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ज्ञानम् आत्म प्रदीपाय
UGC Enlisted & Recognised

Matsya Purana

Department of Fishery, School of Agriculture and Allied Sciences

Issued: **November, 2020**

Departmental Message

Welcome to the Department of Fishery, School of Agriculture and Allied Sciences, TNU, the only leading private Fisheries Education and Research Institute of West Bengal under The Neotia University , took its birth in the year July, 2019. West Bengal, being the lead fish producing state in India, still fetching high demand to have adequate institutes where more aspirants can get the privilege to pursue Fishery Sciences. With nurturing every part of it, the germinated seed is now commemorating its childhood by taking the oath for providing quality fisheries education in order to generate professional fisheries graduates and entrepreneurs with credible skills, capabilities and commitment to transform the sector through innovation and sustainable increase in fish production of the country. To establish itself as one of the premier fisheries institutes serving as a leader in quality fisheries education and research in India is the sole mission of this department.

The department offers B.F.Sc. (4 years degree programme 'Bachelor of Fisheries Science' following the course curriculum as prescribed by Indian Council of Agricultural Research, the nationalized platform under Department of Agricultural Research and Education, GOI. Cherishing the privilege and pleasure of being the one and only leading private Fisheries Institute of West Bengal.

On 21st November, the World Fisheries Forum (WFF) was established and fishing representatives from 18 countries signed a declaration advocating for a global mandate of sustainable fishing practice and policies. To commemorate this day, the 21st November is celebrated every year as World fisheries day. On this occasion Department of Fishery is going to publish an E- magazine (Matsya Purana) half-yearly basis under The Neotia University website to encourage our students' talent and ability. Original idea of this magazine was initiated by our respected teacher Dr. P. K. Mukhopadhyay.

We are thankful to Prof. S. K. Kothari, Dean of School of Agriculture and Allied Sciences, TNU and management of The Neotia University to give the approval for the publishing the magazine. Special thanks to digital initiative team provide an e- platform to students for representing their ideas.

Department of Fishery
School of Agriculture and Allied Sciences
The Neotia University

21st November is celebrated every year as World Fisheries Day

Content

Dean's Message

I am extremely happy to know that fishery science students of School of Agriculture & Allied Science are coming out with an e-magazine on the eve of World Fisheries Day on 21 November. The day is celebrated across the world highlighting the critical importance to human lives, of water and the lives it sustains. Apart from crucial source of food and livelihood to millions of fisher folks, fish diversity determines the health of the water body. However, with growing threats of global warming, climate change, pollution,etc. new challenges are emerging that threatens sustainable basis fish production and livelihood of millions of people across the globe and India in particular. The catastrophic losses because of super cyclonic storm Amphan in Eastern India specifically in West Bengal and also Bangladesh on 20th May 2020 are still fresh in our memories.

I am informed that the e-magazine would have 4-segments (scientific, animation & drawing, students curriculum and photography) and biannual in nature. This would provide our students opportunity on continuous basis to think on the subject as a whole / topic of their choice and apply their creative mind in developing / expressing it. I congratulate our fishery science faculty members, mentors and digital initiative team for encouraging young minds and providing them an opportunity to present their ideas on e-platform. I am sure this will not only benefit the participating students but the entire students of the The Neotia University in pushing forward a new way of learning during COVID19 pandemic. I wish a grand success of this e-magazine to all our beloved fishery science students.

Prof. (Dr.) Sushil Kumar Kothari
Dean
School of Agriculture and Allied Sciences
The Neotia University

Organising Committee

Dr. Debasmita Jana

Teaching Associate & Editor

Department of Fishery
School of Agriculture and Allied Sciences
The Neotia University

Fish touch our lives in countless ways in terms of providing food, nutrition, livelihood, employment, recreation and many more. On 21st November, 1997, in New Delhi, fishermen and women from all over the globe came together to form World Fisheries Forum (WFF) for a global mandate of sustainable fishing practice and policies. I am very happy to annouced that in the pendamic situation COVID-19, our Fishery Department are going to celebrate the World Fisheies Day on 21st November, 2020. On this special occasion we are glad to launch the first ever E-Magazine **"Matsya Purana"** from our Department. This new step would not have been possible without our beloved talented students. I hope this magazine continues to evolve as a creative and vibrant space for the students to discover and nuture their talent.

Dr. Anish Das

Assistant Professor & Editor

Department of Fishery
School of Agriculture and Allied Sciences
The Neotia University

Fisheries sector is the world's fastest growing food production system. Fish is one of the most readily available and easily digestible animal protein sources available to human beings. Fisheries sector offer more than 500 million people for their livelihood worldwide. In India has vast and varied fisheries resources comprising rivers and canals, reservoirs, ponds and tanks, floodplain lakes, wetlands, brackish waters and marine water.

So, managing these vast resources there is urgent need of fisheries trained professional (Fisheries gradutes) require. Fisheries education can meet these requirement, therefore The Neotia University is working on the moto. On the part of these journey the e-megazine (Matsya Purana) will provide the extra wing on novel moto.

Mr. Siddhnath

Teaching Associate & Editor

Department of Fishery
School of Agriculture and Allied Sciences
The Neotia University

Fish forms an important part of people's diets in West Bengal, particularly those that live near rivers, coasts, and other water bodies. A number of traditional societies and communities are rallied around the occupation of fishing.

The E-magazine released on World Fisheries Day will help in highlighting the critical importance to human lives, of water and the lives it sustains, both in and out of water.

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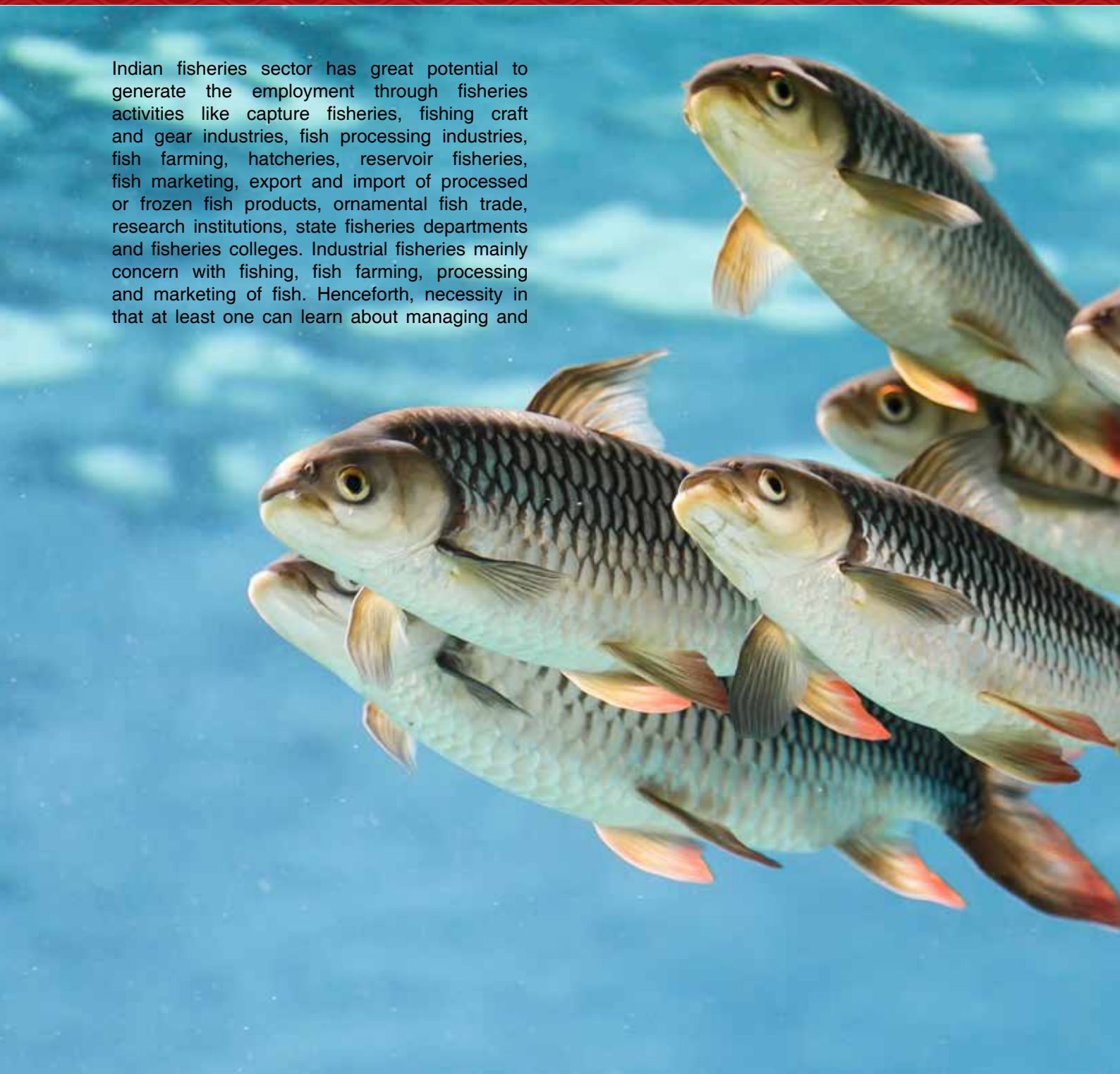

Indian fisheries sector has great potential to generate the employment through fisheries activities like capture fisheries, fishing craft and gear industries, fish processing industries, fish farming, hatcheries, reservoir fisheries, fish marketing, export and import of processed or frozen fish products, ornamental fish trade, research institutions, state fisheries departments and fisheries colleges. Industrial fisheries mainly concern with fishing, fish farming, processing and marketing of fish. Henceforth, necessity in that at least one can learn about managing and

understanding fisheries in the academic education of fisheries science to improve the industrial growth. More than one million people in the world use fish as the main diet for their protein source and more than 100 million people who are directly engaged in fishing whereas in India, around 15 million people directly or indirectly involved in the fisheries sector. Fisheries science education has an undergraduate, postgraduate or Ph.D. program at state, national as well as international level. Central Institute of Fisheries Education at Mumbai is the pioneer institutes in India for fisheries education since 1961. In the year 1969, significantly revolutionized evolution of the fisheries education begin in India by establishment of the first Fisheries College at Mangalore and now almost 25 Fisheries Colleges offer the fisheries education in India under the guideline of Indian Council of Agricultural Research (ICAR), New Delhi.

