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MATSYA JAGAT

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Sept., 2023

- Division of Fisheries Science
The Neotia University
Sarisha, Diamond Harbour

Content

Forewords

It gives me immense pleasure to launch the third issue of the magazine **"Matsya Jagat"** published by the Division of Fisheries Science, The Neotia University. The magazine would help students and other readers stay up-to-date with the latest information and activities related to the Division of Fisheries. The Division of Fisheries Science offer offer a wide range of activities for the benefit of fishers, fish farmers, youth, women, entrepreneurs, etc. I found that it was challenging for professionals and students to obtain reading material for class and up-to-date information from the literature that was available. The readers' demands will undoubtedly be met by this magazine, especially those who are interested in the most recent advancements in aquaculture and fisheries development. I am confident that the magazine will prove to be an important medium for disseminating information regarding latest events and new infrastructure and new technologies and news to all readers.

On this occasion, I would like to extend my appreciation to Prof (Dr.) H Shivananda Murthy (Chair Professor, Division of Fisheries Science, TNU) for this thoughtful initiative. I take this opportunity to extend my best wishes to all readers.

Dr. Biswajit Ghosh
Vice Chancellor
The Neotia University

The Editor-in-Chief Message

It is my pleasure to introduce the third issue of the 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.

Matsya Jagat showcases the progress of the activities carried out under Division of Fisheries Science and I strongly belive that this magazine would serve as a great platform for promoting diversified fisheries activities, ideas and experiences and will further welfare of fisher, fish farmars, students and other readers in addition to the dissemination of information on the various aspects.

I would like to place on record my appreciation for the consistent efforts put in by the editorial team towards making of this magazine.

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From the Editorial Desk

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Welcome to the third issue of the magazine **"Matsya Jagat"** published by the Division of Fisheries Science, The Neotia University. It is our constant endeavor to keep all readers informed about recent activity of the division, news, informative articles and students corner. The Eco carp hatchery, ornamental fish breeding unit, and the duck cum fish culture system were recently installed by the Division of Fisheries Science at Neotia University. First time successfull induced carp breeding carried out in the history of The Neotia University. The division of Fisheries science has shown impressive developmental activity. The magazine has been produced to inform and educate readers including students about recent activities of the division.

We believe that this magazine will serve as a reliable source of information regarding division activity, recent trends in fisheries and inportant fisheries knowledge.

We extend our thatns to Prof (Dr.) Biswajit Ghosh (Vice-chancellor, The Neotia University) Mr. Pradeep Jyoti Agrawal (Pro-chancellor, The Neotia University) and Prof (Dr.) H Shivananda Murthy (Chair Professor, Division of Fisheries Science) for their valuable guidence and suggetions and we look forward to their important continued role in the development of division of fisheries science and this magazine.

We hope all our readers continue to benefit from the published material, and we extend our sincerest thanks to our readers and reviewers.

For future correspondence feel free and you can send articles for publication on the following email: **vikas.pathak@tnu.in**

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Dr. Neeraj Pathak is an Assistant Professor and Faculty Head for the Division of Fisheries Science, as well as in charge-head of Fish Processing Technology and Fisheries Engineering Department at The Neotia University. He is also serving as Academic Coordinator of the Division. He received his doctorate in the subject of Fish Quality Assurance and Management. He has teaching experience of seven years of various organizations throughout India. He has received several national and international Awards. His areas of interest in the research include Fish Processing Technology, Seafood Thermal Processing (Developed a pasteurization technique for soft shell blue swimming crabmeat in Ph.D. research work), and Emerging Fish Quality and Safety (Including value chain analysis for crabmeat, He has published a number of books, manuals, and research articles (with a highest impact factor up to 7.001) in National and International journals.

