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AmbujaNeotia

THE NEOTIA UNIVERSITY

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Volume. II
Issue. III

September
2024

DIVISION
OF
FISHERIES SCIENCES

# MATSYA JAGAT

EDITOR IN CHIEF :
Prof. (Dr) H Shivananda Murthy

EDITOR :
Dr. Hakim Mudasir Maqsood

Cover designed by Subrata Halder (BFSc. 5th SEM Student )

# Contents

# Foreword

It is with immense pleasure that I present to you the third issue of this year's e-magazine, **Matsya Jagat**, published by the Division of Fisheries Science at our university. This publication continues to serve as an invaluable resource for students, faculty members, and other readers, offering the latest information and insights related to the ever-evolving fields of fisheries and aquaculture.

Our Fisheries Science division is committed to providing a diverse range of activities that benefit not only our students but also fish farmers and entrepreneurs. In a time when access to the most cur-rent reading materials and information on aquaculture can be challenging, *Matsya Jagat* aims to bridge this gap. This magazine is designed to cater to the growing demand for knowledge, particu-larly among those who are keen on staying abreast of the latest advancements in aquaculture and fisheries sciences. We hope it becomes a cornerstone in the dissemination of information on the lat-est infrastructure developments and emerging technologies that are revolutionizing fish production, marketing, and preservation.

I extend my heartfelt congratulations to the dedicated faculty members of the Division of Fisheries Science for their relentless efforts in advancing our fisheries division. However, the journey does not end here. There is a pressing need to amplify our outreach activities, ensuring that the knowledge generated here reaches fish farmers, entrepreneurs, and marketing professionals. This integration is vital for fostering economic growth, ecological balance, and the empowerment of communities, particularly those in rural and remote areas of our country.

**Dr. Biswajit Ghosh**
Hon'ble Vice Chancellor
The Neotia University

# The Editor-in-Chief **Message**

It is my pleasure to introduce the 3rd Issue of volume – III of e-Magazine **"Matsya Jagat"** published by Division of Fisheries Science, The Neotia University, started with the objective to propagate the latest divisional activities, and initiatives of the division and impact thereof among the students and readers.

Dissemination of technological information, particularly latest advancements and developments in the area is the need of the hour. "Matsya Jagat" showcases the progress of the activities carried out under Division of Fisheries Science and I strongly believe that this magazine would serve as a great platform for promoting diversified fisheries activities, ideas and experiences and will further welfare of fisher, fish farmers, students and other readers in addition to the dissemination of information on the various aspects. I am sure this e-magazine will serve as media to disseminate the latest developments and activities of the Division of Fisheries Science. I would like to place on record my appreciation for the consistent efforts put in by the editorial team towards making of this magazine.

**Prof (Dr.) H Shivananda Murthy**
Chair Professor
Division of Fisheries Science
The Neotia University

# From the Editorial Desk

Dear Readers,

Welcome to the September issue of Matsya Jagat! This edition is particularly special as it showcases the incredible talent within our BFSc students. The cover design, crafted by a BFSc graduate student, beautifully encapsulates the spirit of our aquatic world, while the cover photo, captured by one of our own BFSc students, adds a visual depth that resonates with the theme.

Inside, you'll find insightful articles penned by both students and faculty, reflecting the vibrant academic and research culture across our departments. We are also delighted to feature the creative side of our students through their artwork and photography, highlighting the diversity of talents that make our community unique.

Thank you for being part of this journey. We hope this issue inspires you as much as it has inspired us.

**Dr. Hakim Mudasir Maqsood,**
Assistant Professor (Fish Genetics and Breeding)
Head, Department of Aquaculture
Div. Of Fisheries Sciences, TNU

# Foreword from **Faculty Head**

With immense pleasure and heartfelt enthusiasm, I welcome you to the latest edition of Matsay Jagat, Issue III (Vol.2). In the dynamic and ever-evolving field of Fisheries Science, Matsay Jagat stands as a beacon of knowledge and insight, serving the curiosity and intellect of both enthusiasts and professionals. As the Assistant Professor and Faculty Head of the Division of Fisheries Science at The Neotia University, I am profoundly aware of the significance of sharing valuable information and fostering a community dedicated to learning and collaboration. This issue promises to deliver a treasure trove of thought-provoking content, meticulously crafted to offer a comprehensive understanding of a diverse range of topics within Fisheries Science. Every article in this issue is de-signed with great care to provide both depth and breadth, ensuring a rich and enlightening experi-ence for our readers.

As a researcher and educator deeply committed to this field, I commend the editorial team for their dedication and vision in curating such an enriching publication. Matsay Jagat continues to be an in-dispensable platform for sharing knowledge, fostering dialogue, and shaping the future of Fisheries Science. I extend my heartfelt gratitude to all contributors whose expertise and passion light up the pages of this issue. May their insights inspire and empower you to explore the boundless possibilities within the realm of Fisheries Science.

With best wishes for a captivating and enlightening read

**Dr. Neeraj Pathak**
Assistant Professor and Faculty Head
Division of Fisheries Science
The Neotia University

# Faculty of Division of **Fisheries Sciences** at a Glance

## Faculty

### Prof. (Dr.) H. Shivananda Murthy

MFSc, PhD, PDF (USA, UK and Spain)
Chair Professor (with powers and position of Dean), Division of Fisheries Sciences

#### Department of Aquaculture

### Dr. Hakim Mudasir Maqsood

Assistant Professor (Fish Genetics and Breeding)
Head, Department of Aquaculture

**Key Research Area:**
Nutrigenomics, Genome Editing, One Health Aquaculture

### Ms. Puja Chakraborty

Asst. Prof (Adhoc Grade-I) Aquaculture

**Key Research Area:**
Nanotechnology, Environmental remediation, Aquatic toxicology

#### Department of Fisheries Engineering

### Ms. Aditi Banasure

Assistant Professor (Fisheries Engineering)

**Key Research Area:**
Traditional fish traps, TKs, Collapsible trap, Destructive fishing practices.

#### Department of Fish Processing Technology

### Dr. Neeraj Pathak

Assistant Professor and Head,
Fish Processing and Technology

**Key Research Areas:**
Emerging Fish Quality and Safety, Thermal Processing

#### Department of Aquatic Animal Health Management

### Dr. Avishek Bardhan

Assistant Professor and Head (AAHM)

**Key Research Area:**
Antimicrobial resistance, Aquatic Health, Antibiotic Safety, Drug toxicity

#### Department of Aquatic Environment Management

### Dr. Suman Karmakar

Assistant Professor & Head,
Aquatic Environment Management

**Key research area:**
Aquatic Toxicology

#### Department of Fisheries Resources Management

### Dr. Vikas Pathak

Assistant Professor and Head (FRM)

**Key Research Area:**
Fish diversity, Biology and Ecological studies

#### Department of Fisheries Economics, Extension and Statistics

### Mr. Khemraj Bunkar

Assistant Professor and Head (FEES)

**Key Research Area:**
Supply/Value chain analysis and Economic analysis

### Ms. Camelia Chattopadhyay

Assistant Professor (Ad hoc grade-II), FEES

**Key research areas:**
Fisheries Extension and Aquaculture

## Technical Staff

Laboratory Technician: 01

**Mr. Rohit Khatua** (MSc Marine Biology)

Field Staff: 03

# **Activities** at Division of Fisheries Sciences

## Prof H S Murthy participated in the CIBA's National Fish Farmers Day Celebration:

ICAR- Central Institute of Brackish Water Aquaculture celebrated 'National Fish Farmers Day' on July 10, 2024 at the Kakdwip Research Center, West Bengal. Prof H Shivananda Murthy, Dean & Chair Professor participated as the Chief Guest in the program, felicitated progressive fish farmers and addressed and interacted with the fish farming community. Prof Murthy had the privilege of planting a tree in the campus after the program. More than 60 fish farmers attended the program. The program was organised by the CIBA Research Center in a befitting manner.

# National Fish Farmers Day Celebration at TNU

Division of Fisheries Sciences celebrated National Fish Farmers Day on 11th July 2024 to com-memorate the pioneering work of Dr. Hiralal Choudhury and K. H. Alikunhi, whose breakthroughs in the induced breeding of Indian major carps have revolutionized freshwater aquaculture in India. The event also honored fish farmers and others involved in aquaculture and fisheries activities. The celebration witnessed the participation of local fish farmers, non-governmental organizations (NGOs), students, and other stakeholders in the aquaculture sector. This diverse gathering under-scored the community's collaborative spirit and dedication to advancing aquaculture practices.

The event commenced with an inauguration ceremony attended by esteemed dignitaries including the Registrar of TNU, Vice President of TNU, and the Chief Guest, Dr. Debasis De (Principal Scentist and Head) ICAR-CIBA, Kakdwap Research Centre. Their presence highlighted the im-portance of this day and set a celebratory tone for the proceedings.

# Orientation of I-Year BFSc Students (2024 Batch)

On 9th August 2024, the Division of Fisheries Sciences organized an orientation program for the new BFSc batch. Prof. H.S. Murthy (Chair Professor) introduced the program to the students, fol-lowed by a student-teacher interaction and a session where new students interacted with senior stu-dents.


# Prof H S Murthy participated in the International Conference

Prof H Shivananda Murthy, Dean & Chair Professor Chaired a Technical Session on “Inno-vations in Aquaculture” during the International Conference “13th Indian Fisheries and Aquaculture Forum” held at Biswa Bangla Convention Center, Kolkata during 22-25 February, 2024.

He also delivered a lead talk on recent advances in aquaculture in the conference. The conference was organized by ICAR- CIFRI, Kolkata in association with other organizations.

# Teachers Day Celebration at Div. Of Fisheries Sciences

On September 11th, 2024, BFSc students and faculty members commemorated Teachers' Day. Prof. (Dr.) H. S. Murthy, Dean of the Division of Fisheries Sciences, highlighted the pivotal role teachers play in shaping the nation's future and stressed the importance of student commitment to excelling in their careers.

BFSc students and faculty celebrating Teachers' Day 2024, with Prof. (Dr.) H. S. Murthy delivering an inspiring address on the vital contributions of educators and the role of students in building their futures.