B.F.Sc. (Bachelor of Fisheries Science)

The basic qualification for admission to B.F.Sc. course is 12th in science with biology group. The major aim of B.F.Sc. is to create technically sound and skillful administrators / fisherman / fish farmer to assist in fisheries research and developmental activities. The B.F.Sc. is professional undergraduate course with 8 semesters (4 years) duration. The subject areas of B.F.Sc. includes aquaculture, biology, breeding, genetics, biotechnology, nutrition, fish health management, aquatic resources management, aquatic environment management, oceanography, marine biology, fish processing technology, microbiology, biochemistry, navigation and seamanship, craft and gear technology, fishery economics, extension and statistics. In addition to indoor education, B.F.Sc. course also conducts field visits including sampling in nearby coastal areas through fishing vessels, sampling in rivers or reservoirs or estuaries, aqua farms, hatcheries and fish processing plants. Upon the final year of the course, students internships training programme READY (Rural and Entrepreneurship Awareness Development Yojana) are also available either in fish processing or aquaculture. The Student READY In-Plant Training provided for 24 weeks (0+20 credit hours) on Seventh Semester, it covers In-plant Attachment for 12 weeks, Rural Fisheries Work Experience Program for 8 weeks and rest of the for 4 weeks cover Study Tour (in and outside State) and finally on 8th semester Student READY include capacity building and skill development of the students in planning, development, formulation, monitoring and evaluation of project for entrepreneurial proficiency with a total credit load of 0+20 credit hours (24 weeks).

M.F.Sc. (Master of Fisheries Science)

The candidate has to excel in the entrance test conducted by ICAR or State Agriculture Universities for M.F.Sc. programme. The M.F.Sc. is the 2 year course and only B.F.Sc. graduates are eligible for M.F.Sc. in various disciplines of fisheries science such as aquaculture, fisheries resource management, aquatic environment management, aquatic health management, fish genetics and breeding, fisheries biotechnology, fish nutrition and biochemistry, fish processing and fishery engineering. The 2 years programs containing first year course work (30 credits) and second year full time basic research work (20 credits) in selected areas of fisheries, ended with the thesis submission and viva-voice examination. In addition to this, during the 3rd semester of 2nd year, the candidate has to present one credit seminar and during 4th semester at the end of research work, the candidate has to present the research/thesis seminar in the presence of advisory committee and/or the expert in respective research area. The candidate has to submit the thesis to university for external evaluation and the external recommendation to university considered as final report for the award of M.F.Sc. degree through the viva voice examination.

Ph.D. (Doctor of Philosophy)

Doctor of Philosophy (Ph.D.) is an option available for the research purpose after completion of the M.F.Sc. In Ph.D programme, the candidates need to complete course work (28 credits), two credit seminars (2 credits) and research dissertation (45 credits). The award of degree depends upon dissertation evaluated external recommendation to the University after completion of viva voice examination.

Courses and Programs

The various undergraduate and postgraduate courses available in the field of fisheries like aquaculture, processing, extension, economics and marketing. Students can pursue the following fisheries courses on the basis of their eligibility for these courses:

Bachelor's Courses

Bachelor of Fisheries Science (B.F.Sc.)
Duration - 4 years

Bachelor of Science
(Industrial Fish and Fisheries)
Duration - 3 years

B.Sc. (Fisheries)
Duration - 3 years

B.Sc. (Aquaculture)
Duration - 3 years

Diploma Courses

Diploma in Costal Aquaculture

Diploma in Aquaculture

PG Diploma in Aquarium Science and Technology

PG Diploma in Industrial Aquaculture

Diploma in Brackish water and Marine Aquaculture

Master's Courses

Master's of Fisheries Science (M.F.Sc)
Duration - 2 years

Master's of Science (M.Sc)
Duration - 2 years

Employment Opportunities

The employment opportunities for B.F.Sc. graduates are available in the government as well as private sector. In the government sector, more opportunities are available like state fisheries department, Inspector of Fisheries, Research Assistants, Sub-Inspector of Fisheries, Assistant Directors, Assistant Fisheries Development Officer (AFDO)/Fisheries Extension Officer (FEO) Fisheries Research officer and Fisheries Development Officer (FDO). In State Fisheries Development Corporations and co-operated societies have different posts available as Deputy Managers, Managers, Project Officers, production manager, farm manager, Assistant manager and Fisheries Officers. In Fish Farmers Development Agency (FFDA) and Brackish water Farmers Development Agency (BFDA), opportunities are Executive Officers in respective states. In nationalized as well as private banks different posts are available like managers, Assistant Development Officer, Rural Development Officer, Field extension Officer and agriculture Field Officer. B.F.Sc candidates can apply for the post of Instructor, field assistant, Research Assistant, Biochemist, Biologist, Technicians, farm technician, microbiology or lab assistants in Universities. Candidates having postgraduate degree (M.F.Sc) can apply for the post of Assistant Professor in the faculty of Fisheries. Agricultural Scientist Recruitment Board (ASRB) conducts an All India Competitive Exam like Agricultural Research Service (ARS) for the recruitment of scientists in various agricultural and fisheries research institutions under the ICAR. Fisheries graduates can also get job in central agencies like as Aquaculture Assistants, Executive Assistant, Lab Assistant, Junior Technical Officers, Technical Officers and Assistant Directors in Marine Product Export Development Authority (MPEDA) Export Inspection Agency (EIA), Coastal Aquaculture Authority of India (CAA), Food Safety and Standards Authority of India (FSSAI) and as Technical Officers and Scientists in Fisheries Survey of India (FSI), National Institute of Oceanography (NIO), Indian National Centre for Ocean and Information

Services (INCOIS). Employments in central government agencies like Marine Product Export Development Authority (MPEDA), Fisheries Survey of India (FSI), NIO, WHO, CIFE, CIFA DCFR, NBFGR, CIFRI, CIBA, CIFA, CMFRI, NACSA, FSI and many others. Degree holders can apply for research projects or can do further study as JRF, SRF, RA. Project Scientist, Project Co-coordinator etc. Candidates can find the number of job opportunities in institutions, banks, fishing/oceans and in foreign countries. Apart from scope for higher education in fisheries in countries such as USA, Canada, Australia, Japan, China and in European countries, there are a demand for fisheries professionals in the aquaculture and processing sectors in Gulf and African countries. Candidates can work as a supervisor, shift in charge, production manager, manager or general manager or officers in seafood processing and export units, fish and shrimp farms and hatcheries.examination.

Fisheries graduates can start their own enterprise as an entrepreneur like aquarium business, aqua-Shoppe, fish breeding center, shrimp farming, fish farming, cage culture, fish processing, fish drying, packing, cold storage, cold chain enterprise or may involve in export-import activity in national as well international market The financial support can be obtained through NFDB, NABARD or through other nationalized banks. Government and World Bank are always supporting to develop fishing industry by assistance in terms of subsidies and finance. The main area in which fisheries enterprise can be developed are feed manufacturing, feed sales, ornamental fish culture and breeding, aquaculture, hatchery and seed production, fish processing and marketing, net making, establishment of Agri Clinics for fish disease diagnosis and for testing and supply of farm inputs. Several fisheries graduates are doing business in foreign countries in field of aquaculture, fish processing export and import.

Conclusion

Fish is the chief source of animal protein compare with other source of animal protein. In future due to climate change the agricultural activity bias towards fisheries and aquaculture probably the soil salinization more prone to costal aquaculture of shrimp. On the basis of such situation fisheries sector will creates more employment to increase the current potential of the fisheries production. Hence, the fisheries sector is a better carrier opportunities for the youths to improve the personal and human life.

Health Benefits of
Eating Fish

Dr.Tanushri Ghorai
Assistant Professor, Dept. of Fisheries Engineering and Processing Technology
College of Fisheries, Dholi, RPCAU, Bihar

In recent times, people are looking for ways to support their immune system and a good nutrition is essential to supporting a strong immune system. An important step in staying healthy is eating a balanced diet which can be provided by seafood, both fish and shellfish as it containing essential nutrients to boost the immune for proper functioning. Fish is considered as an important food item for quality animal proteins and healthy fats including omega-3 fatty acids, vitamin and minerals. Fish meat contains 66-85% water, 15-24% protein, 0.1-20% lipid and 1-3% carbohydrate and 0.8-2% inorganic substances (Ninawe and Ratnakumar, 2008). Fish contains easily digestible quality proteins with balanced amino acid composition along with healthy fats especially long-chain omega-3 fatty acids, essential nutrients, including vitamin and minerals (Tilamia and Sampels, 2017).Proteins mainly helps in healing and recovery of wounds. Fishes, especially small indigenous fishes has potential to eradicate micronutrient deficiency disease in developing countries as it is a rich source on various health beneficial micronutrient and minerals such as calcium, phosphorus, iodine, selenium, zinc, magnesium etc. (Mohantyet al., 2017).Minerals play a vital role for proper body functions like maintenance of acid– base balance, water balance, formation of teeth and bones properly (Duran, 2010). Fatty fishes like salmon, trout, tuna, mackerel and sardines are considered as healthiest as it contains higher amount of fat-based nutrients. Fish oil omega-3 fight against the development of erratic and potentially deadly cardiac rhythm disturbances and improve blood vessel function, reduce inflammation and raise “good” HDL cholesterol levels (Hjalmarsdottir, 2018) as well as lower “bad” LDL cholesterol. Dietary Guidelines of America recommend that there is a necessary of regular consumption of fish and seafood for the optimal wellness of human and eating seafood can reduce respiratory deaths by 20% (Zhang et al., 2018). So eating fish every day is really good for health as its unique composition help to fight against hunger and malnutrition.