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She holds a master degree (M.F.Sc) in Fisheries Extension from ICAR-CIFE, Mumbai. She has different training experiences regarding fish culture and value-added fish products from several reputed fisheries institutes. She has participated as Event Manager/Media Crew in ICAR NAHEP sponsored Skill Development Programme on Communicating Science. She has completed one month internship in 'Video Editing' from 'Bangla Time', Kolkata. She has participated in All India Agri Uni Fest in the event group dance at Shree Venkateshwara Veterinary University (SVVU), Tirupati. Her directed and edited tribal short film 'Dream Never Lies' has been awarded in International Micro Film Festival, Kolkata in January, 2022. She has published research paper in popular journals.

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Dr. Bardhan's research focuses on antibiotic resistance, with a particular emphasis on florfenicol. He has made significant contributions to the field, publishing and co-authoring approximately 13 papers, book chapters and popular articles in renowned national and international journals. Notably, he worked as a young professional II for 6 months under the national project 'All India Network Project on Fish Health. He has organized several fish farmers training program.. he actively serves as a reviewer for several esteemed international journals. He is a life member of the Healthcare and Biological Sciences Research Association (HBSRA) and holds recognized memberships with prestigious organizations. He has received research grant project proposal in TNU, reflecting his dedication to innovative research.

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Dr. Suman Karmakar is an Assistant Professor in the Fishery Science Division at The Neotia University. He has received Masters degree and Doctor of Philosophy award in the subject of Aquatic Environment Management. He was participated different types of National and International Symposium. He is expert in the field of Aquatic Toxicology and Aquatic Ecology and Biodiversity. He was published a number of research article in National and International Journals.

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Mr. Khemraj Bunkar is an Assistant Professor in the Department of Fisheries Economics. The Neotia University, Sarisha, West Bengal, India. He received his Master's degree in the subject of Fisheries Economics from the ICAR- Central Institute of Fisheries Education, Mumbai. In addition, He qualified for the ICAR - National Eligibility Test (ICAR-NET) in the subject of Agriculture Economics. His areas of interest in the research include fish supply chain analysis, value chain analysis, and economics of reservoir fisheries & fish markets. He has published a number of research articles, book chapters, books, and popular articles in peer-reviewed national and international journals, magazines, and publishers.

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Dr. Mudasir is an Assistant Professor in the Division of Fisheries Sciences at The Neotia University. With a strong background in Fish Genetics and Biotechnology, his research focuses on fish nutritional genomics and proteomics, plant-based alternatives for antibiotics, and the development of climate-resilient aquaculture systems through genome editing and nutritional intervention. Dr. Hakim completed his Ph.D. in Animal Biotechnology from Faculty of Veterinary Sciences & Animal Husbandry SKUAST-K, where he worked on identifying novel bioactive compounds for growth and immune response in Rainbow trout aquaculture. He has published numerous research articles, collaborated with prestigious research institutes both in India and abroad, and received awards and scholarships for his contributions to the field. Previously he did his MFSc (Fish Biotechnology) from CoF Ratnagiri DBSKKV Maharashtra. He graduated in Fisheries Sciences from Faculty of Fisheries SKUAST-K.

Dr. Pankaj Gargotra

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Dr. Pankaj Gargotra joined the faculty on July 7th, 2023, and has been employed as an assistant professor in aquaculture at the Fisheries Division of The Neotia University. He has done his doctorate in Aquaculture from Fisheries College and Research Institute, Toothukudi (Tamil Nadu Dr. J Jayalalithaa University, Nagapattinam). For his doctorate, he received a Senior Research Fellowship from ICAR. For the first time ever in captivity, he successfully reproduced an Indian Spiny Loach during his doctoral studies. Dr. Pankaj Gargotra received his master's degree in aquaculture from the Kerala University of Fisheries and Ocean Studies, Kochi. During his master's program, he worked on replacing soy meal with guar meal and investigated its impact on the development and survival of Cyprinus carpio fry. Dr. Pankaj Gargotra graduated from the Faculty of Fisheries, Rangil, SKUAST-K. Additionally, he has 1.6 years of work experience from the ICAR-DCFR, where he made a substantial contribution to the first successful breeding of the key coldwater fish species Barilius vagra.