# Fisheries Science Division signed MoU with country's premier ICAR Institute – CMFRI

Prof H Shivananda Murthy, Dean & Chair Professor Chaired a Technical Session on "Inno-vations in Aquaculture" during the International Conference "13th Indian Fisheries and Aquaculture Forum" held at Biswa Bangla Convention Center, Kolkata during 22-25 February, 2024.

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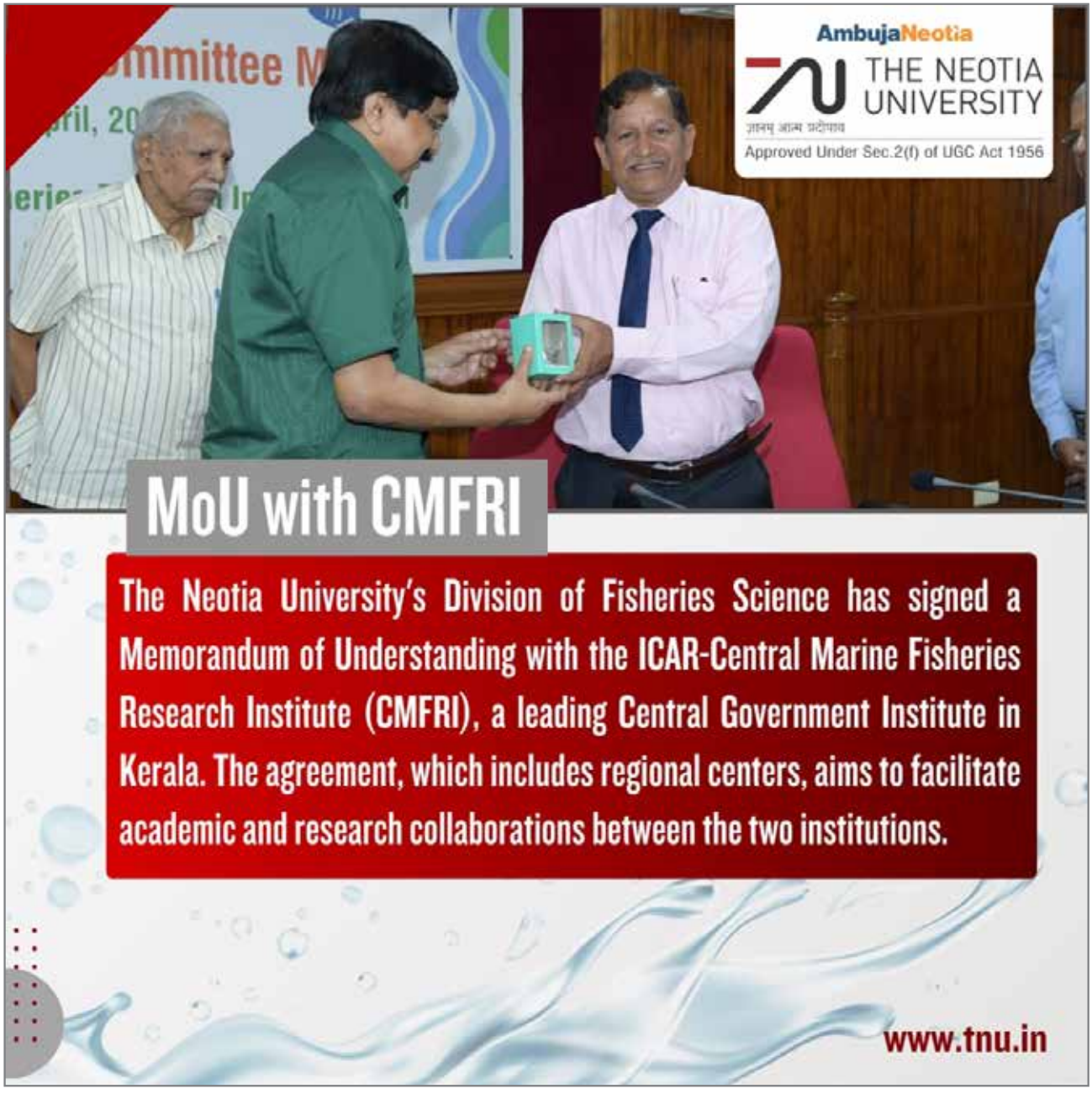


Recently, the Fisheries Division of the Neotia University has signed MoU with the country's premier ICAR - Central Marine Fisheries Research Institute (CMFRI), having HQ in Cochin, Kerala and has a dozen Regional Centers located all over the country, including the one at Digha in West Bengal.

# Internship Programme

The B.F.Sc. 7th Semester students completed their out-campus internship at the University of Kalyani and ICAR-CIFA (Rahara Research Station) from 15th to 30th July 2024. From 1st to 12th August 2024, the Department of Aquaculture, Division of Fisheries Sciences, TNU, provided an in-campus internship with hands-on training in induced breeding, rearing of live fish food organisms, ornamental fish rearing and management, and integrated fish farming.



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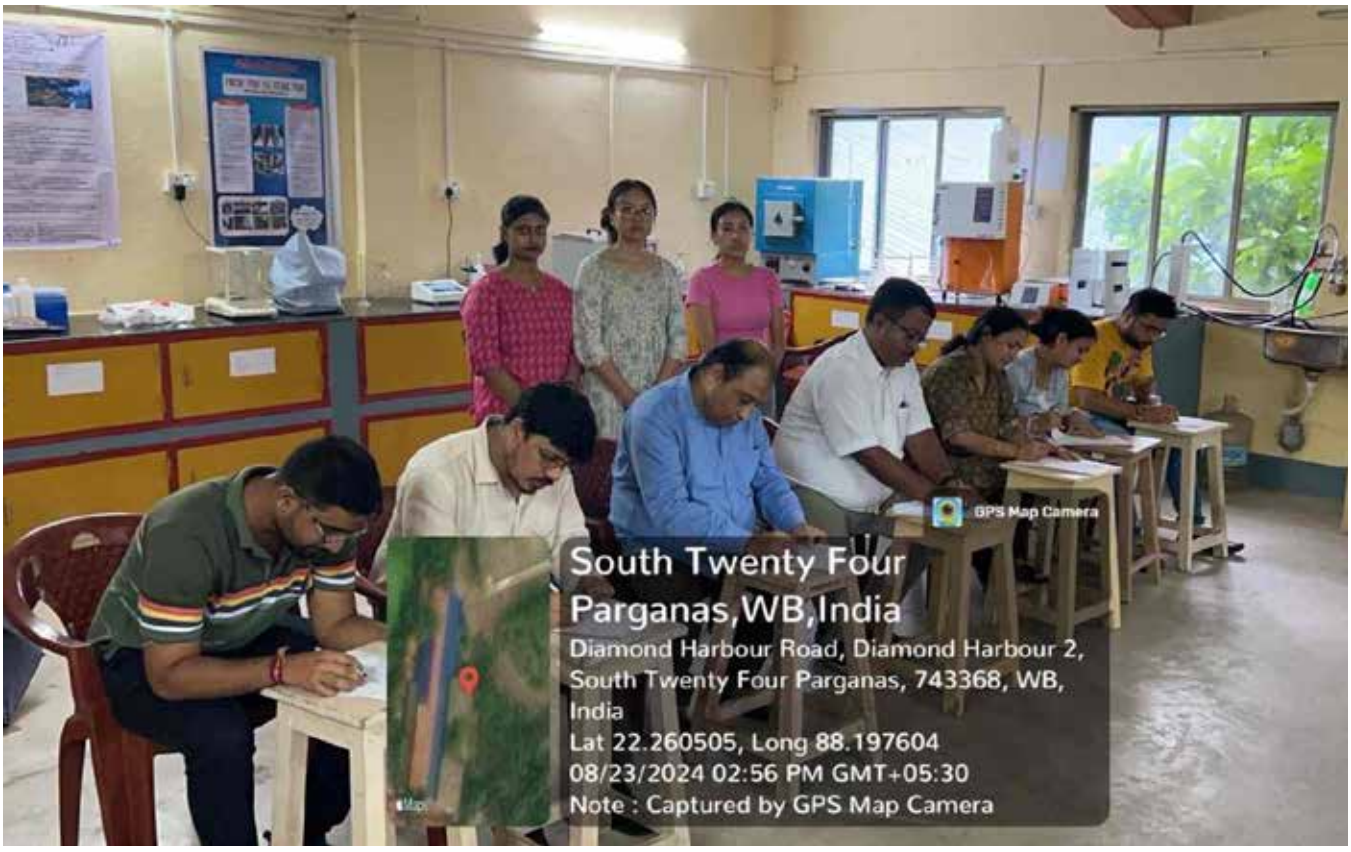
# Department of **Fish Processing Technology**

Final year BFSc students under the mentorship of Dr. Neeraj Pathak developed fish sausage from locally available low-cost fish species and sensory quality was evaluated by the external panelists from different schools of TNU. The developed product is under further study before it may be launched and commercialized.



# Department of **Aquaculture**

## 1. Breading of Indian Major Carps (IMCs)

Under the mentorship of Dr. Hakim Mudasir Maqsood (Head, Dept of Aquaculture), the induced breeding of IMCs was carried out in July-August 2024. The B.F.Sc internship batch (7th Sem), along with B.F.Sc 3rd and 5th Semester students, were involved to cover their practical classes and provide them with first-hand experience in breeding using synthetic hormones.


Practical demonstration of Pituitary Gland extraction from fish and its preservation for use in in-duced breeding. 5th Sem BFSc students under the mentorship of Dr. Hakim Mudasir Maqsood were provided hands-on-training in PG extraction and preservation.

# PG extraction and preservation.


# 2. Fish Harvesting and Sale

The Department of Aquaculture carried out routine harvesting of fish ponds 2 and 3. During this phase, Catla weighing approximately 7 kg were caught from pond 2. The harvested fish were put up for sale along with duck eggs as part of the department's regular revenue generation efforts. Besides IMCs, species like tilapia, mourala, channa, puntius and glass fish were also caught.