Fish is considered as an important food item for quality animal proteins and healthy fats including omega-3 fatty acids, vitamin and minerals.

Better Management Practices in Aquaculture Special Emphasis on Soil and Water Chemistry

Debashis Barai and Shouvik Sarkar
B.F.Sc 2nd Year 1st Semester

INTRODUCTION: Aquaculture is the culture of all aquatic life forms. Water and soil quality plays an important role in aquaculture. Understanding water chemistry and soil chemistry would lead us to a better aquatic environment for aquatic organisms. Water and soil quality parameters are mentioned below:

WATER QUALITY PARAMETERS	DESCRIPTION	IMPACTS	
Chemical aspects of water quality		**If it increases**	**If it decreases**
1. pH	Measure of hydrogen ion concentration in water and indicate how much water is acidic or basic, ideal pH is 7.5 to 8.5.	Water become slightly alkaline which damages the outer surfaces (like skin and eyes).	Water become slightly acidic which increases the water toxicity and causes stressful condition to fish.
2. Alkalinity	The ideal range of total alkalinity for fresh water fish ponds is 60-300mg/ liter as CaCO3 increases the alkalinity.	Respiratory distress, effects fish skin and tail and their growth as well.	Fish undergoes stress and their endocrine system doesn't function properly.
3. Hardness	Total hardness for fresh water fish ponds should be greater than 75 - 300ppm as CaCO3	They fail to adapt and for many small fishes they fail to breed or for some species life span reduces.	Does not affects fish much.
4. Dissolved gases:			
a) Oxygen (dissolved O2)	5ppm or 5mg/L	Lethal gas bubble disease occurs which causes formation of bubbles form on gills, eyes, fins and can form in heart causing death.	Chronic respiratory distress occurs. Anaerobic respiration starts.
b) Carbon dioxide (CO2)	8 to 10 ppm or mg/L	Fish loses their smell, hear, move and evade predators.	Sudden temperature fall occurs creating a huge chance of microbial disease outbreak.
c) Ammonia	Un-ionised ammonia (NH3) concentrations in pond water should be kept below 0.5 mg/l.	Burns the gills of fish and placing them under incredible stress and eventually die.	Relatively lesser toxic.
5. Salinity	Freshwater- 0-2ppt	Freshwater fishes might die. Due to hyperosmotic water condition.	Fishes might die. Due to hypoosmotic water condition
6. TDS	0-19.99ppt	It becomes lethal.	ion deficiency is occurs.
Physical aspects of water quality		**If it increases**	**If it decreases**
1. Temperature	For warm water fishes: 24-30 C and cold water fishes: 14-18 C	Metabolism rate increases and the need for food increases.	Metabolism rate decreases so they can use energy for a longer period of time.
2. Transparency	The ideal transparency for aquaculture is 40-60ppm or mg/L	Phytoplankton growth increases.	Light penetration decreases and photosynthesis decreases.
3. Density	Ideal density is 1		
4. Depth	Ideal depth for aquaculture is 1.5 to 2 meter	Oxygen level decreases causing chronic stress in fishes.	Fishes cannot swim freely causing acute stress.

SOIL QUALITY PARAMETERS	DESCRIPTION
1. Soil pH	The ideal range of soil pH - 6.0-8.0
2. Acid sulfate soils	Acid sulfate soils from mine spills and coastal mangroves contain high levels pyrite (FeS2 1-6%)
3. Bottom soil oxidation	One of the most important factors for maintaining pond productivity - controls most of the chemical reaction in the pond environment
4. Organic Carbon Content	Pond soils with less than 0.5% Organic carbon.
5. Carbon to nitrogen ratio	C:N ratio - less than 10 and C:N ratio – more than 20
6. Essential nutrients: N, P, K	N: - 250 to 500 ppm , P: 60-120 ppm, K: small amounts of potassium are needed

Conclusion

We can conclude that we have basic idea about water and soil quality parameters we understand the value of this in aquaculture. So maintaining these parameters we have good production and good health of fishes.

Acknowledgement

Special thanks to our respected teachers:

Dr. Pratap Kumar Mukhopadhyay
Visiting Professor and former Principal Scientist of CIFA.

Dr. Anish Das,
Assistant Professor, The Neotia University

Dr. Debasmita Jana,
Assistant Professor, The Neotia University

Fish Disease Management, Prevention And Prophylaxis Measure

Shreyam Mandal
B.F.Sc. 2nd Year 1st Semester

Abstract

Aquaculture is a rapidly growing part of agriculture worldwide. It makes up around 44 percent of total fish production globally. This increased growth of production is achieved despite facing many challenges in the aquaculture environment. However, the disease is a factor that can cause slow growth of fish or even mass mortality, which leads to a significant loss. To reduce the fish disease's impact, it is necessary to address health constraints based on scientifically proven and recommended ways. This review aims to point out some of the best approaches to preventing and controlling infectious diseases in aquaculture.

Introduction

The ways of prevention and contingently medical treatment of fish are particular and often different from those in warm-blooded animals. They require a thorough knowledge of the environment of fish. Preventive arrangements consist of a complicated set of treatments elaborated based on a good knowledge of disease etiology and a host (fish) biology. It concerns the elimination or restriction of infection (invasion) sources and the possibilities of its further expansion, likewise enhancing the condition of fish organisms to be able to withstand the infection (invasion). Prevention is of primary importance in disease elimination. No specific therapeutics were developed for some diseases up to now, and the result of the application of useful, experimentally verified medicaments is often reversely affected by the operational conditions and the technology of rearing. The medical treatment became economically unremunerative in this way. Besides, some treatments cannot be performed in specific periods, e.g., in the growing season, during the wintering, or some fish culture units (e.g., large ponds).

That is why it is much more essential to prevent diseases than to recover them. The effective preventive treatments are to be applied above all in specialized fish culture units with a closed warm water system, in early fish fry rearing, hatcheries, trout farms, wintering ponds, and storage reservoirs.

Fish disease management, prevention, and prophylaxis measure

a) Providing water sources free of pathogens

Underground waters are the most suitable water sources free of pathogens. However, the surface water from rivers and channels is used as the source of inflow water in most cases. In these situations, suitable filters can partially reduce the number of invasion stages of parasites in inflow water, above all, when supplying smaller reservoirs with intensive culture. Bars are usually placed before these filters to separate rough particles. Sand filters consist of a set of sedimentation divisions terminated by a filter with fiber and sand. These types of filters catch above all the heavier parasite stages, unable to move actively. The water from the pond with fish stock is entirely unsuitable for these purposes.

Chemical treatment of inflow water is an emergency arrangement with often undesirable parallel effects. The disinfection of the water entering fish culture units by UV radiation is not usual, although it can be considered the simple method to destroy viruses, bacteria, and molds germs. Since the inflow water from rivers and channels is slightly turbid and contains several suspended solids and dissolved compounds, UV radiation's disinfective efficiency is markedly reduced in these situations.

b) Protection from the transfer of pathogens

This principle means, above all the transfer of pathogens by uncontrolled transport of fish and spawns. The transport of fish with an unknown health condition is to be avoided in principle. All transported fish are to be accompanied by a veterinary certificate confirming that fish were examined before transporting them; they are healthy and originate from the environment in which no critical transfer diseases appear. The list of these diseases is precisely stated in veterinary instructions. Spawns can also transfer some viral and bacterial diseases. The same veterinary certificate must complete Their transport as fish transport for this reason.

Fish introduced from other territories must be subjected to quarantine for one year, regardless of whether they are native or extraneous. The duration of quarantine can be prolonged, e.g., in fish imported from abroad, until three years. A Prolongated period of quarantine is of particular importance, especially in spawners predestined for further reproduction of imported species.

The self-sustaining in stock production in individual farms and similar organizations is a significant way of preventing the dissemination of fish diseases. Only fish previously examined, free of diseases, and relevantly treated by medicinal baths are stocked into ponds and fish culture units. The stocking of fry originating from semi-artificial and artificial spawning not contacted with fish of higher age categories also minimizes infection danger.

The prevention from the introduction of coarse fish into ponds and fish culture units is the other important arrangement protecting the stock against the transfer of pathogens. These fish are above all the source of ectoparasites, dangerous, especially in decreased fish resistance. Except for this, they can also transfer some other pathogens, resulting in heavy losses in important fish species. Adequate bars and filters can serve for prevention from coarse **fish penetration.**

The protection of piscivorous birds to step into fish culture units (esp. trout farms) is the prevention limiting the expansion of some fish diseases. Protective nets are used to prevent the birds from running in. The numbers of piscivorous birds are regulated in localities where overpopulated.

Preventive control of snails (Lymnaea sp.) as intermediate hosts of some fish parasites can be performed by biological, mechanical (placing nets in the inflow), physical (drying and freezing of the bottom), and chemical (application of molluscicides) ways.

Safe and harmless removal of dead fish is a significant way to prevent further transfer of fish pathogens. Fresh or slightly decayed dead fish are decontaminated in the nearest veterinary facility. Lower masses of dead fish are burnt or buried into deep pits (approx. 2 m) in a distance of at least 20 m from the pond bank. The bottom of this pit and dead fish must be covered by burnt or chlorinated lime. The layer of at least 60 – 80 cm of the soil must cover a pit's content.

c) Disinfection of ponds, fish culture units, and equipment; winter freezing and summer drying of ponds

Disinfection is of great importance in the prevention and elimination of fish diseases. Preventive disinfection protects the fish stocks against pathogens. This way improves the hygiene of environmental conditions for fish. Focal disinfection is performed for control of the focus of dangerous fish disease.