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Ms. Aditi Rambhau Banasure is working as an Assistant Professor. She completed her graduation (B.F.Sc.) from the College of Fishery Science, Nagpur, and post-graduation (M.F.Sc.) from the College of Fisheries, Shirgaon, Ratnagiri, Maharashtra under the Fisheries Engineering and Technology department. She has research experience on study and designing traditional freshwater fish traps in Ratnagiri district, Maharashtra, India in the Department of Fisheries Engineering and Technology. She has published research papers, articles, and abstracts. Also, she has presented at international conferences and attended training, skill development programs, and workshops.

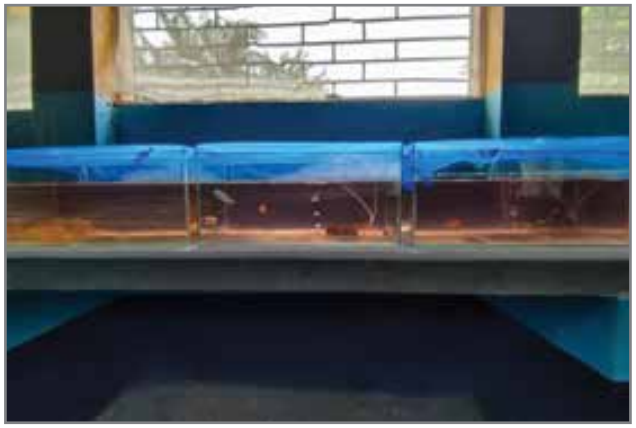
Activities
of the Division of Fisheries Science


B.F.Sc. Students were collected water samples from different ponds and Analyzed water quality parameters


Students involve in the preparation and mending of Fishing gear, and Knots, Bends and Hitches-making activity


Newly inaugurated unit of Integrated (Duck cum fish farming) under the Division of Fisheries Science



Newly inaugurated unit of Ornamental Fish Production under the Divison of Fisheries Science

Students learning in vacuum packaging

Skill development program for students


B.F.Sc. Students were involved in disinfection of Hatchery and Ovasis Hormone Injection to the Brooder

B.F.Sc. Students were involved in Construction and installation of Bamboo Cage in pond