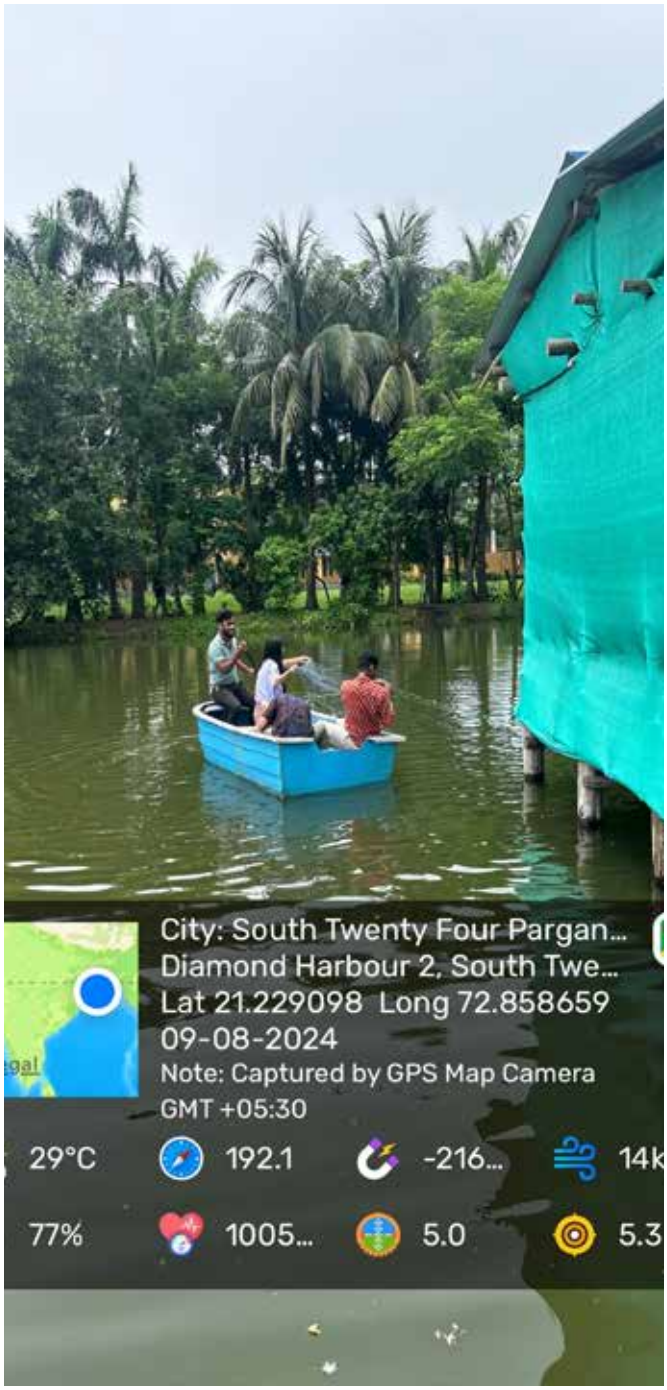
# Department of **Aquatic Environment Management** & Department of **Fisheries Resources Management**

Student exposure visit to Digha coastal belt in connection to their course work under the mentorship of Dr. Suman Karmarkar (Asst. Prof. & Head, Dept. Of AEM) & Dr. Vikas Phatak (Asst. Prof. & Head, Dept. Of FRM).



# Department of **Fisheries Engineering & Technology**

Braiding of fishing net and operation of gill net fishing by 5th Sem Students aspart of their practical course under the mentorship of Ms Aditi Banasure (Asst. Prof. Dept of Fisheries Engineering & Technology).

# Department of **Fisheries Economics, Extension and Statistics**

A national seminar (virtual) titled ***"Economic Strategies for Sustainable Fisheries: Integrating Profitability with Environmental Stewardship through Extension Management"*** was held on **20th September 2024**. The seminar focused on the intersection of economic viability and environmental sustainability in fisheries, highlighting strategies for enhancing profitability while preserving eco-systems.

Prof H S Murthy welcomed the guests, speakers and participants and introduced the topic of semi-nar. Dr Manish, Registrar and Mr. Suhas Mukherjee, Senior Vice President and Director, HRD, The Neotia University, addressed the participants in the inaugural session

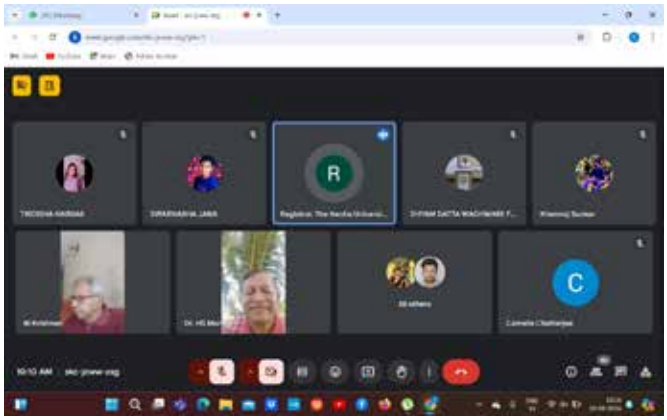
## Key Speakers:

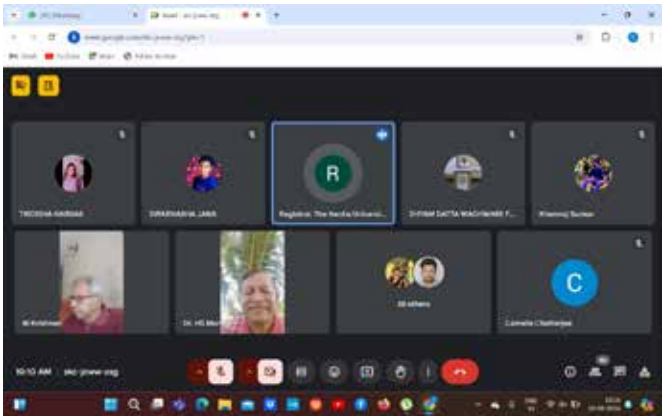
1. **Dr. M. Krishnan**
   Ph.D. in Agricultural Economics and Adviser (Fisheries) at Infinite Sum Modeling Inc., Seattle, USA, shared insights on fisheries economic strategies for sustainable growth.

2. **Prof. (Dr.) Biswarup Saha**
   Professor of Fisheries Extension at West Bengal University of Animal and Fishery, Kolkata, discussed the role of extension management in supporting sustainable practices within Indian fisheries.

3. **Dr. Samarpan Chakraborty**
   Subject Matter Specialist in Agricultural Extension at Dhannyaganga KVK, RKMVERI, Murshidabad, highlighted grassroots-level extension ser-vices and their impact on fisheries sustainability.

The seminar saw participation from scientists, research scholars, and students across India.

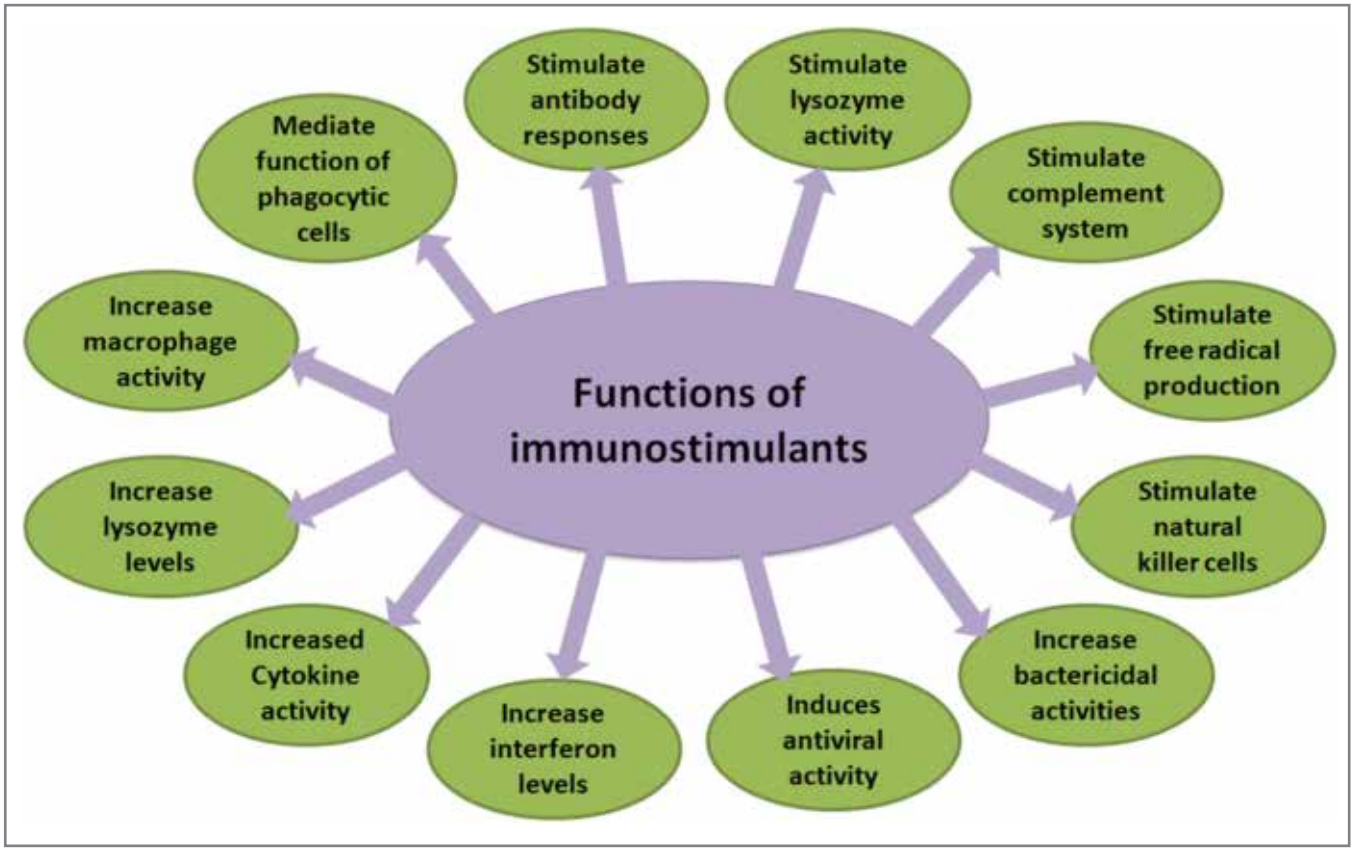




# Enhancing fish health in aquaculture: **The role and benefits of Immunostimulants**

**Avishek Bardhan, S K Jamirul Ali, Sayantan Basu, Binayak Maiti, Sourashish Sengupta, Soumili Halder**

Div. of Fisheries Sciences, The Neotia University, Sarisha




## Introduction

Aquaculture, the cultivation of aquatic organisms such as fish and shellfish, has grown exponentially in recent decades, establishing itself as a crucial sector in global food production. This growth, however, has brought challenges, particularly in the form of infectious diseases that thrive in inten-sive farming environments. These diseases, exacerbated by overcrowding and environmental stress-ors, pose significant threats to the aquaculture industry, often leading to substantial financial losses. Traditional methods for controlling these diseases, such as antibiotics and vaccines, have limitations, including residual effects in fish and the environment, and the emergence of drug-resistant patho-gens. In response, the use of immunostimulants has emerged as a promising alternative. Im-munostimulants are natural or synthetic compounds that enhance the immune response in fish, of-fering a safer and more effective method for disease prevention and control in aquaculture (Mehana et al., 2015).