Natural physical phenomena are fully used for disinfection in intensive fish culture due to their economic convenience. It concerns the drying and

freezing of the pond bottom. Most of the pathogens die after perfect drying of the pond bottom when its relative moisture has dropped 10 – 15 %. The perfect freezing of the wet places and sun radiation (above all by its UV rays) have a very favorable effect in our conditions. These natural physical phenomena are exploited by summer drying and winter freezing of water reservoirs (ponds). Summer drying is a radical, long-term intervention during which all pathogens are controlled due to the pond bottom's perfect drying. Winter drying aims to destroy the pathogens by freezing. It safely leads to the destruction of leeches (Piscicola geometra), fish lice (Argulus sp.), predatory larvae of water insects, eggs and spores of parasites, and other pathogens. Employing the natural ways for disinfection has a disadvantage in usually long-term duration (several months up to one year).

Chemical disinfection is an effective way of preventing and suppressing fish diseases. Usually, accessible disinfective preparations are used in fish culture (e.g. burnt lime, chlorinated lime, nitrogen lime, potassium permanganate, formaldehyde, Chloramine, Chlorseptol, Jodonal etc.). Burnt lime is mostly employed to disinfect the bottom of ponds and reservoirs in the dose of 2.5 – 3 ton/ha, or chlorinated lime in the dose of 0.5 – 0.6 ton/ha. In the case of myxosporoses, nitrogen lime (5 t/ha, or 0.5 kg/m2) is to be applied. After fishing out the pond, the disinfection of fishing pit, pond ditches, and muddy wet places is performed on large ponds where the whole-surface bottom disinfection is impossible. 5% water solution of formaldehyde, chlorinated lime (200 – 400 mg/l), 0.5 % water solution of natrium hydroxide, Chloramine and chlorseptol (30 g/l) or other disinfectants can be used for treatment of concrete channels, troughs, and other arrangements employed for fish culture. The same disinfectants and concentrations are to be used for the treatment of the equipment. Potassium permanganate (5 g/l), Jodonal (2.8 – 4.5 ml/l), and other disinfectants can also be employed for these purposes.

d) Optimization of environmental conditions

The optimization of natural environmental conditions is the main pre-condition for ensuring the stock's good health condition during the rearing period. The following principles must be ensured:

optimal water quality without stressing physio-chemical effects. Keeping the oxygen concentration on the optimal level and protection against water pollution are of particular importance.

Maximum development of natural food resources by the adequate interventions, feeding fish by supplementary feed mixtures in sufficient amount and quality (the attention should be paid on the quality of individual feed components and bio factors), basic preventive arrangements protecting the early developmental stages and young fish from bacteria and protozoans, including sufficient amount of natural food of appropriate size and species composition.

Responsible establishment of maximum stocking density. Inadequately high stocking density results in stress behavior, worsened condition, and resistance, making the spread of diseases easier. The stocking density is of particular importance in trout farming and fish culture in special intensive units (but also in ponds), preventing stress situations evoked by other factors, above all manipulation during fishing out, transport, and long-term storage.

e) Regular control of health condition and preventive treatment of fish

Preventive control of health conditions is to be carried out in hatcheries and early fry rearing units twice a week and in highly productive intensified ponds, trout farms, and fish culture units with recycling warmed water weekly. Other stocks (esp. in usual pond culture) are investigated monthly. The health condition of fish is always to be controlled before fishing out, transporting fish, and stocking. Preventive treatment can be suggested based on investigational results. This treatment is performed above all by applying medicaments into the water environment and feeding by medicated feeds.

Conclusion

Aquaculture is a huge industry operating worldwide and proliferating. The sector has been facing many constraints and challenges which are sophisticated and multifaceted. Among these challenges, infectious diseases take the lion share causing billion-dollar loss annually. Therefore, problem planning prevention and control strategy based on globally accepted principles and locally appropriate strategies are recommended. These strategies should focus on preventing the development of infection rather than treating diseased stocks. Generally, the use of a combination of immunoprophylaxis, biosecurity measures, and only legally approved antibiotics can result in the ultimate health protection of fish in aquaculture.

Conservation measures for Tenualosa ilisha - The state fish of West Bengal

Shreyam Mandal
B.F.Sc. 2nd Year 1st Semester

Abstract

The ilish *(Tenualosa ilisha)* is a prevalent food fish in the Indian Subcontinent. It is the state fish of West Bengal. However, in the last few decades, the production (capture) of hilsa is continuously decreasing in the Hooghly-Bhagirathi river system of West Bengal due to over-fishing, exploitation of brood fishes, lack of mesh size regulation, construction of dams and barrages, ineffective fish pass and pollution. The state government has taken many necessary steps to conserve the species viz; banning the fishing of Juveniles (jatka), declaring hilsa sanctuaries and banning fishing in these sanctuaries during certain months in the year, prohibtion of monofilament gill net having of mesh size below 90 mm to catch hilsa and, transportation, marketing, selling or possessing any fish of the hilsa or shad group of length below 23 cm is banned.

Introduction

The ilish *(Tenualosa ilisha)* (ইলিশ) also known as the ilisha, hilsa or hilsa shad, is a species of fish in the family Clupeidae. It is a very popular food fish in the Indian Subcontinent. It is the national fish of Bangladesh and the state fish of West Bengal. However, in the last few decades, the production(capture) of hilsa has continuously decreased in the Hooghly-Bhagirathi river system in West Bengal due to over-fishing and exploitation brood fishes, lack of mesh size regulation, construction of dams and barrages, Ineffective Fish Pass, and pollution. So, it is very important to make conservation measures for this precious fish. If the conservation of hilsa is not done correctly, it will fail to fulfill the people's demand, the price will be high, the export of this fish will stop and it will affect the economy, and in the worst case, it can be extinct. in this way. Besides, some treatments cannot be performed in specific periods, e.g., in the growing season, during the wintering, or some fish culture units (e.g., large ponds).

Conservation measures for the state fish of the West Bengal *(Tenualosa ilisha)*

Here we have two separate instruments. The first indicates the creation of two new sub-rules under the Inland Fisheries Rules 1985 directed at the conservation of hilsa (and other fish) and the second is an order under the West Bengal Marine Fishing Regulation Act, 1993. However, the three principles that cover the bulk of the provisions across these two instruments are as follows:

- Protecting hilsa and other similar fishes in the shad group

- Banning the fishing of Juveniles (jatka)
- Declaring hilsa sanctuaries and banning fishing in these sanctuaries during certain months in the year.

Given the nature of the first instrument, its directions apply only to the inland waters. The directions are as follows:

- Use of monofilament gill net having mesh size below 90 mm prohibited for catching hilsa and other hilsa species and no fish of whatever variety may be caught using nets of mesh size below 40 mm.
- Transporting, marketing, selling, or possessing any fish of the hilsa or shad group of length below 23 cm is banned.

Further, a new rule was added declaring the following as hilsa sanctuaries: 1) The stretch of river between Lalbagh and Farakka; 2) Katwa to Hooghly Ghat; 3) Diamond Harbour to Nishchintapur Godakhali; 4) A 5 sq km area around the 'Sand Bar' located in the river Matla, Raimangal and Thakuran in the Sundarbans area; 5) Similar sand bars near Farakka barrage and banning fishing in these sanctuaries from June to August and between October to December every year. Moreover, the fishing of hilsa is prohibited within 5 km of Farakka barrage to protect and facilitate brooders spawning in the area. Catching jatka by bag net, scoop net, lift net, and small meshed gill nets for catching hilsa below 23 cm is prohibited during February to April every year to conserve juvenile hilsa migrating downstream towards the sea. It must be mentioned that the length of the stretch from Farakka to Lalbagh, from Kalna to Hooghly Ghat, and from Godakhali through Diamond Harbour to Nishchintapur add up to 318 km (constituting about 57% of the entire meandering riverine stretch from Farakka to Gangasagar), and that the ban mentioned above of 6 months applies to this combined 318 km stretch.

The other document is like an order under the provisions of the West Bengal Marine Fishing Regulation Act, 1993. Therefore, by implication, its scope is confined to the state's coastline and extends into the sea up to 12 nautical miles. Moreover, it also extends inwards into the Hooghly up to the northern point of the Rupnarayan's confluence with the Hooghly—the northern marker of the ADF Marine (Diamond Harbour). The directions of the order are as follows:

- Use of monofilament gill net having mesh size below 90 mm prohibited for catching hilsa and other hilsa species.
- Catching jatka by bag net, scoop net, lift net, and small meshed gill nets for catching hilsa below 23 cm is totally prohibited during February to April every year so as to conserve juvenile hilsa migrating downstream towards the sea.
- The restriction of catch to sizes above 23 cm precisely as in the previous document.
- Bottom trawling in the shallow continental shelf is banned.
- In the period from 15 September to 24 October of each year, hilsa shad or any fish in the shad fish may not be caught from 5 days before full moon to 5 days after full moon

Conclusion

The acts mentioned above are applied immediately in in Hooghly-Bhagirathi river system and it helps to slow down the decreasing graph of the capture production of hilsa. But the capture production of hilsa is still decreasing every year because of the less awareness of this regulations in local fishermen and many people are still not obeying the rules and regulation for getting little more profit. So, the problems like over-fishing, exploitation of brood fishes, use of low mesh size, and pollution is still there. West Bengal government is trying to protect the hilsa like a precious treasure but the conservation of hilsa will not be completely successful as long as the local people are not becoming aware.