Activity of students out of campus

B.F.Sc. Students at Sasya Syamal KVK

Zooplankton collection with zooplankton net

Pond harvesting and broodstock collection for hypophysation

Injecting brooders with sex-hormones for hypophysation

Guest lecture at The Neotia University

Industrial and Academic collaboration of the Division of Fisheries Science

MoU between The Neotia University and Bangladesh Agricultural University

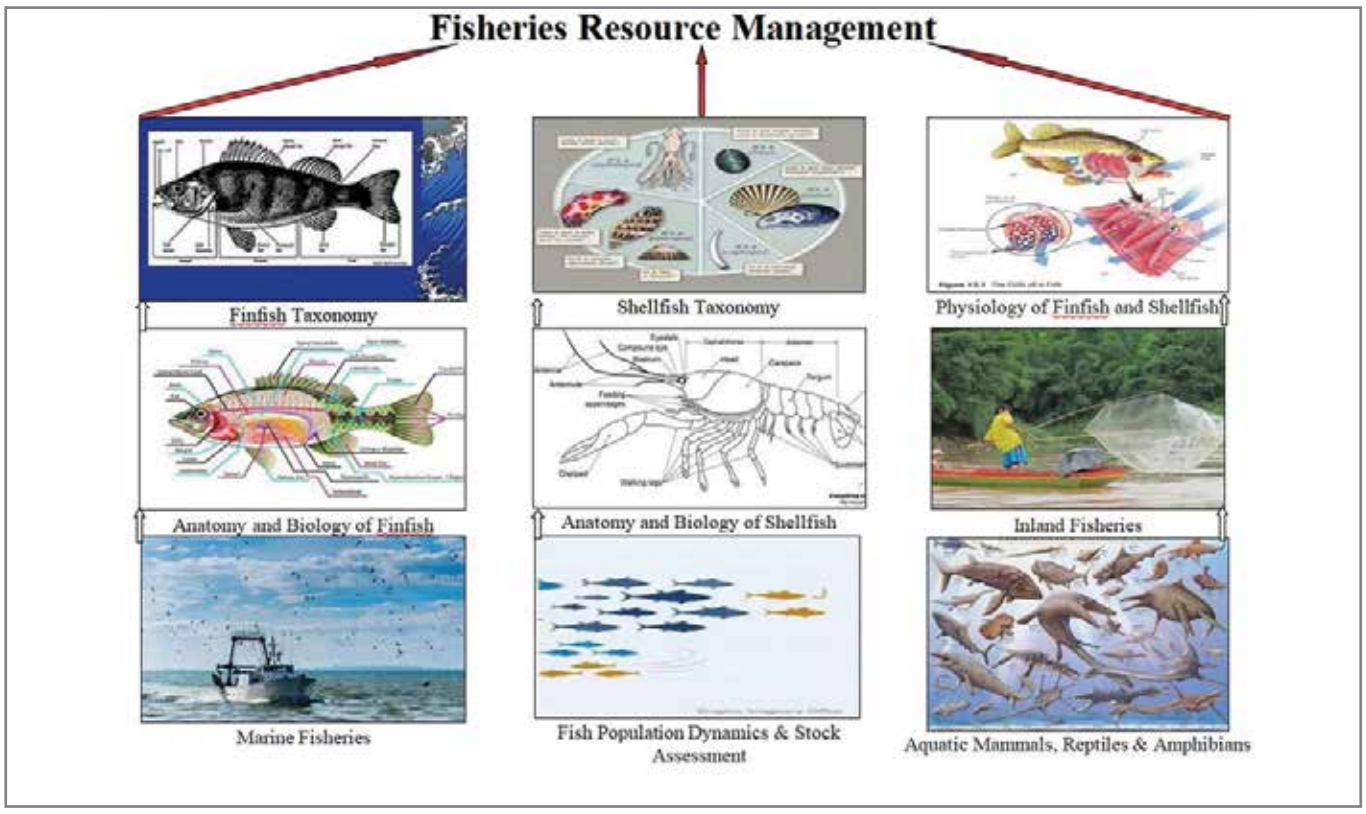
MoU between The Neotia University and Krishna Agritech Industries

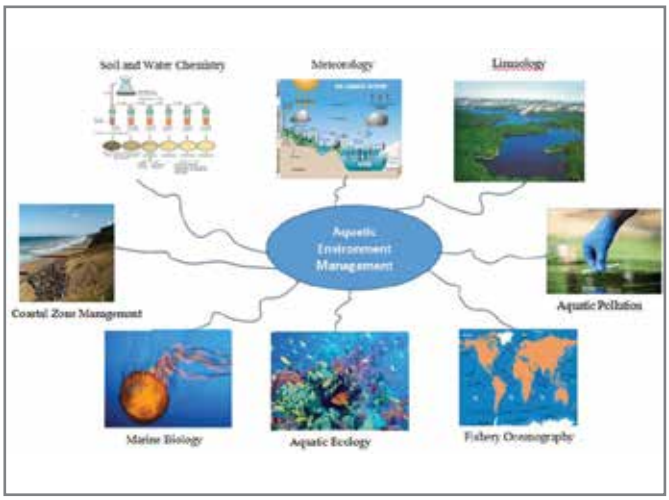
MoU between The Neotia University and Aqua Doctor Solutions