## Immune system and disease control in fish

Immunization plays a key role in preventing diseases in fish. Fish rely on both general and specific immune defenses. Their skin and mucus serve as the first line of defense against infections. If path-ogens get inside, the fish's immune system activates different types of cells and proteins to fight off the invaders. Teleost fish have immune cells like macrophages, neutrophils, and lymphocytes, along with protective proteins like complement and lysozyme. The innate immune system, which includes these cells and proteins, is the fish's main defense and also helps guide the body's longer-term im-mune responses (Mehana et al., 2015). In fish farming, diseases, especially bacterial infections, are a major problem and can cause significant losses. These infections are often caused by specific types of bacteria that can lead to severe illness and death in both wild and farmed fish. To combat these issues, fish farms use antibiotics, chemicals, and immune-boosting substances. However, despite these measures, disease outbreaks still pose a serious economic risk to the aquaculture industry.

## The role of fish immunostimulants in fish health

Immunostimulants play a vital role in enhancing the innate and adaptive immune systems of fish, helping to protect them against a wide range of pathogens. The innate immune system, the first line of defense in fish, includes physical barriers like skin and mucus, as well as cellular responses in-volving phagocytic cells such as macrophages and neutrophils. Immunostimulants enhance these non-specific defenses, increasing the activity of natural killer cells, complement systems, and lyso-zyme activity. Additionally, they boost the production of antibodies, further strengthening the fish's ability to combat infectious agents (Mehana et al., 2015).

The use of immunostimulants in aquaculture has gained momentum due to their ability to improve fish welfare, enhance disease resistance, and reduce the reliance on antibiotics. Various types of immunostimulants, including ß-glucans, chitin, lactoferrin, and vitamins, have been shown to effec-tively modulate the immune response in fish. These compounds can be administered orally, through feed, or via injection, depending on the specific needs of the aquaculture operation (Kumar et al., 2023). Moreover, the application of immunostimulants is not limited to disease prevention; they are also used to improve the efficacy of vaccines, providing a more robust immune response in vac-cinated fish.

**Table 1. Types of immunostimulants in aquaculture**

| Source | Types |
|---|---|
| Synthetic chemicals | Levamisole, FK-565, 3-MDP (Muramyldipeptide). |
| Bacterial derivatives | ß-glucan, Peptidoglucan, FCA, EF203, LPS (Lipopolysaccharides), Clos-tridium butyricum, Chromobacter sterohalis, Vibrio anguillarum cells |
| Polysaccharides | Chitin, chitosan, Lentinan, Oligosaccharide |
| Animal Plant extracts | Ete (Tunicate). Hde (Abalone). Firefly squid, Quillajasaponin (Scaptree), Glycyrrhizin (licorice) |
| Nutritional factors | Vitamin C and Vitamin E |
| Hormones, Cytokines and others | Lactoferrin, Interferon, Prolactin |

## Advantages and challenges

The advantages of using immunostimulants in aquaculture are manifold. They offer a non-specific boost to the immune system, which is particularly useful in preventing outbreaks of diseases in high-density farming environments. Immunostimulants are also environmentally friendly, as they do not leave harmful residues in the water or the fish, unlike antibiotics and other chemicals. This makes them a safer option for both the aquaculture industry and the end consumer. Furthermore, immunostimulants can be used in combination with vaccines to enhance their efficacy, making them a versatile tool in disease management.

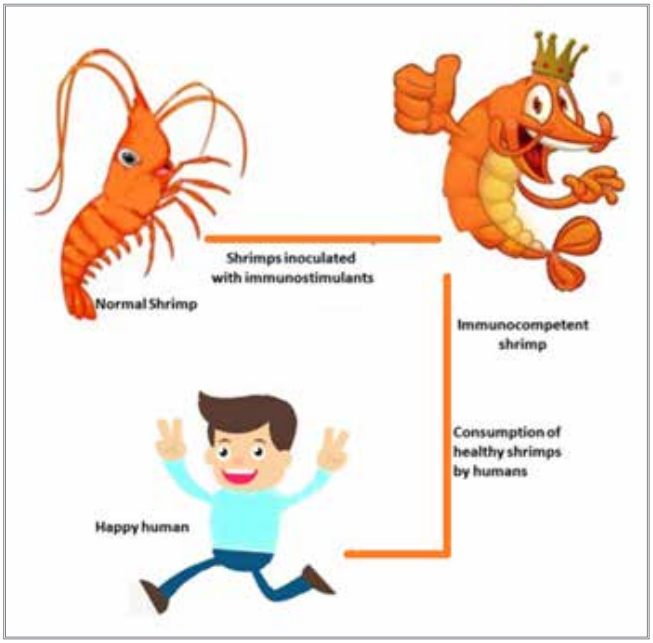



**Fig.1 Effect of immunostimulants on shrimp culture and its environment (Source: Kumar et al., 2023)**

However, there are challenges associated with the use of immunostimulants. The effectiveness of these compounds can vary depending on the species of fish, the type of immunostimulant used, and the method of administration. Long-term studies on the effects of immunostimulants are still limited, and more research is needed to fully understand their potential impacts on fish health and aquacul-ture productivity (Faruk et al., 2021). Additionally, while immunostimulants are generally safe, there is a need for standardized guidelines on their use to ensure consistent and effective results across different aquaculture systems.

## Vaccines versus immunostimulants

Vaccines provide targeted, long-term protection by creating immune memory against specific path-ogens. They require exposure to an antigen and typically protect against one or two specific diseases. In contrast, immunostimulants boost the immune system more broadly, enhancing general defenses like complement activation and phagocytosis, without targeting a specific pathogen. Examples include zymosan and glucans. While vaccines offer specific protection, immunostimulants strengthen the immune response against a wide range of infections (Farooqi and Qureshi, 2018).

## Conclusion

The aquaculture industry faces significant challenges in managing diseases that threaten fish health and productivity. Traditional methods of disease control, such as antibiotics and vaccines, have lim-itations that necessitate alternative approaches. Immunostimulants offer a promising solution, providing a natural and effective means of enhancing the immune response in fish. By improving disease resistance and reducing the need for antibiotics, immunostimulants contribute to more sus-tainable and profitable aquaculture practices. As research in this field continues to evolve, the use of immunostimulants is likely to become an integral part of fish health management, supporting the growth and sustainability of the global aquaculture industry.

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# Zebrafish: A Model Organism for Human Drug Discovery and Understanding Genetic Disor-ders

**Hakim Mudasir Maqsood[1*], Katherine Patton[2], Elvonu Toso[2]**

[1]Department of Aquaculture, Div. of Fisheries Sciences, TNU

[2]7th Sem BFSc Students

## Introduction

Zebrafish (Danio rerio) have emerged as a powerful model organism in biomedical research. Their genetic similarity to humans, transparent embryos, and rapid development makes them an ideal sys-tem for studying human diseases and drug discovery.

## Why Zebrafish?

### 1. Genetic Similarity to Humans

- Zebrafish share about 70% of their genes with humans.
- Over 80% of human disease-related genes have a counterpart in zebrafish.