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A Glimpse of Aquatic Vertebrate

Abhishek Bhowmik
B.F.Sc 1st Year 1st Semester

Opah *(Lampris guttatus)*

Fish, any of approximately 34,000 species of vertebrate animals (Phylum Chordata) found in the fresh and salt waters of the world. Living species range from the primitive jawless lampreys and hagfishes through the cartilaginous sharks, skates, and rays to the abundant and diverse bony fishes. Most fish species are cold-blooded; however, one species, the opah (Lampris guttatus), is warm-blooded.

- The term fish is applied to a variety of vertebrates of several evolutionary lines. It describes a life-form rather than a taxonomic group. As members of the phylum Chordata, fish share certain features with other vertebrates. These features are gill slits at some point in the life cycle, a notochord, or skeletal supporting rod, a dorsal hollow nerve cord, and a tail. Living fishes represent some five classes, which are as distinct from one another as are the four classes of familiar air-breathing animals—amphibians, reptiles, birds, and mammals. For example, the jawless fishes (Agnatha) have gills in pouches and lack limb girdles. Extant agnathans are the lampreys and the hagfishes. As the name implies, the skeletons of fishes of the class Chondrichthyes (from chondr, “cartilage,” and ichthyes, “fish”) are made entirely of cartilage. Modern fish of this class lack a swim bladder, and their scales and teeth are made up of the same placoid material. Sharks, skates, and rays are examples of cartilaginous fishes. The bony fishes are by far the largest class. Examples range from the tiny sea horse to the 450-kg (1,000-pound) blue marlin, from the flattened soles and flounders to the boxy puffers and ocean sunfishes. Unlike the scales of the cartilaginous fishes, those of bony fishes, when present, grow throughout life and are made up of thin overlapping plates of bone. Bony fishes also have an operculum that covers the gill slits
- The study of fishes, the science of ichthyology, is of broad importance. Fishes are of interest to humans for many reasons, the most important being their relationship with and dependence on the environment. A more obvious reason for interest in fishes is their role as a moderate but important part of the world’s food supply. This resource, once thought unlimited, is now realized to be finite and in delicate balance with the biological, chemical, and physical factors of the aquatic environment. Overfishing, pollution, and alteration of the environment are the chief enemies of proper fisheries management, both in fresh waters and in the ocean. (For a detailed discussion of the technology and economics of fisheries, see commercial fishing.) Another practical reason for studying fishes is their use in disease control. As predators on mosquito larvae, they help curb malaria and other mosquito-borne diseases.

  Fishes are valuable laboratory animals in many aspects of medical and biological research. For example, the readiness of many fishes to acclimate to captivity has allowed biologists to study behaviour, physiology, and even ecology under relatively natural conditions. Fishes have been especially important in the study of animal behaviour, where research on fishes has provided a broad base for the understanding of the more flexible behaviour of the higher vertebrates. The zebra fish is used as a model in studies of gene expression. There are aesthetic and recreational reasons for an interest in fishes. Millions of people keep live fishes in home aquariums for the simple pleasure of observing the beauty and behaviour of animals otherwise unfamiliar to them. Aquarium fishes provide a personal challenge to many aquarists, allowing them to test their ability to keep a small section of the natural environment in their homes. Sportfishing is another way of enjoying the

Lamprey *(Petromyzontiformes)*

Harlequin rasbora *(Trigonostigma heteromorpha)*

natural environment, also indulged in by millions of people every year. Interest in aquarium fishes and sportfishing supports multimillion-dollar industries throughout the world.

General Features

Structural Diversity

Fishes have been in existence for more than 450 million years, during which time they have evolved repeatedly to fit into almost every conceivable type of aquatic habitat. In a sense, land vertebrates are simply highly modified fishes: when fishes colonized the land habitat, they became tetrapod (four-legged) land vertebrates. The popular conception of a fish as a slippery, streamlined aquatic animal that possesses fins and breathes by gills applies to many fishes, but far more fishes deviate from that conception than conform to it. For example, the body is elongate in many forms and greatly shortened in others; the body is flattened in some (principally in bottom-dwelling fishes) and laterally compressed in many others; the fins may be elaborately extended, forming intricate shapes, or they may be reduced or even lost; and the positions of the mouth, eyes, nostrils, and gill openings vary widely. Air breathers have appeared in several evolutionary lines.

Oyster toadfish *(Opsanus tau)*

Many fishes are cryptically coloured and shaped, closely matching their respective environments; others are among the most brilliantly coloured of all organisms, with a wide range of hues, often of striking intensity, on a single individual. The brilliance of pigments may be enhanced by the surface structure of the fish, so that it almost seems to glow. A number of unrelated fishes have actual light-producing organs. Many fishes are able to alter their coloration—some for the purpose of camouflage, others for the enhancement of behavioral signals.

Impact of Consumption of Fish in Human Health

Ranit Nath
B.F.Sc. 2nd Year 1st Semester

Abstract

The article aimed at identifying and discussing scientific evidences on impact of fish consumption in human health. In recent years, in developed countries and worldwide, lifestyle-related diseases have become a severe problem. Studies examining dietary habits have revealed the health benefits of seafood consumption. Seafood contains functional components that are not present in terrestrial organisms. These components include n-3-polyunsaturated fatty acids, such as eicosapentaenoic acid and docosahexaenoic acid, which aid in preventing arteriosclerotic and thrombotic disease. Also, seafood is a prime source of various nutrients, such as protein, amino acids, fiber, vitamins, and minerals. It is essential to conduct more longitudinal studies that assess both the benefits and risks of fish consumption for human health. We also emphasize the need for policies to reduce fish and seafood exposure to mercury and other contamination.

Keywords: Fish food consumption, Fish, Polyunsaturated fatty acid, health.

Introduction

- Fishes are rich in essential fatty acids, as well as in iron, vitamin B12 and calcium. Fish consumption is recommended by The American Cancer Society and the American Heart Association (AHA) at least two times a week.

- Some studies have demonstrated the health benefits of fish consumption thanks to the correlation between omega-3 fatty acids and a decrease in coronary heart diseases, depression, stroke, blood pressure, glycemic index, triglycerides, cancer, and others. On the other hand, the research could also quantify fish contamination levels in 17 fish and check possible risks linked to its consumption, such as contamination by heavy metals, organ chlorine pollutants, and dioxins.

- Seafood is currently accepted as an essential food for humans. Seafood is highly regarded for its abundance of high-quality proteins, n-3 polyunsaturated fatty acids (PUFAs), and other nutrients, such as minerals, trace elements, and vitamins (FAO 2010). These nutrients are essential for bodily functions and are beneficial to growth, the brain, and the nervous system; they also have anti-cancer properties. Seafood has helped alleviate food crises in many developing countries, providing a valuable supplement to a diverse and nutritious diet. In recent years, seafood consumption has gradually increased throughout the world (FAO 2010).

- In particular, seafood's health benefits have principally been associated with high intakes of n-3 PUFAs, such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Fish oil contains abundant EPA and DHA and is sold as a functional food that can promote superior health. Many other bioactive components derived from seafood are also sold and are under development as functional foods. Functional food is generally consumed as conventional food that forms a part of the daily diet. Functional food provides basic nutritional functions and reduces the risk of lifestyle-related diseases.

Fish Consumption around the World and Consumer Demand for Seafood

- Fish is crucial to a nutritious diet in many areas across the world. Fish and fish products are recognized as some of the healthiest foods on the planet and as some of the least impactful on the natural environment. For these reasons, they are vital for national, regional, and global food security and nutrition strategies and have a big part to play in transforming food systems and eliminating hunger and malnutrition.

- Over the past 40 years, fish and seafood consumption underwent a significant change. In 2019, capture fisheries and aquaculture supplied more than 177 million tons of fish around the world. Fish provided about 3.3 billion people, with almost 20 percent of their average per capita intake of animal protein. In 2017, fish accounted for about 17 percent of total animal protein and 7 percent of all proteins consumed globally. In 1961–2017, the average annual growth rate of total food fish consumption increased at 3.1 percent, outpacing the annual population growth rate (1.6 percent). In per capita terms, food fish consumption rose from 9.0 kg (live weight equivalent) in 1961 to 20.3 kg in 2017. Preliminary estimates for per capita fish consumption in 2018 currently stand at 20.5 kg.

Health Effects of Seafood Consumption

- Epidemiological evidence gathered from Greenland Inuit and Japanese fishing villages has demonstrated that the intake of marine animal products is useful in preventing CVD. Many other studies from various countries have also reported that seafood consumption helps protect against lifestyle-related diseases. Numerous epidemiological studies have examined the relationship between marine dietary products and CVD. In one report, individuals who consumed fatty fish had a 34% reduction in CVD in a three-cohort study, and 35 g/day of fish consumption resulted in decreased CVD mortality.

- A meta-analysis revealed that individuals who consumed fish once a week had a 15% lower risk of CVD mortality compared with individuals who consumed no fish. One ecological study reported that high-frequency fish and seafood consumption decreased the risk of type 2 diabetes in populations with an overweight group. Sufficient seafood consumption in childhood has been demonstrated to help ensure good fetal neuron development and infant and child cognitive and visual development; however, whether or not these positive effects continue into adulthood has not been confirmed.

Fish consumption and heart diseases

- The relation between frequency of fish consumption and benefits for heart diseases could be found in studies on the population of the USA, where it was demonstrated that a consumption frequency ≥1 time a week was associated with a reduction in the progression of atherosclerosis in women that have reached menopause and reduction in esthenosis in diabetic women; in the development of the venous thromboembolism in the 45 to 64-year-old population, as well as in hospitalization and death rates due to weak heart in adult and aged women. In Sweden, lean fish consumption of ≥3 times a week reduced stroke risk in women.

