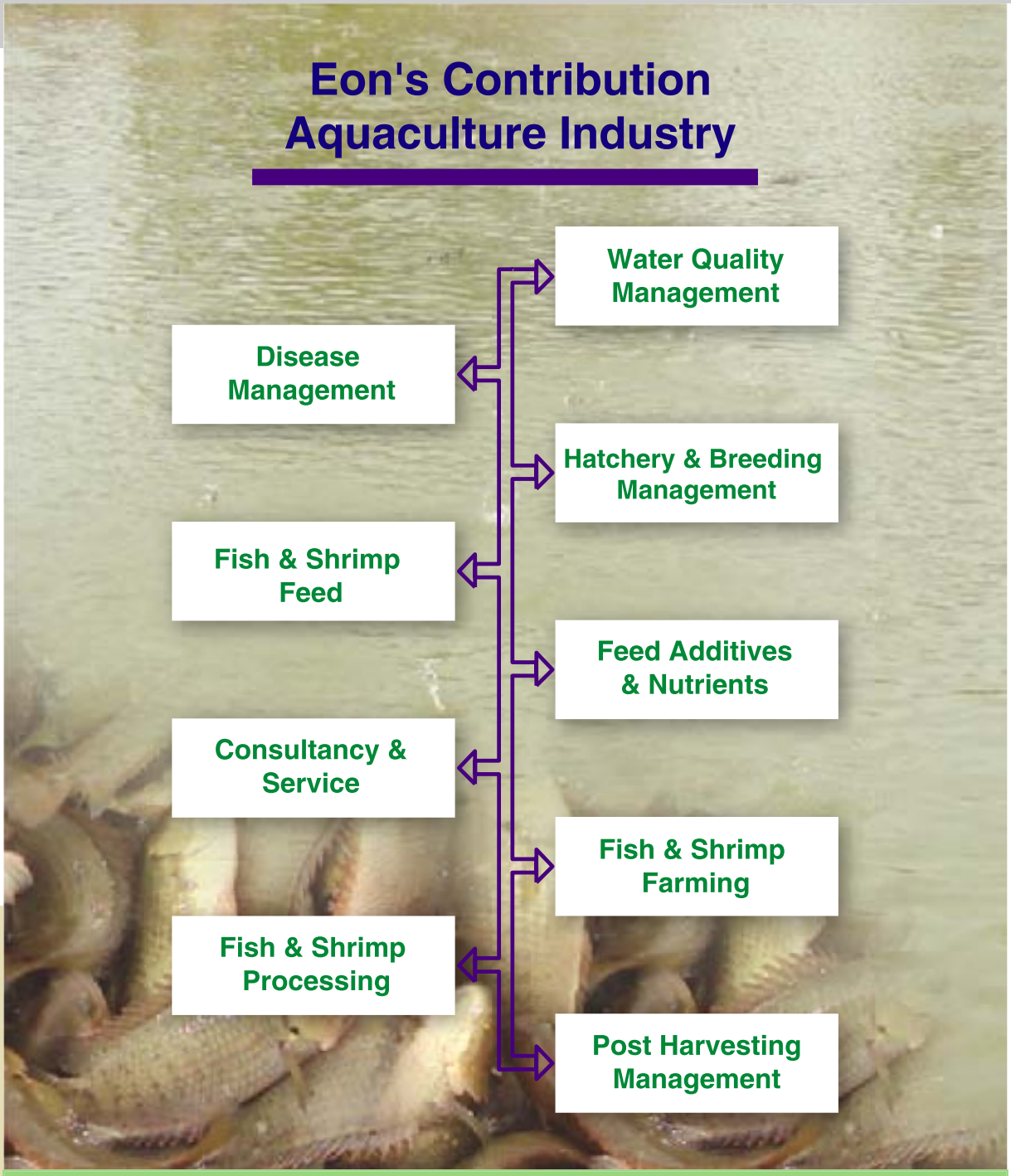
Australian Aquaculture 2012
www.australian-aquaculture.com
May 01-04, 2012
Location: Melbourne, Victoria, Australia
Contact: sarah-jane.day@aquaculture.org.au

Future Fish Eurasia 2012
www.future-fish.com
June 07-07, 2012
Location: Izmir, Turkey
Contact: selin@eurasiafairs.com

Vietfish 2012 - Vietnam Fisheries International Exhibition
www.vietfish.com.vn
June 26-28, 2012
Location: Ho Chi Minh City, Vietnam
Contact: info@vietfish.com.vn

The 9th International Conference on Recirculating Aquaculture
www.recircaqua.com
August 24-26, 2012
Location: Roanoke, Virginia, USA
Contact: aquaconf@gmail.com

Aqua 2012
www.was.org
September 01-05, 2012
Location: Prague, Czech Republic
Contact: worldaqua@aol.com



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ISO 9001 : 2008 Certified Company

Bangladesh Fisheries Research Forum (BFRF) foresees ahead to be flourished as an organization to provide a platform for scientific collaboration, team work and future horizon of research and development activities in fisheries sector. Major objectives of BFRF are to develop networking among fisheries professionals and institutions; to share knowledge and experience to promote growth of the sector; to initiate discussion and dialogue among different stakeholders; to assist public and private sector, donors and development partners; to secure funding from donors and offer research awards to scientist/s to address demand-led research; to organize workshop, seminar, conference, dialogue and training; and to offer support services to industries, government and private sectors.

photos : **Dr. Mostafa Hossain**
concept **Dr. Md. Nahiduzzaman**
graphics **roots** bogra

www.bfrf.org