### 2. Transparent Embryos

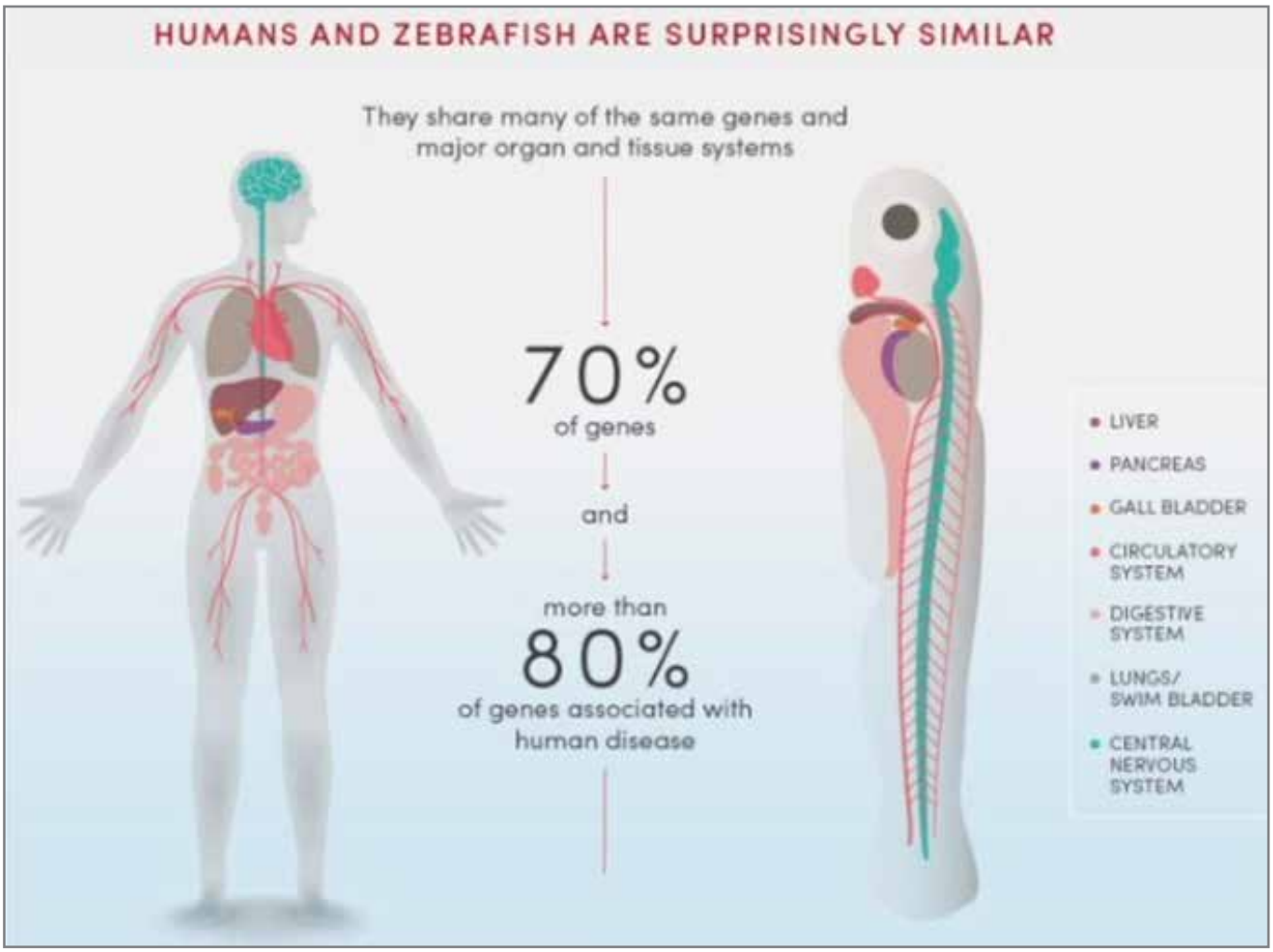
- Allows direct observation of developmental processes and organ formation.
- Facilitates real-time imaging of disease progression and treatment effects.

### 3. Rapid Development and High Fecundity

- Embryos develop quickly, providing swift results in experimental studies.
- Large number of offspring enables high-throughput screening.

### 4. Cost-Effective and Efficient

- Maintenance and breeding are less expensive compared to other vertebrate models.
- Small size and aquatic environment reduce space and resource requirements.



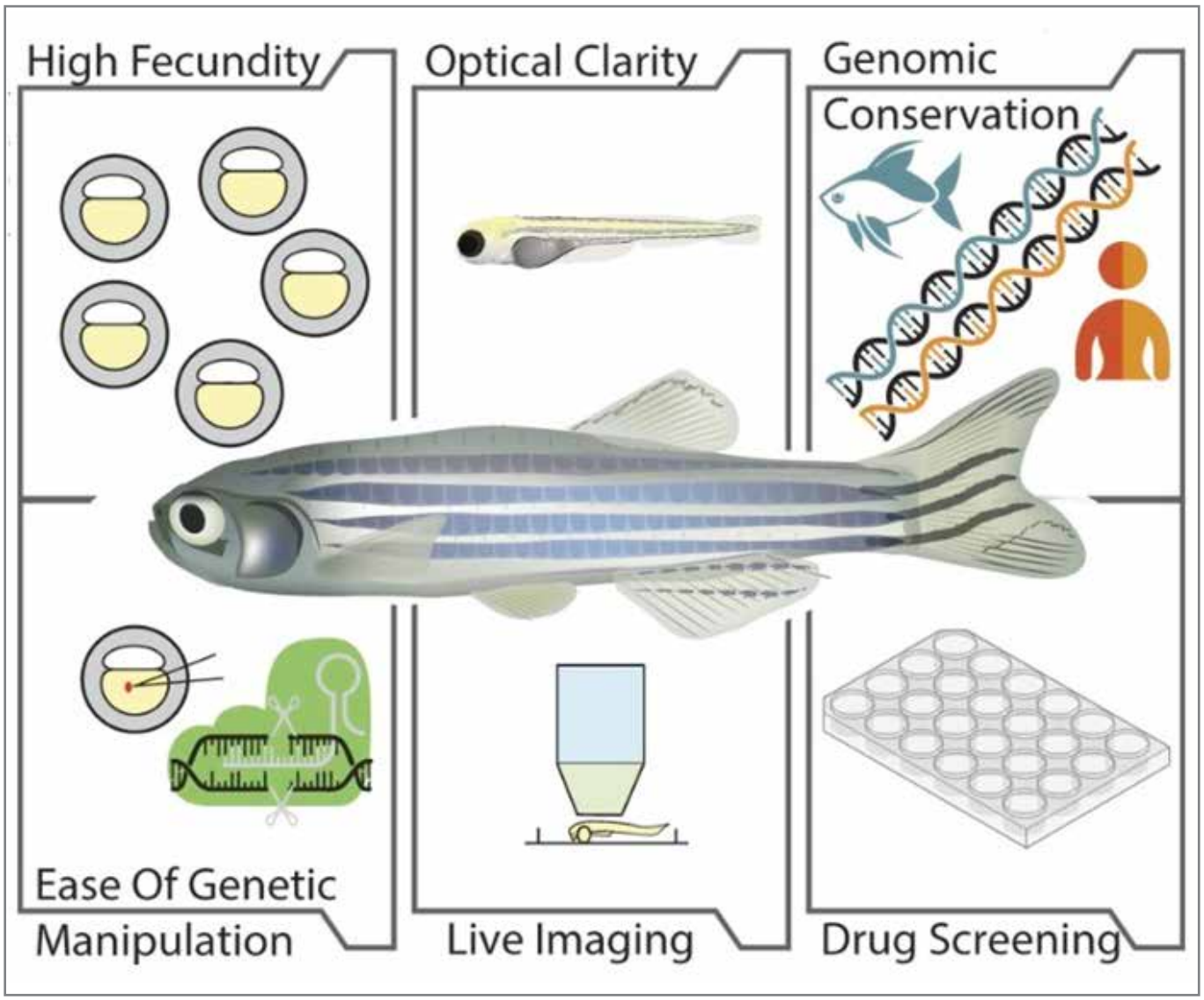

## Applications in Human Drug Discovery

### 1. High-Throughput Drug Screening

- Zebrafish embryos are used to screen large libraries of compounds for potential therapeutic effects.
- Automated imaging and analysis systems ccelerate the identification of drug candidates.

### 2. Toxicity Testing

- Zebrafish models provide a whole-organism context for assessing drug toxicity.
- Early detection of adverse effects can be achieved, nsuring safer drug development.




## Understanding Genetic Disorders

### 1. Gene Editing and Disease Modeling

- Techniques like CRISPR/Cas9 enable precise genetic modifications in zebrafish.
- Creation of zebrafish models for a wide range of human genetic disorders, including cancer, car-diovascular diseases, and neurological conditions.

### 2. Functional Genomics

- Functional studies of genes implicated in human diseases.
- Insights into gene function and interaction pathways, paving the way for targeted therapies.

## Case Studies

### 1. Cancer Research

- Zebrafish models have been used to study tumor growth, metastasis, and response to chemother-apy.
- Identification of new anti-cancer compounds through zebrafish-based screening.

### 2. Cardiovascular Diseases

- Models for congenital heart defects and other cardiovascular conditions.
- Studies on heart regeneration and repair mechanisms, offering potential for regenerative medi-cine.

### 3. Neurological Disorders

- Investigation of genetic and environmental factors in neurodevelopmental and neurodegenerative diseases.
- Development of new treatments for conditions like Alzheimer's and Parkinson's diseases.

## Conclusion

Zebrafish are invaluable in bridging the gap between basic research and clinical applications. Their contributions to understanding human genetic disorders and advancing drug discovery continue to grow, making them a cornerstone of modern biomedical research.

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# Engineering Solutions for Bycatch Reduction: Innovations in Fishing Gear Design

**Aditi Banasure* and Khemraj Bunkar**

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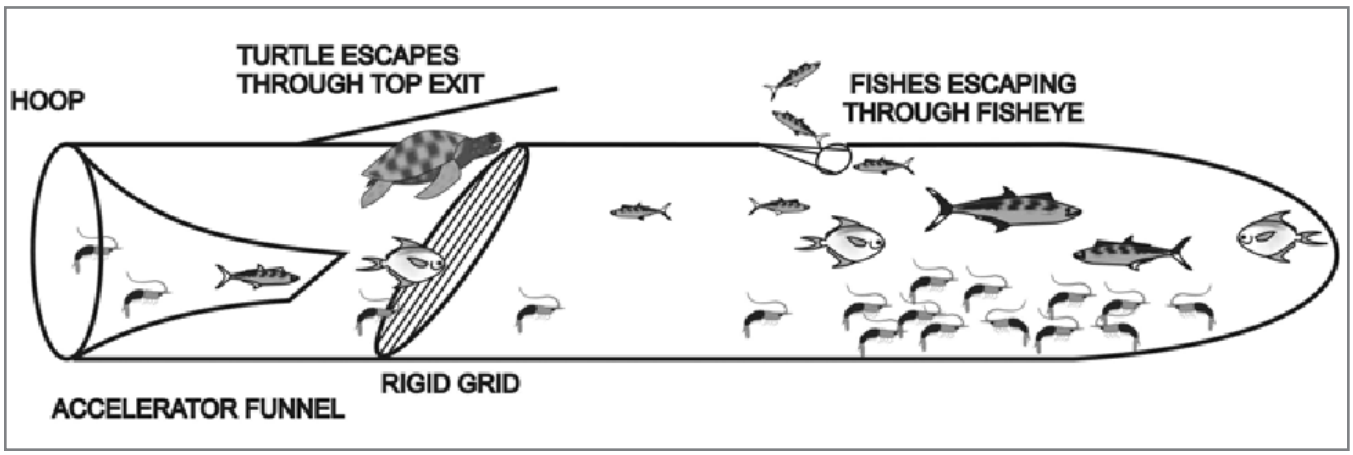


Bycatch, the unintended capture of non-target species during commercial fishing operations, has long been a significant challenge for the fishing industry. Bycatch can include fish species that are not commercially viable, juvenile individuals of target species, as well as other marine organisms like seabirds, turtles, and mammals. The consequences of bycatch are far-reaching, contributing to the decline of vulnerable species, disrupting ecosystems, and causing economic losses. In the case of India, it is estimated that 56.3% of the total marine capture is bycatch. Bycatch rates are signifi-cantly higher in India, where fishing is done mainly by trawling and with shrimp as the target spe-cies (Pradip and Harshada, 2023). To address this issue, fisheries engineers have been at the fore-front of developing innovative fishing gear designs aimed at reducing bycatch while maintaining the efficiency of fishing operations.