- These studies demonstrate that fish consumption at least once a week can be a protective factor for heart diseases and, the higher the consumption frequency, the higher the protective effect is. The explanation for these findings can be: omega-3 fatty acids reduce the likelihood of blood clotting, and consequently, the risk of heart attacks and stroke. Therefore, it is recommended to consume fish with high levels of omega-3 fatty acids, such as trout, salmon, tuna, halibut, swordfish and mackerel, to prevent heart diseases, 2 to 3 times a week.

Conclusion

People have come to realize the importance of seafood in our diet. Numerous studies have proved that some of the best sources of excellent fats, protein, vitamins, and minerals that promote health can be found in seafood. Unfortunately, it took so many years for the health benefits of seafood to be realized. In the future, an increase in lifestyle-related diseases, the majority of which are a result of dietary habits, is expected in both developed and developing countries. There is evidence that increased consumption of seafood and bioactive components derived from fish, shellfish, and seaweed could positively impact the health of people around the world. Thus, the role of seafood in the maintenance and enhancement of health may grow stronger, given lifestyle-related disease and the local food environment. To sum, it is of paramount importance to promote seafood consumption and a reduction in high-sugar and high-fat food, including fast food and soft drinks (sugar, in particular), saturated fatty acids, and n-6 PUFAs, which is currently excessive.

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Recent Advancement of Culture Techniques In The Fisheries Sector

Gaurav Ghosh
B.F.Sc. 2nd Year 1st Semester

Abstract

In the current times, we face three major problems-: Space availability, Resources acquirement, and Waste management. So the aim was there among the researchers of different disciplines as to how to deal with them or mitigate them. In the scope of fisheries application, we hope to address the above matters along with the basic idea of the need to maximize the profit & produce. Here we will get to know about some cultural techniques that came in recent times and are doing well for the above concerns.

Introduction

The latest cultural techniques deserve the mention of Biofloc Technology, Bottom cleaning technology, RAS and Sewage fed aquaculture. The former two are tank-based culture techniques that address space concerns and water wastage issues, especially in Biofloc technology. As mentioned earlier, all practices are a form of intensive aquaculture, feed supply is needed in every practice technique, but the only thing is that we need less feed in these techniques, which is also the most significant advantage of these technique practices. In the sewage fed aquaculture, the household and industries' wastewater is used to culture fishes. This practice needs space and is not very popular among farmers.

A Brief Overview of these Techniques

Biofloc was first developed in the French Research Institute for Exploitation of the Sea, Oceanic center of Pacific, and was tested with the tilapia (Oreochromis niloticus) & Pacific white shrimp (Litopenaeus vannamei). Commercial level application of BFT started in 1988 by Sopomer farm and Belize aquaculture farm of Central America, producing approximately 26tons/ha/cycle using 1.6 ha lived to grow-out ponds. Greenhouse BFT farms are successfully run in Maryland, USA. The main advantage of this BFT (Biofloc technology) is that there is a saving of 40% protein in the feed & since protein is one of the costliest components, the feed cost comes down drastically with good & fast growth of the species can be achieved. In BFT, there is a bacterial colony (called floc) is grown, which can fix the waste nitrogen (as ammonia, in fish feces) to usable form (Nitrite). This bacterial colony is the main component of BFT. BFT, Bottom cleaning, and RAS technology improve land and water use efficiency but BFT is equipment dependent heavily and complicated to understand & implement. The Bottom cleaning, on the other hand, is similar to BFT but primitive to it. Instead of the bacterial colony breaking it, i.e., the ammonia and other wastes, they are removed out mechanically with the help of a central drainage system, and that wastewater is used to grow plants that the cultured fish eats. The Bottom cleaning is easier but wastes a fair amount of water as lower aquifer (groundwater) is preferred here, and also, there is a risk of weed infestation in the nearby water body if not managed & appropriately checked. The (Recirculatory Aquaculture System) in the view of water wastage & efficient utilization is theoretically the best but demands a considerable investment and proper related infrastructure facilities that need periodic maintenance like in BFT. Despite being very promising and useful, it is practiced only in West Bengal in India. This technique demands raw sewage, which is easily available, but transportation is still tricky. This technique is based on the sedimentation & decantation of water filtration where the solid particles are removed, and the water with high nutrient and organic matter is used for fish culture. It is an open-system culture practice, unlike the BFT & Bottom cleaning Technology.

Conclusion

All of the above culture techniques are very scientific & can generate very high yields as mentioned earlier. These techniques are the example of intensive aquaculture. More farmers' development & adoption is a growing necessity to ensure low-cost protein to the ever-expanding population. Despite the tremendous potential of these techniques, they are species-specific, i.e., they can't be used to culture all types of fish species, which turns out to be a drawback. Along with these, the awareness is also significantly less among the ordinary people; thus, they miss out or start with half or no necessary knowledge and often lands in failure. Thus, we need proper awareness initiatives from the government's sides so that the interested people do not miss out. As these techniques are beautiful and farmers can take inspirations from these practice methods and develop something useful in their culture, making higher profits & always produce the main aim.

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Ornamental Fish Diseases

Sayan Chakraborty
B.F.Sc. 1st Year 1st Semester



Introduction

Aquaculture is a growing part of agriculture. It makes up the considerable production of fish globally. Despite facing many challenges in the Aquaculture environment, this increases the growth of production, which achieves. To reduce fish diseases, it is necessary to follow scientifically proven and recommended ways.

Gill Rot

The disease occurs due to the fungus Brachiomyces sanguinis.

Symptoms of diseases

Due to close blood vessels, Gills converted into white color, and Gills rotting starts. Due to this, fishes face breathing problems and float and at Last died.

Treatment

At first, keep the fish 3-5% saltwater within 5-10 min if it is the outbreak of infection, then apply 10-15 kg quicklime in water.

Fin and Tail Rot

Tail and fin rot are bacterial infections of the tail and/or fins and may be caused by generally low water quality in a fish tank or aquarium.

Symptoms of Diseases

Fish fins that may be reduced to stumps, exposed fin rays, blood on edges of fins, reddened areas at the base of fins, skin ulcers with gray or red margins, cloudy eyes are the primary symptoms.

Treatment

An effective treatment is added antibiotic(water treatment) such as chloromycetin (chloramphenicol) and tetracycline at 10 mg per liter of water

Dropsy

The diseases occur due to Aeromonas sp.

Symptoms of Diseases

Under the scale waterlogging at the body and stomach filled with water due to the infection in kidneys, the excess amount of water cannot remove by their body.

Treatment

Use potassium permanganate at 1L water in a 1 mg ratio.

Conclusion

Aquaculture is a huge industry. The sector has been facing many challenges among the challenges of infectious diseases. For preventing this problem, practical strategies are recommended. These strategies focus on preventing the development of infections and used legally approved medicine to protect fishes.

Impact of Covid-19 on Small Fish Farmers and Businessmen

Outbreak of Corona Virus disease (Covid-19) has severely affected the global economy. Major victims of the covid 19 outbreak were small fish farmers and Sellers. Ever since the Central Government announced a day long curfew on March 22nd followed by a 21day lockdown, starting from March 25th to control the spread of Corona Virus, and this lockdown created a major impact in the Fisheries sector especially as many farmers, who were dependent upon fishes for their livelihood. Impact the markets too faced a lower supply and that created a major ups and downs in the market.

For more information regarding the problems faced by farmers and fish sellers, we thought to approach one of West Bengals fish Feed supplier Mr. Ayan Biswas a and tried to collect some more information about the Covid 19 impact on the Fish market. Mr. Biswas said that covid 19 impacted the Fisheries in many ways like lack transportation for which supplier were unable to supply fish feeds into the main markets. As the Government, announced total lockdown, the normal market sale has been lower as many sellers were unable to supply items and farmers who were dependent upon the public transport were unable to supply the fishes in the market that created a lower in supply. Though the government said that you if you are capable of availing your private transport then you can sell by following the lockdown rules and regulations, so did some were able to sell but maximum couldn't sell as due to lack of transportation and they were totally dependent upon Public transport system that created a ups and downs in the market.

Some local sellers were able to sell fishes or fish feeds via contact services like you have book your item and they will send you the product but that wasn't too much profitable as due to covid 19 many people were not able to take any products.

He also said that the some fish feed sellers have faced lack of consumers and that created them to sell the feeds with little higher than normal price as the lack of consumers made the stock of feeds which they bought before lockdown and lack of consumers increased the sellers stock to get increase. Less buyers created a increase in feed price.

The covid situation has made great economic problem around the market which was not only suffered by Sellers and farmers in fact many local fish sellers too as they were unable to bring fishes from the market. For instance and to know about the struggles of local fish sellers, we thought to take an interview of a local fish seller. Here's a small interview of him in the video.

Conversation between Sayani Kar and a Local Fish Seller

Sayani: Uncle your name?

Fish Seller: Kartik Das.

Sayani: where do you live?

Fish Seller: Teherpur.

Sayani: Well, how many years have you been in this business?

Fish Seller: I have been selling fishes for about 40-45 years.

Sayani: Well 40-45years, from where do you brought this fishes?

Fish Seller: I brought this from Ranaghat, before i used to bring it from Sealdah, now from Ranaghat, Krishnanagar and many more places.

Sayani: Have you recieved any kind of help from Government?

Fish Seller: No, i didn't get any sort of help from the Government.

Sayani: How did you manage to bring fishes, during the lockdown period?

Fish Seller: At that time I used to buy fishes from people who were using motorbikes to go for fishing, paying a little more high price and would sell them little by little and by that earning we used to survive somehow.

Sayani: So, are you able to sell fishes at that time like now?

Fish Seller: Yeah, but not so much.

Sayani: How did you manage to run your business at that time?

Fish Seller: That time I used roam here and there and used to sell somehow about 5-10kg fishes per day.

Sayani: Did the government helped?

Fish Seller: No, the government didn't helped us so much, but provided us with some rice.