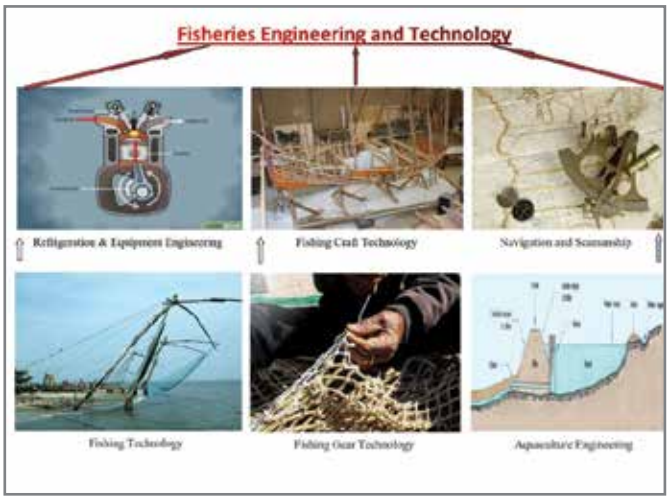
MoU between The Neotia University and NDM Seafood processor and Exporter

MoU between The Neotia University and Anmol Feeds Pvt. Ltd.

B.F.Sc. Courses

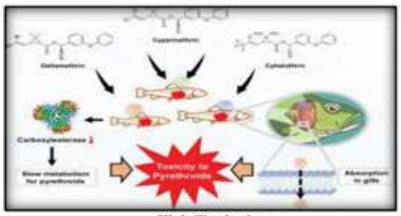






AQUATIC ANIMAL HEALTH MANAGEMENT

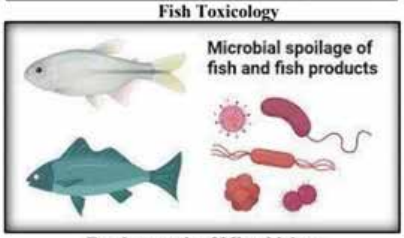
Therapeutics in Aquaculture



Fish Toxicology

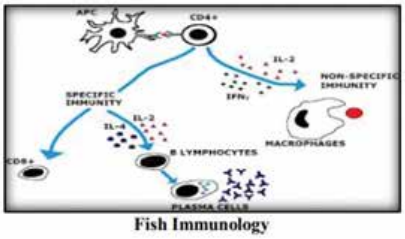
Fish and Shellfish Pathology

Microbial and Parasitic Diseases of Fish and Shellfish



Fundamentals of Microbiology

Pharmacology



Fish Immunology

Students Corner

1. Gram negative bacteria is dominated in

   A) **Freshwater** B) Brackishwater C) Marine D) Glaciers

2. The mother of probiotics is commonly referred to

   A) Streptococcus B) **Lactic Acid Bacteria** C) E. Coli D) None

3. Type of lime used for aquacultural purposes

   A) Quick Lime B) Dolomite C) **Agricultural Lime** D) Alum

4. Sanitizer used in fish hatcheries to disinfect larvae, tanks and other equipments

   A) **Quaternary Ammonium Compounds** B) Formalin C) Chlorine D) Iodine

5. Carotenoid pigment which is found primarily in shrimps

   A) Xanthophyll B) Melanin C) **Astaxanthin** D) Pteridine

6. Chemical which upon addition to a vaccine results in its increased power and strength

   A) Cytokines B) Bacterin C) **Adjuvant** D) Glucan

7. An algaecide which is often referred to as “blue stone”

   A) Malachite Green B) Poly Aluminium Chloride C) **Copper Sulphate**
   D) Quaternary Ammonium Compounds

8. Disease outbreaks restricted to a particular area is termed as

   A) Epidemic B) Pandemic C) **Endemic** D) Sporadic

9. Host-pathogen interaction can be described by which model

   A) **Snieszko’s** B) Fox’s C) Duncan D) Kraber’s

10. Cortisol mainly increases ……. levels in fish blood

    A) Protein B) **Glucose** C) Immunoglobulin D) Insulin

11. ICAR was established in the year

    A) 1989 B) **1929** C) 1954 D) 1934

12. Farm and Home Visit is a…...contact method

    A) Group B) Mass C) **Individual** D) None

13. Extension literally means

    A) Rural People B) **Stretching Out** C) Strategy D) Guidance

14. Innovators are called

    A) Extension Agent B) **Venturesome** C) Respectable D) All

Students Corner

15. SMCR model of communication is given by

A) William B) **Berlo** C) Schramm D) Aristotle

16. Which of the following is not a principle of effective communication ?

A) Persuasive and Convincing Dialogue B) Participation of the Audience
C) **One-Way Transfer of Information** D) Feedback