## The Challenge of Bycatch

Bycatch poses multiple challenges. Ecologically, it threatens biodiversity, as non-target species often include endangered or protected animals. For fishers, bycatch results in wasted effort and resources, as the unintended catch must often be discarded, leading to economic inefficiencies. Moreover, regulatory frameworks aimed at conserving marine life impose limits on bycatch, meaning fishers risk penalties if they exceed allowable levels.

## Engineering Innovations in Gear Design

To mitigate bycatch, engineers and marine biologists have collaborated to create a variety of gear modifications and new technologies. These innovations focus on making fishing operations more selective, allowing fishers to target specific species while avoiding others.

### 1. Selective Trawls and Grids

One of the most significant advancements in bycatch reduction has been the development of selec-tive trawls and grids. Traditional trawl nets capture a wide range of species due to their large, non-discriminatory openings. To address this, engineers have designed grids and panels that are inserted into the trawl nets. These grids allow smaller, non-target species to escape while retaining the larger, target species. Additionally, modifications like sorting grids and escape hatches have been particu-larly effective in reducing the bycatch of juvenile fish, ensuring that young fish have the chance to mature and reproduce.

### 2. Bycatch Reduction Devices (BRDs)

Bycatch Reduction Devices (BRDs) are specialized tools added to fishing gear that help reduce the capture of non-target species. For example, turtle excluder devices (TEDs) have been widely im-plemented in shrimp trawl fisheries to allow sea turtles to escape from nets. BRDs can be custom-ized for different fisheries and target species, making them a versatile solution. In some cases, BRDs are designed to exploit the behavioral differences between target and non-target species, such as differences in swimming speeds or escape responses.

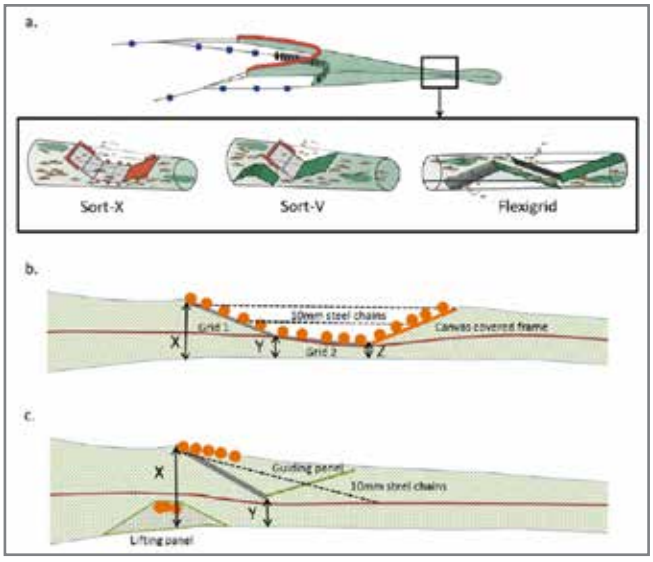


**Fig. 1. Grids used in bottom trawler**

### 3. Acoustic Deterrents and Visual Cues

Acoustic deterrents and visual cues have been employed to reduce bycatch, particularly for marine mammals and seabirds. These devices emit sounds or lights that deter non-target species from ap-proaching fishing gear. For instance, pingers, which are small acoustic devices attached to nets, have been effective in reducing the bycatch of dolphins and porpoises in gillnet fisheries Dawson et. al, 1998. Similarly, visual deterrents like colored or illuminated fishing lines have shown promise in reducing seabird bycatch in longline fisheries.

**Fig. 2. Pinger - Acoustic Deterrent Device**

### 4. Hook and Line Modifications

In longline fisheries, which target species like tuna and swordfish, bycatch of seabirds, sharks, and turtles is a major concern. To reduce this, engineers have developed several hook and line modifica-tions. Circle hooks, for example, are designed to reduce the likelihood of hooking non-target species and are easier to remove if bycatch does occur. Additionally, weighted lines that sink faster can prevent sea birds from being caught as they dive for baited hooks. These modifications, along with the use of bird-scaring lines (tori lines), have significantly reduced seabird bycatch.

### 5. Real-Time Data and Monitoring Systems

Advances in real-time data collection and monitoring have also played a crucial role in reducing bycatch. By equipping fishing vessels with GPS, sonar, and video monitoring systems, fishers can receive real-time data on the presence of non-target species. This allows them to avoid areas with high concentrations of bycatch species. Additionally, automated systems can alert fishers when by-catch thresholds are being approached, enabling them to adjust their fishing practices accordingly.

## The Future of Bycatch Reduction

While significant progress has been made in reducing bycatch, ongoing research and innovation are essential to further improve fishing gear selectivity. Future advancements may include the devel-opment of “smart” fishing nets that can automatically release non-target species, or the integration of artificial intelligence and machine learning to predict and prevent bycatch events more effectively.

Collaboration between engineers, fishers, regulators, and conservationists will be crucial in advanc-ing these technologies and ensuring their widespread adoption. As the demand for sustainable sea-food continues to grow, the pressure to reduce bycatch will only increase, making these engineering solutions more important than ever.

## Conclusion

Innovative fishing gear design is at the heart of the effort to reduce bycatch and promote sustainable fishing practices. Through selective trawls, BRDs, acoustic and visual deterrents, hook modifications, and real-time monitoring systems, fisheries engineers are providing practical solutions to one of the industry’s most persistent challenges. These advancements not only help protect marine ecosystems but also support the long-term viability of the fishing industry, demonstrating the critical role of engineering in sustainable fisheries management.

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# Eco-Carp Hatchery:
## Its components and working

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In the dynamic realm of aquaculture, hatcheries play a pivotal role in the controlled propagation and cultivation of aquatic species. The efficiency and sustainability of a hatchery depend on a careful orchestration of various components that collectively contribute to the success of the facility. As we embark on an exploration of these crucial hatchery components, it becomes evident that the intricate balance between technological innovation, environmental consciousness, and scientific expertise is essential to meet the growing demand for sustainable and responsible aquaculture practices. From energy sources to water management systems, each component plays a unique role in shaping the future of hatcheries, ushering in an era where ecological considerations & technological advance-ments harmoniously coexist. Let's delve into the intricacies of these components, unravelling the layers that constitute the foundation of modern hatchery operations

## Components of Chinese Circular Hatchery

### Water stocking pond

It is a water stocking pond from where the desirable water taken, sometime also we use under-ground water stock to use in the hatchery.

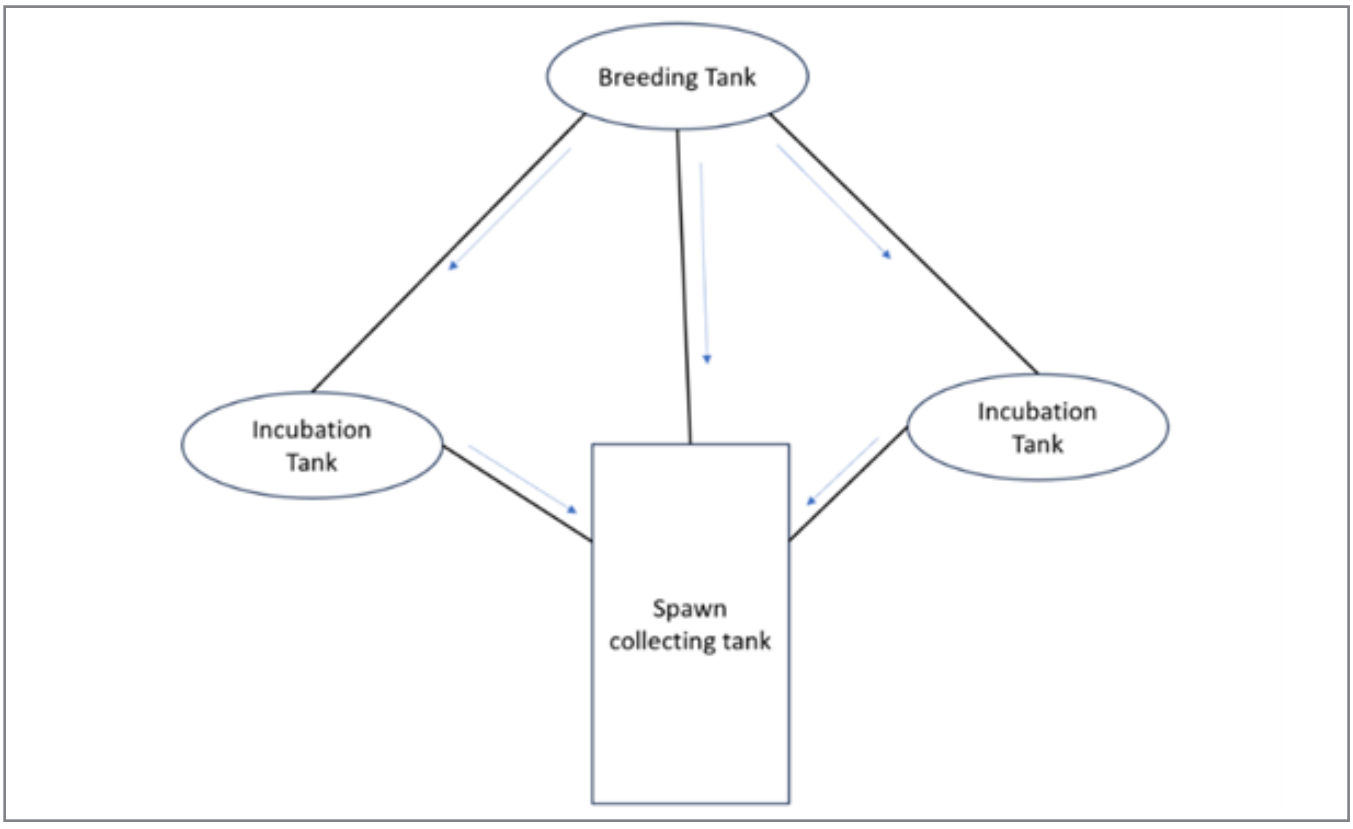
## Overhead Tank

This is the tank where the water is stocked before use in hatchery. Usually, it is present in a certain hight from the hatchery.