Sayani: Can you see any sort of improvement now?

Fish Seller: Yeah, there's an improvement for sure as people started accepting it and I could sell fishes like earlier I used to sell.

Sayani: Thank you uncle for giving us your precious time. Hope everything will be okay. With thats it Take care and Bye!

Kartik Das

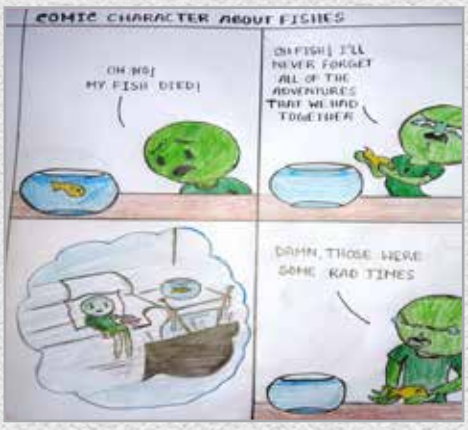
*Photographer: Joydeep Banik, Edited by: Subhrajit Chakraborty, Sayani Kar

Information collected by: Swastik Mondal, Sayani Kar (B.F.Sc, 2nd Yr 1st Sem)

https://youtu.be/lZTiLwdvtvc

Animation/ Drawing

Srijoni De
B.F.Sc. 1st Year 1st Semester



Srijoni De
B.F.Sc. 1st Year 1st Semester

Srijoni De
B.F.Sc. 1st Year 1st Semester

Abhinandan Paul
B.F.Sc. 2nd Year 1st Semester

Abhinandan Paul
B.F.Sc. 2nd Year 1st Semester

Abhinandan Paul
B.F.Sc. 2nd Year 1st Semester

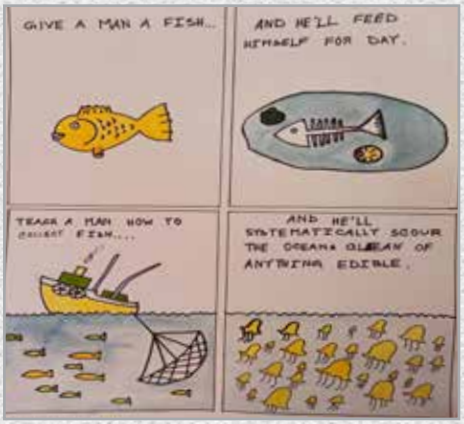
Abhinandan Paul
B.F.Sc. 2nd Year 1st Semester

Dipasree Roy
B.F.Sc. 1st Year 1st Semester

Dipasree Roy
B.F.Sc. 1st Year 1st Semester

Animation/ Drawing

Dipasree Roy
B.F.Sc. 1st Year 1st Semester



Dipasree Roy
B.F.Sc. 1st Year 1st Semester

Bratati Das
B.F.Sc. 2nd Year 1st Semester

Bratati Das
B.F.Sc. 2nd Year 1st Semester

Bratati Das
B.F.Sc. 2nd Year 1st Semester

Bratati Das
B.F.Sc. 2nd Year 1st Semester

Swastik Mondal
B.F.Sc. 2nd Year 1st Semester

Priyamedha Saha
B.F.Sc. 1st Year 1st Semester

Suhail Alam
B.F.Sc. 2nd Yr 1st Semester

বৃষ্টি

জন্ম হল তোমার হাতে
শস্যে ভরা মাঠ,
ধান পাকে ধান কাটে
কৃষকের ডাক।
হাসে তারা খিলিখিলি
মাঠে কেন উৎপাত !
শিরে শীষ আছে যখন
ভরবো মাঠ ঘাট ।
তোমার জন্য সম্ভব সব
এতো হাসি মুখ
দুঃখের অবসান
তাই এত সুখ ।
ঝিরিঝিরি ঝরনার
মতো তুমি ঝরছো
কানে কানে কৃষকের
হয়তো কিছু বলছো ।
দুঃখের অবসান
তাই এত সুখ ।
ঝিরিঝিরি ঝরনার
মতো তুমি ঝরছো
কানে কানে কৃষকের
হয়তো কিছু বলছো ।
হবে অবসান দুঃখ তোদের
দেব শস্য ভরা মাঠ,
স্বপ্ন দেব বক্ষ ভ'রে
দুঃখ ? বালাই ষাট ।

আবির হালদার
B.F.Sc. 2nd Year 1st Semester

Students Curriculum

হয়তো এক সাধারণ জেলে

রাত থাকতে দিন শুরু হয়ে যায়, সূর্যের মুখ দেখার আগেই যাদের বেরিয়ে পড়তে হয় নিজেদের কাজে,তারা হল আমাদের সমাজের অত্যন্ত গুরুত্বপূর্ণ এক সম্প্রদায়, যাদের আমরা 'জেলে' বলে থাকি, সংস্কৃত ভাষায় যাদের নাম ধীবর।জীবনধারনের জন্য প্রধানত মাছ ধরা ও সেই সম্পর্কিত পেশার উপর নির্ভর করেন বহু মানুষ।সাধারণত ভাবে যারা মাছের উপর নির্ভর করে জীবিকা নির্বাহ করে তারা জেলে হিসাবে স্বীকৃত।আবার নদীর উপর নির্ভরশীল দেরও জেলে বলা হয়। যদিও এখন জেলে শব্দের ব্যাবহার এখন কমে গিয়ে "মাছ চাষী" বা "মৎস্য চাষী" বলা হয়। ভোর হওয়ার আগেই যারা শীত-গ্রীষ্ম-বর্ষার তোয়াক্কা না করেই ঝাঁকে ঝাঁকে মরশুমি ও সহজাত মাছ ধরে রাজ্য-কেন্দ্র স্তরের অর্থনৈতিক উন্নয়নে সাহায্য করে। "মাছে-ভাতে বাঙালি" আপ্তবাক্যকে বাস্তবে রূপ দিতে, বাঙালির রসনা তৃপ্তির জন্য নানারূপ মাছ ধরে আমাদের প্রতিদিনের চাহিদা পূরণ করে চলেছে জেলেরা.. তাদের রোজকার জীবনযাত্রা এক থেকে গেলেও আমাদের থাবার থালায় রোজ ই মাছের জোগান দিয়ে চলেছে তারা,অথচ তাদের একাংশ তবুও সমাজে থেকে যায় অপাঙক্তেয়,ব্রাত্য।প্রকৃত ধাঁচের জীবনযাত্রা ছাড়াও নিজেদের জাল, নৌকা, নদী, মৎস্য আহরণ ও বিপণন কে কেন্দ্র করে তারা গড়ে তুলেছেন এক অনন্য সংস্কৃতি। মাছ চাষী দের প্রধান উপকরণ জাল,তবে শুধু জালের উপর মাছ ধরার দক্ষতা নির্ভর করে না, নির্ভর করে কৌশলগত ধরনের উপর। ঋতুভেদে জেলেদের আয়ের পরিমাণ ভিন্ন হয়। মাছ ধরার পাশাপাশি জাল তৈরি করেও অনেকে জীবিকা নির্বাহ করে থাকেন।"সব পাখি ঘরে ফেরে ,সব নদী....."- জীবনানন্দ দাস তার বিখ্যাত কবিতা "বনলতা সেন" এ লিখেছেন সব পাখি হয়তো ঘরে ফেরে, তবে সব জেলে ঘরে ফেরেনা, জেলেরা অধিকাংশ ক্ষেত্রেই গরীব। তারা এক নৌকায় মাছ ধরে মাসের পর মাস।জেলে পাড়ায় ঢুকলে যে চিত্র আমাদের চোখের সামনে ধরা পড়বে তার বর্ননা বহুবছর আগে "তিতাস একটি নদীর নাম" উপন্যাসে অদ্বৈত মল্লবর্মণ দিয়েছেন - "ঘাটে বাঁধা নৌকা, মাটিতে ছড়ানো জাল,ঘরে ঘরে চরকি, টেকো, জাল কেনার সরঞ্জাম। এইসব নিয়েই তাদের সংসার।"দিন বদলায় নতুন দিন আসে। আড়ৎদার - চালান বাবুদের নাম বদল হয় কিন্তু সমুদ্র বা নদী পাড়ের জেলে পল্লী গুলোতে গেলে মনে হবে জেলে জীবনে কোনোদিন আধুনিকতা আসেনি।কিছু কিছু জায়গায় বসবাসকারী জেলেরা খুবই অসহায় ও হতদরিদ্র। পাড়ার সবাই জেলে হলেও তাদের অধিকাংশই মাছ ধরার জন্য জাল কিংবা নৌকা কোনোটাই নেই। যেকারনে এই হতদরিদ্র প্রভাবশালী মহলের কাছে শোষণের শিকার। ছল -চাতুরি র আশ্রয় নিয়ে আড়ৎদার বা চালানবাবুরা বিনা পয়সায় এদের মাছ হাতিয়ে নেয়। নৌকা ও জালের মালিকেরাও তাদের নানা কৌশলে ঠকায়। শোষণ আর বঞ্চনাই যেনো তাদের নিয়তি। অন্যদিকে প্রকৃতিও অনুকূলে নয়। বর্ষার জল কখনো কখনো ভাসিয়ে নেয় তাদের মাথা গোঁজার ঠাঁই। নড়বড়ে ঘর গুলো সামান্য ঝড়েই বিধ্বস্ত হয়। রোগ- শোক - জরা - মৃত্যু এখনকার জেলেদের নিত্যসঙ্গী। দিনরাত মাছ ধরা আর শুকনো নিয়ে ব্যাস্ত থাকতে হয়। রোদে পুড়তে পুড়তে তাদের চেহারা নিগ্রোদের মতো হয়ে যায়। দু - বেলা দু মুঠো ভাতের জন্য পরিবার পরিজন ছেড়ে নদী সমুদ্রে কতই না কষ্ট করে। সমাজের অংশ হিসেবে ওরাও থাকুক,ওরাও বাঁচুক প্রাণভরে...!!