17. The mode of communication that involves a single source transmitting information to a large number of receivers simultaneously, is called

A) Group Communication B) **Mass Communication**
C) Intrapersonal Communication D) Interpersonal Communication

18. According to conflict management strategy “I win, you win” means

A) Avoiding B) Competing C) **Collaborating** D) Compromising

19. Promotion is the example of

A) Safety Need B) Social Need C) **Status Need** D) Basic Need

20. Biological diversity Act

A) **2002** B) 2003 C) 2004 D) 2005

Answers:

1	2	3	4	5	6	7	8	9	10
A	B	C	A	C	C	C	C	A	B
11	12	13	14	15	16	17	18	19	20
B	C	B	B	B	C	B	C	C	A

Fisheries News

1. Maharashtra declares silver pomfret as state fish to enable its conservation

The Maharashtra government on Tuesday declared the silver pomfret as the state fish amid reports of its declining numbers in the region.

The state government's move will enable the department to work towards the conservation of the fish, locally known as paplet or sarangi.

The state forest and fisheries department issued a government resolution (GR) declaring the silver pomfret as the state fish.

The GR quoted a report by the International Union for Conservation of Nature (IUCN), which stated that the population and catch of the silver pomfret is declining in Maharashtra (source: Indian Express)

Silver pomfret is also locally known as paplet or sarangi. (File photo)

Fisheries News

2. Corals storm back after 'sea-weeding' project

A volunteer seaweed removal program involving citizen scientists has seen a dramatic improvement of up to 600% coral regrowth off the coast of Magnetic Island.

Programme has been ongoing since 2018, saw volunteer citizen scientists help remove macroalgae (aka "sea-weeding") from experimental plots at two reef sites. Magnetic Island is characterized as one of the degraded reefs on the Great Barrier Reef.

The findings from the first three years of the project, published today in the Journal of Applied Ecology, show that in areas of reef that were weeded, significant regrowth was recorded, in a welcome sign for rejuvenation of corals.

Dr. Adam Smith removes macroalgae from corals off the coast of Magnetic Island.
Credit: Roxana Caha (phys.org)

Fisheries News

1. CMFRI report finds 86 per cent of Indian fish stocks at sustainable levels Seafood Source dated 10th July 2023

comprehensive marine fish stock assessment conducted by Central Marine Fisheries Research Institute (CMFRI) has determined 117 of 135 fisheries in India, or 86.7 percent of those surveyed, had enough population to support fishing maximum sustainable yield. Sustainable stocks included various snappers, eels, dolphinfish, lizardfish, and pomfret, while lobsters, croakers, groupers, catfish, and sharks were among the 8.2 percent of fisheries deemed to be overfished.

(CMFRI, July, 2023)

Fisheries News

4. Sardine genome may exlain climate change inpact on small pelagics The Times of India dated 8th september 2023

In a major breakthrough in marine fisheries research, a team of scientists at the ICAR-Central Marine Fisheries Research Institute (CMFRI) has decoded the whole genome of the Indian oil sardine, a popular food fish. This is the first time that the genome of a marine fish species from the Indian subcontinent has been decoded. CMFRI Director Dr A Gopalakrishnan described this development as a 'milestone' in Indian marine fisheries, saying that the decoded genome will be a valuable resource for understanding the biology, ecology and evolution of the oil sardine (Sardinella longiceps).