### Breeding tank/Pool

Breeding tank or spawning pool is a circular tank, which is the largest circular tank in the hatchery. It has a depth of 1.2 meter and has a diameter of 7 meter. On

the floor of the tank there have some water inlet pipe diameter of 3 inch at 450 angles at the floor level. At the centre there are 3 outlet pipe diameters of 3 inch (G.I. pipe) in which one pipe is attached to the egg collection chamber and other two is attached to the incubation pool. The floor have a slope to the central outlet (1:35). At the top of the side wall some fountains / shower is attached, which make a rain like environment in the spawning pool. Here the brood fish is released after injecting the pituitary hormones. After cur-tain time the eggs are released in the water. After that the egg mixed water is forwarded to the incu-bation tank or egg collecting tank as per demand.

## Incubation hatching tank

It is smaller than the breeding / spawning pool. It has the diameter of 3meter and has a hight of 1m & at the centre there is one more circular structure with a diameter of 1 meter and also the hight is 1meter. There is a present of net on the wall of the inner circle. The mesh size of the net is depend-ing on different different size of the eggs of different different fish species. At the centre of the bottom there is a outlet pipe with a diameter of 3inch (G.I. pipe) which carried out the extra water from the pool. At the bottom there is 6 numbers of duck mouth inlets fixed centrally in the outer tank. The outer tank is attached to the spawn collecting chamber directly with 3inch dia. pipe. The egg loaded water is entered to the outer chamber and the water is drained out through the central outlet pipe leaving the eggs in the outer chamber of the incubation tank. The eggs continued their circular motion with the help of duck mouths. When the spawns are released from the egg-cell they are carried out to the spawn collecting tank

## Spawn collecting tank & egg collection chamber

It is a combined tank where the egg collection chamber & the spawn collecting chamber is present. The size of egg colleting chamber is (2.5*2) meter with a depth of 1 meter & the size of spawn col-lecting chamber is (3*2) meter with a depth of 1 meter. In some hatchery there is only one chamber which is used as both egg collection and spawn collection. The spawns are come through the pipe to the tank there is a filter present made up of nets, by which the spawns are filtered and the excess water is drained out. From here the spawns are distributed to nursery ponds as per demand.

Chinese carp hatcheries play a pivotal role in supporting the aquaculture industry by providing a controlled environment for the reproduction and early development of carp species. With a rich his-tory and continuous advancements in hatchery technologies, China has emerged as a global leader in carp production. The hatcheries not only contribute significantly to the domestic demand for fish but also play a crucial role in international markets. The success of Chinese carp hatcheries can be attributed to their integration of traditional knowledge with modern techniques, rigorous manage-ment practices & research-driven innovations.

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# The Supply Chain of Fish in India: An Overview

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## Introduction

India, with its vast coastline of over 8,118 kilometers and extensive inland water resources, ranks among the top fish-producing countries in the world (3rd in fish production and 2nd in aquaculture). The fisheries sector is a crucial component of India's economy, contributing approximately 1.1 % of the Indian GVA and 6.72 % of the agricultural GVA (DoF, 2022). However, the fish supply chain in India is a complex and multifaceted system that involves a wide range of activities from capture and farming to processing, distribution, and retail. In India mandatory regulations or policies for food safety are not completely enforced resulting in the occurrence of fraudulence incidents (Dandage et al., 2017). This article provides an in-depth look at the fish supply chain in India, ex-amining its key components, challenges, and opportunities for improvement.

## Components of the Fish Supply Chain

A supply chain is a network of individuals and companies that are involved in creating a product and delivering it to the consumer. The fish supply chain in India can be broadly divided into several key stages: capture/farming, processing, commission agents, transportation, wholesale, retail, and consumption.

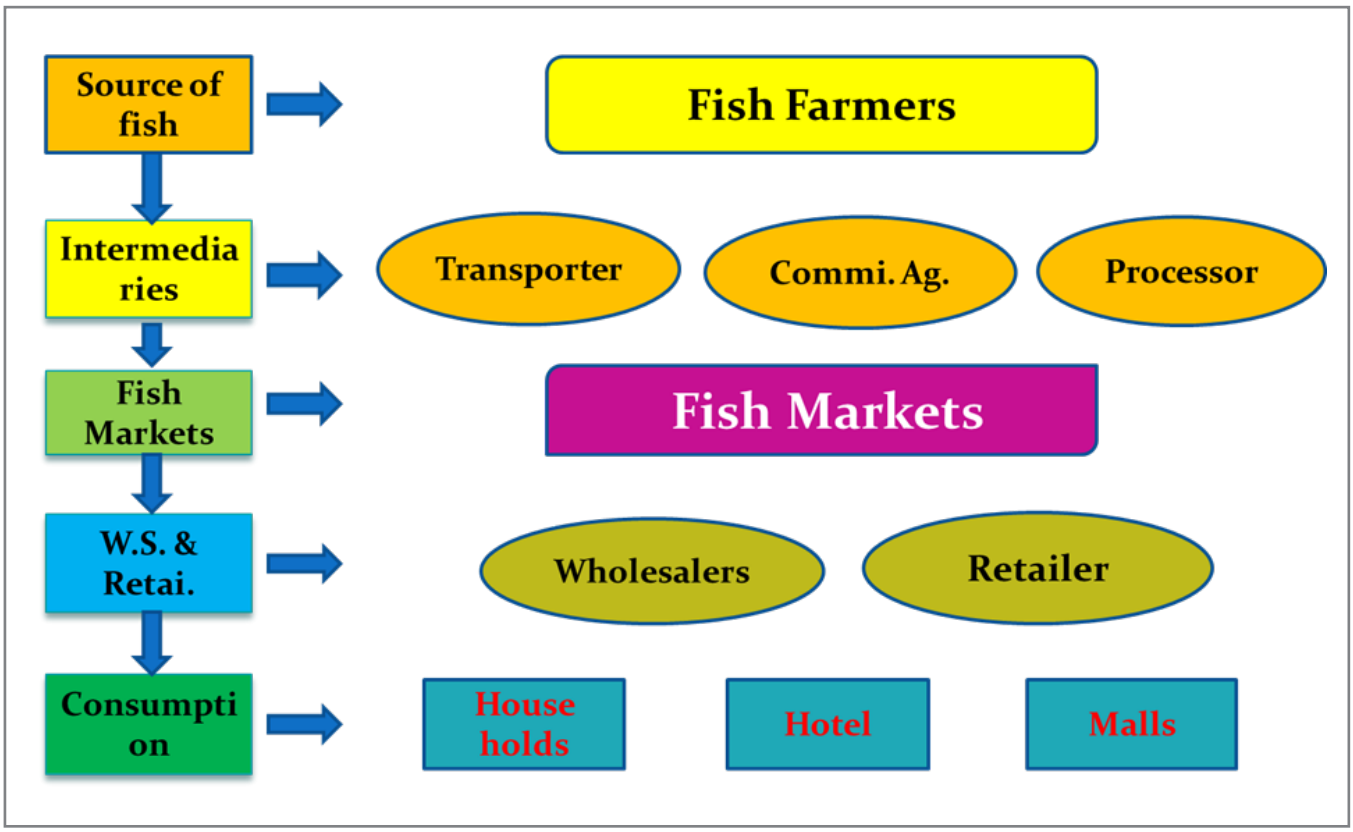


**Fig. 1 Fish supply chain in India**

## Capture and Farming

### Marine Fishing:

Marine fishing, which includes both deep-sea and coastal fishing, is the most traditional form of fish capture in India. The sector is highly fragmented, with a large number of small-scale and artisanal fishers using a variety of fishing methods such as trawling, gill netting, and purse seining. Major marine species caught include sardines, mackerel, tuna, and shrimp.

### Inland Fishing:

India's inland fisheries are equally important, particularly in freshwater and brack-ish water bodies like rivers, lakes, ponds, and estuaries. Inland fish production, which includes both capture and aquaculture, has grown significantly over the years. Popular species include carp, catfish, and prawns.

### Aquaculture:

Aquaculture has emerged as a key driver of fish production in India. The country is one of the largest producers of farmed fish, particularly in states like Andhra Pradesh, West Bengal, and Tamil Nadu. Aquaculture involves the breeding, rearing, and harvesting of fish in controlled environments. This method is increasingly favoured due to its sustainability and ability to meet the growing demand for fish.

### Processing:

Once the fish are caught or harvested, they undergo various levels of processing depending on the end use. For domestic consumption, fish are often sold fresh or minimally processed, while for ex-port, fish are typically processed into frozen, canned, or dried products.

The processing of fisheries products should be done within a few hours of being caught as the preservation or processing methods determine the shelf life and quality of the final product. The drying technique is admitted as the most common and affordable technique for preserving fish (Pay-ra et al., 2016) and decrease the post-harvest loss due to contamination (Madan et al., 2018).

### Transportation:

Transportation plays a crucial role in the fish supply chain, especially given the perishable nature of the product. Efficient and quick transport from landing sites to processing units, wholesale markets, and retail outlets is vital.

Fish are typically transported via road, often in refrigerated trucks or insulated containers to main-tain the cold chain. However, in many parts of India, especially in rural areas, inadequate transpor-tation infrastructure and the lack of proper cold storage facilities pose significant challenges, leading to high post-harvest losses.