জেলের পেশা সম্পর্কে কবি উত্তম চক্রবর্তী লিখেছেন—

নদীর ধারে বাড়ি জেলে
নদীর পাড়ে প্রান
নদী চরে বেড়ে ওঠাই
বালুচরের জান।
জেলের পেশা মাছ ধরাতে
সারাজীবন ধরে
তাইতো জেলে জীবন গড়ে
নদী পাড়ের তরে।
মাছ ধরিতে মাঝ নদীতে
জেলে যখন যায়
ঢেউ এর তালে নৌকাটি তার
উল্টে যেতে চায়।
জোয়ার ভাটা নদীর খেলা
জেলের খেলা জলে
মাছের খেলা জেলের জালে
কেমন ধরে নিলে ?
জীবিকা তার মাছ বেচাতে
দুঃখে জীবন চলে
বেঁচে থাকার তাগিদে তার
জীবন বাজি খেলে।
নদীতে তার অন্ন বলে
নদী চোখের জলে
এই নদীতে বাঁচে জীবন
মরণ তারই কোলে।

শুভ্র মণ্ডল
অরিন্দম জানা

B.F.Sc. 2nd Year 1st Semester

মায়ের আগমন

শরৎকাল আর পেঁজা তুলা, মায়ের আগমন
বাংলা জুড়ে ঘরে ঘরে বিরাট আয়োজন।
দুগ্গা মায়ের ইচ্ছা ভীষণ প্রণ বিরিয়ানি ভোজ;
গণেশ ভায়া করছে এখন ভাঁপা ইলিশ খোঁজ।
কার্তিক তার ময়ূর নিয়ে কাটলেটে দেয় মন;
মুশকিলেতে লক্ষী ভীষণ চিলি ফিশ না লেমন স্যালমন।
সরস্বতীর বীনার তারে কন্টিনেন্টাল সুর;
চিতল মুইঠা চেখে দেখার ইচ্ছেটা ভরপুর।
সবাই মিলে ম্যাগাজিনে ইচ্ছে পূরণ হোক,
মায়ের সাথে ভোজন রসে মাতুক মর্ত্যলোক।।

অমৃতা চিনে

B.F.Sc. 1st Year 1st Semester

Life of A Blues Son

Arindam Jana and Pritam Pramanik

B.F.Sc 2nd Year 1st Semester

Those who start their day at night, those who have to go out on their own before rising of the sun, are one of the most important community in our society, whom we called “Jale”, whose name in Sanskrit is “Dhibar”. Generally, those who depends on fish for their livelihood are recognized as fisher man. And dependents on the river are also called fisher man. Once fishing was considered the main occupation of fisher man. As the demand for fish increases day by day, the scope of work of fisher man has also increased several times. They manage every step of fish farming starting from the breeding season of the fish. And so now the use of the ward fisherman has decreased and the use of the ward “the fish farmer” is increases. There was a time when these fishermen also used to weave nets used for fishing.

Now a day’s concentration many fishermen are forced to go to the river to catch fishes in defiance of government restrictions as they have no way to make ends meet. We are struggling to survive. This struggle is not just a few days or night, we are going through these struggle day by day. In fact, it seems like curse to be born in prison now. Why do not the fishermen return? Pirates attack at the set. Snatch the net, snatch the fish trawler. The fishermen took the money hostage when he did not get the money, he threw the fishermen into the sea. No one returns from inevitable death. While fishing in the sea, the fishermen go to the deep sea. Then, if there is a storm, to trawlers returns, no trawler can return. The relatives do not want to believe even if some trawler can give the news of those who cannot return even then, for months, his wife and relatives stared at the colorful trawler. Even then, the only on recourse for seasoning fishermen is the Bay of Bengal. Where, life’s run to the bet of the waves.

This is not the end of the story. The pirates are also the big crisis at sea. They hit the trawler at the night and went out guns and rifles. Forcedly snatched money, trawler, motors. Once again, the fishermen are thrown into the water and the trawler dis appears in an instant, decides if the sea is rough, there are boat accidents. Everything is there. There is moneylender’s care, there is hunger for rice. Only Hilsa has no right to eat. Yet for hilsa he has to go down to the sea, to the oscillation of the sea, to the floating, floating face of the child – beloved man. But knowing all this, in spite of seeing everything, one has to go down to the sea of hunger. where ever you go, there is no shelter in the salt water except the mother space. But they also know that the trawler will overturn and disappear if it gets a little messy. Their plastic tires and bamboo rafts will not provide any security. Yet the intensity of hunger in the stomach is so much greater than the fear of the sea that hunger is forced to overcome fear.

Just Fishermen

Gaurav Ghosh

B.F.Sc. 2nd Year 1st Semester

(The rusted poet)

Bating his oar hard in the blues,
There needs dare & devotion all true.

Sinking can stuck their fate,
Yes, I'm talking about the "Just Fishermen".

They belong to the fraternity,
That remains lost to the salty blues,
To them, they see the earth's curvature,
Amidst the calm and dangerous sea's nature.

They are the ones,
whom nature can easily prey,
Still they risk themselves,
Only to let them and our needs to get paid.

They seem common men,
With experiences hidden amidst their visage,
Only the wrinkles they have,
Give the witness to that fact.

They are the people,
Who have given the Bengali their attribute,
We boast of as our ethnic attitude,
Whatever they might be as social,
For the men who fools Poseidon on daily basis,
No wonder, how hard is their lives are under crisis.

The men in folded lungis and a faded top,
Adorned their head is a printed cloth,
Which though is a native towel,
But a deeper abstract look reveals,
Their readiness to combat,
Be that a load or a chronic struggle.

They are the fishermen, they are a community,
They may be poor,
But live the adrenaline with dignity.

Long live those men,
Long live those men!!
The more I tell about them,
The less is thereby being justified.

It's my respect that forever resides,
I learnt a lesson,
On keeping joy and sorrow,
All side by side.

Photography Division

Abhirup Ghosh
B.F.Sc 2nd Year 1st Semester

Rishi
B.F.Sc 1st Year 1st Semester

Abhirup Ghosh
B.F.Sc 2nd Year 1st Semester

Abhirup Ghosh
B.F.Sc 2nd Year 1st Semester

Shreyam Mondal
B.F.Sc 2nd Year 1st Semester

Rishi
B.F.Sc 1st Year 1st Semester

Adwaid Suresh
B.F.Sc 2nd Year 1st Semester

Shreyam Mondal
B.F.Sc 2nd Year 1st Semester

Amrita Chiney
B.F.Sc 1st Year 1st Semester

Adwaid Suresh
B.F.Sc 2nd Year 1st Semester

Amrita Chiney
B.F.Sc 1st Year 1st Semester

Dipasree Roy
B.F.Sc 1st Year 1st Semester

Abhishek Bhowmik
B.F.Sc 1st Year 1st Semester

Dipasree Roy
B.F.Sc 1st Year 1st Semester

Dipasree Roy
B.F.Sc 1st Year 1st Semester

Swastik Mondal
B.F.Sc 2nd Year 1st Semester

Subhajit Sardar
B.F.Sc 1st Year 1st Semester

Adwaid Suresh
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Dipasree Roy
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Amrita Chiney
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Swastik Mondal
B.F.Sc 2nd Year 1st Semester

Swastik Mondal
B.F.Sc 2nd Year 1st Semester

Shouvik Sarkar
B.F.Sc 2nd Year 1st Semester

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Swastik Mondal
B.F.Sc 2nd Year 1st Semester

Shouvik Sarkar
B.F.Sc 2nd Year 1st Semester

Shreyam Mondal
B.F.Sc 2nd Year 1st Semester

LEGEND- BUILDING

A. UTILITY & SERVICES

1. Main Gate/ Securityroom
1a. ATM
6. Panel Room
16. Central Store
19. Electrical Room

B. ADMINISTRATIVE

2. Administrative Block

C. INSTITUTIONAL

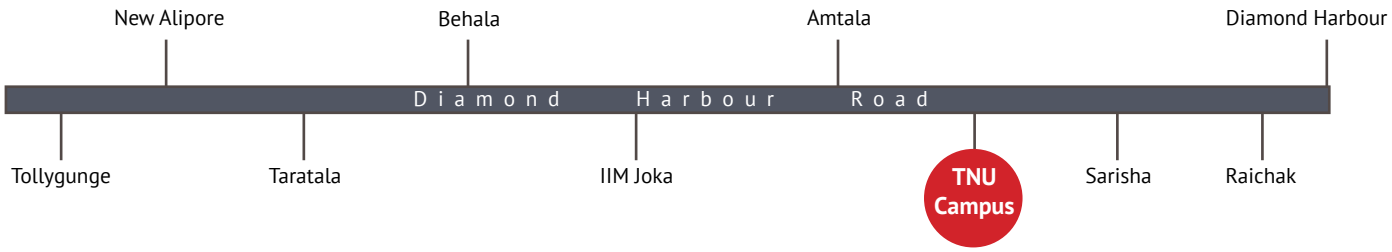
3. Scholastic Building-I
4. Scholastic Building-III
5. Scholastic Building-II
7. Workshop
8. Ship Building
9. BNS Scholastic Building

D. RESIDENTIAL

10. Boys Hostel-II
11. Girls Hostel-III
12. Boys Hostel-IV
13. Boys Hostel-VI
15. Staff Quarter
17. Canteen Block
22. Director's Residence
23. Basketball Court
24. Badminton Court
25. Football Ground

E. RECREATIONAL

20. Multipurpose Hall
21. Swimming Pool



AmbujaNeotia

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