### Commission agents:

Commission agents are licensed dealers who play a role in the supply chain by selling produced fish from one fish buyer to another fish buyer and receiving a portion of the money paid for the sold produce.

### Wholesale and Retail:

After processing, fish are distributed through a network of wholesalers and retailers. Wholesale markets, commonly found near coastal regions or major cities, serve as the primary distribution hubs where fish are auctioned to retailers.

Retailing in India is highly diverse, ranging from traditional wet markets to modern supermarkets and e-commerce platforms. Wet markets remain the most common retail outlets, especially in rural and semi-urban areas, where fresh fish is sold directly to consumers. In urban areas, supermarkets and online platforms are increasingly gaining popularity due to convenience and the availability of a wider variety of products.

### Consumption:

Fish is a staple in many parts of India, particularly in coastal states like Kerala, West Bengal, and Odisha, where it is a major part of the diet. In these regions, fish is consumed in various forms – fresh, dried, salted, or smoked.

The demand for fish in India is growing steadily, driven by rising incomes, urbanization, and in-creasing awareness of the health benefits of fish consumption. However, there is a significant varia-tion in consumption patterns across the country, with higher per capita fish consumption in coastal and northeastern states compared to inland areas.

### Challenges in the Fish Supply Chain

Despite its significance, the fish supply chain in India faces several challenges that hinder its effi-ciency and sustainability:

### Fragmentation and Informality:

The fish supply chain is highly fragmented, with a large number of small-scale operators involved in fishing, processing, and retailing. This fragmentation leads to inefficiencies and makes it difficult to standardize practices and ensure consistent quality.

The informal nature of the sector also poses challenges, particularly in terms of labor rights, safety standards, and the ability to scale operations.

### Infrastructure Deficiencies:

Inadequate infrastructure, especially in transportation and cold chain logistics, is a major bottleneck. The lack of proper roads, storage facilities, and refrigeration leads to significant post-harvest losses, estimated to be around 20-25% of the total fish production.

Investment in modern infrastructure, such as cold storage facilities and efficient transportation net-works, is critical to reducing these losses and improving the overall efficiency of the supply chain.

### Market Diversification:

There is potential to diversify the fish market by promoting lesser-known species, value-added products, and niche markets such as organic or sustainably sourced fish. This can help reduce pres-sure on popular fish species and create new income opportunities for producers.

Expanding the domestic market, particularly in inland areas where fish consumption is currently low, can also help stabilize the supply chain and reduce dependence on volatile export markets.

## Conclusion

The fish supply chain in India is a vital part of the country's food system and economy. While it faces significant challenges, there are also numerous opportunities for improvement and growth. By addressing issues related to infrastructure, sustainability, and market access, India can strengthen its fish supply chain, ensuring that it continues to provide livelihoods, food security, and economic benefits for years to come.

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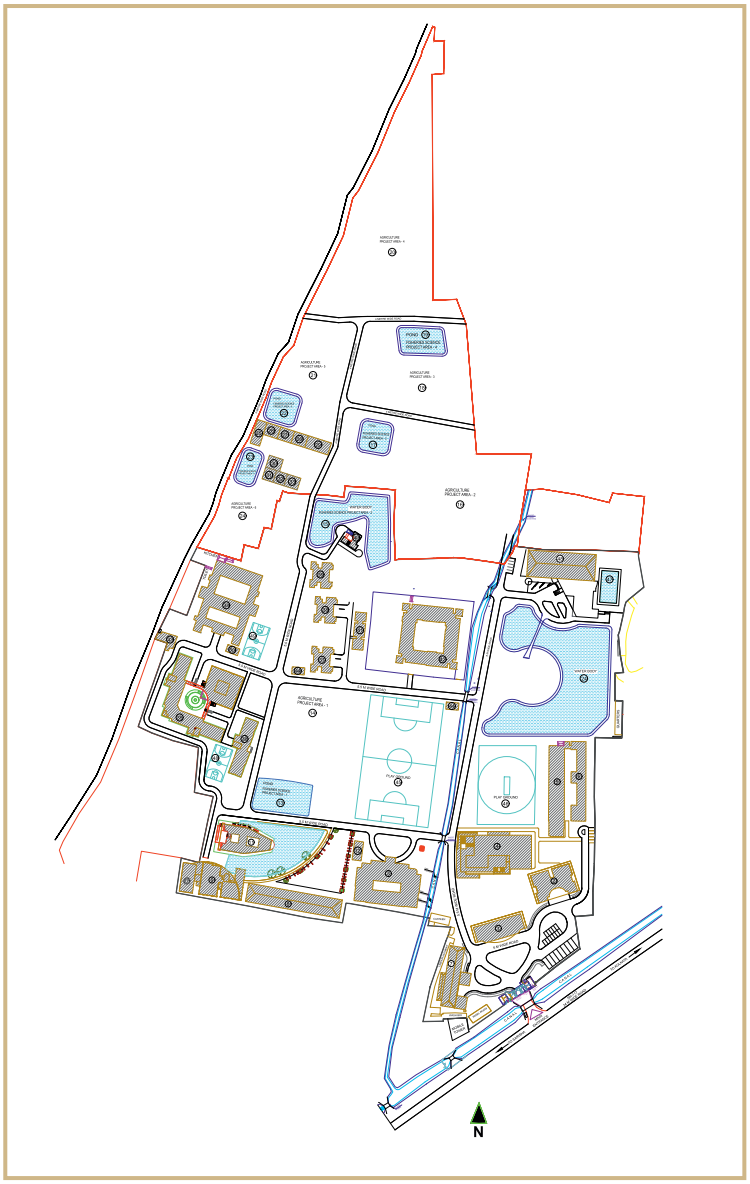
# Students Corner

**Art by Anushry (BFSc II-Year); Goonch Catfish. Scientifisc Name: Bagarius bagarius Photo by Neerav (BFSc I-Year); Photo by Tridisha Harbab (BFSc III-Year); Photo by Subarta Haldar (BFSc III-Year)**


**3rd position secured by Aaditya Halder (BFSc III-Year) in inter school Rubik's cube competi-tion**




## LEGEND- BUILDING

**A. ADMINISTRATIVE BLOCK**

1. ADMINISTRATIVE BUILDING (G + V)

**B. ACADEMICS BLOCK**

2. SCHOLASTIC BUILDING - 1 (G + III)
3. SCHOLASTIC BUILDING - 2 (G + II)
4. SCHOLASTIC BUILDING - 3 (G + III)
5. SCHOLASTIC BUILDING - 4 (G + III)
6. SCHOLASTIC BUILDING - 5 (G + III)
7. WORKSHOP BUILDING
8. NEW WORKSHOP BUILDING
9. NEW PHARMACY BUILDING (G + III)
10. PHARMACY BUILDING (G + III)
11. SHIP IN CAMPUS (G + III)

**C. AGRICULTURE & FISHERY SCIENCE BLOCK**

12. POLY HOUSE & NET HOUSE
13. FISHERY SCIENCE PROJECT AREA - 1
14. AGRICULTURE PROJECT AREA - 1
15. FISHERY SCIENCE PROJECT AREA - 2
16. AGRICULTURE PROJECT AREA - 2
17. FISHERY SCIENCE PROJECT AREA - 3
18. AGRICULTURE PROJECT AREA - 3
19. FISHERY SCIENCE PROJECT AREA - 4
20. AGRICULTURE PROJECT AREA - 4
21. AGRICULTURE PROJECT AREA - 5
22. FISHERY SCIENCE PROJECT AREA - 5
23. FISHERY SCIENCE PROJECT AREA - 6
24. AGRICULTURE PROJECT AREA - 6
25. MUSHROOM UNIT
26. FIELD LAB
27. STORE HOUSE
28. SERICULTURE UNIT
29. THRESHING FLOOR
30. BIO GAS PLANT
31. CATTLE SHED
32. VERMI COMPOST PIT
33. BIO FERTILIZER PLANT

**D. RESIDENTIAL BLOCK**

34. BOY'S HOSTEL - 1 & 2 (G + III)
35. BOY'S HOSTEL - 1 & 2 (G + III)
36. BOY'S HOSTEL - 1 & 2 (G + III)
37. OLD STAFF QUARTERS (G + III)
38. NEW STAFF QUARTERS (G + III)
39. NEW STAFF QUARTERS (G + III)
40. DIRECTOR'S RESIDENCE (G + I)
41. OLD STAFF QUARTERS (G + III)
42. GIRL'S HOSTEL - 3 (G + II)

**E. UTILITY & SERVICES BLOCK**

43. ELECTRICAL ROOM
44. PUMP ROOM

**F. RECREATIONAL BLOCK**

45. FOOTBALL GROUND
46. CRICKET GROUND
47. SWIMMING POOL
48. MULTI PURPOSE HALL
49. BASKETBALL COURT (3 NOS.)

**G. HEALTH BLOCK**

50. MEDICAL UNIT

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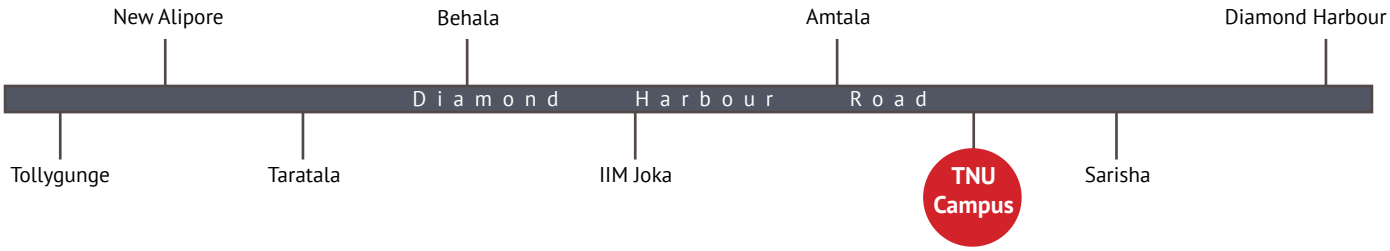


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