(Source: The Hindu)

Article

Food Waste, Food Loss, and Food By-products: A brief elucidation

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The 21st century agricultural and food sector faces critical challenges, including food safety and waste management (Esparza et al., 2020). Food waste is increasing in waste facilities and landfills, representing resource wastage and environmental issues across the Food Supply Chain. Low-income nations suffer socioeconomic impacts from food waste, while consumer habits in medium/high-income countries result in significant household waste production (Sharma et al., 2023). Food waste can be categorized into two main groups: animal and vegetable. Animal sources include dairy, meat, fisheries, and seafood processing industries, while vegetable sources encompass cereals, roots, tubers, oil crops, and fruits/vegetables. These residues are challenging to utilize due to logistical issues and perishability. They share a commonality in being rich in organic matter with carbohydrates, proteins, lipids, and bioactive compounds, necessitating comprehensive characterization. Reducing food waste and converting it into value-added products can enhance the efficiency of the Food Supply Chain, lowering associated costs and improving food accessibility and security (Lau et al., 2021). The growing demand for products with desirable properties, such as nutritional and health benefits, makes fruit and vegetable waste particularly promising due to their abundance and potential.

The term “Food Waste” (FW) lacks a universally agreed-upon definition in the literature, leading to controversy and significant discrepancies in waste inventory data. FW typically includes food and inedible parts removed from the Food Supply Chain (FSC), destined for recovery or disposal methods like composting, anaerobic digestion, or landfill (Sharma et al., 2023). However, it excludes parts, edible or inedible, intended for animal feed or bio-based chemicals production. A broader and more useful concept is “Food Supply Chain Wastes” (FSCW), encompassing all wastes generated across the FSC, from raw material production to food processing and distribution. There are related terms like “Food Loss” (FL), which denotes the loss in quantity or quality of food, and “Food Loss and Waste” (FLW), representing the total loss and elimination of edible parts during all FSC stages. Additionally, “food byproducts” refers to biomass and residues that can be processed into value-added products (Esparza et al., 2020). These definitions and distinctions are crucial as they influence waste inventory calculations and efforts to address food waste and losses in the food industry.

In the context of food waste and loss, there are several related terms that are worth mentioning. “Food Loss” (FL) refers to the loss in quantity or quality of food at any stage of the Food Supply Chain. This can occur during production, storage, transportation, or even at the consumer level (Reshmy et al., 2021). FLW is a more comprehensive term, representing the sum of losses and eliminations of edible parts from food intended for human consumption at all stages of the FSC. FLW encompasses both food loss and the broader concept of food waste, providing a more holistic perspective on the issue. Additionally, the term “food byproducts” is relevant to discussions of food waste and loss. Food byproducts refer to the biomass and residues that result from food processing and other related activities (Reshmy et al., 2021). These byproducts can often be treated and converted into value-added products. This concept aligns with the growing interest in sustainability and circular economy practices,

where waste materials are transformed into valuable resources rather than being discarded (Ganesh et al., 2023). These definitions and distinctions are not merely semantic but have practical implications for efforts to address food waste and losses in the food industry. The lack of a standardized definition for food waste can lead to inconsistent reporting and data collection, making it challenging to develop effective strategies for waste reduction (Ganesh et al., 2023)). Furthermore, the categorization of food byproducts highlights the potential for creating economic and environmental value from what might otherwise be considered waste.

In conclusion, the terminology surrounding food waste, loss and by-product is complex and varies across the literature. The lack of a universally accepted definition for “Food Waste” has led to discrepancies in data reporting and challenges in addressing this critical issue. Related terms such as “Food Loss” and “Food Loss and Waste” offer nuanced perspectives on the issue, while “food byproducts” highlight the potential for value creation from waste materials. Clear and standardized definitions are essential for accurate measurement, reporting, and effective strategies to reduce food waste and promote sustainable practices in the food industry.

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Matsya Jagat. Parasite tagging: an innovative approach to fish pathological research. Vol 1 Issue 3, Jul-Sep 2023, pp 24-25

Parasite tagging: An innovative approach to fish pathological research

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Introduction

The term 'parasite tagging' involves the use of specific parasites in specific hosts to gather information about host's ecology, behavior, migration patterns, feeding behavior and pathophysiological processes involved. Although the same hasn't been used profusely for health and pathology purposes, 'parasite tagging' has proliferated in ecological research. Parasites can be used as tags because they often have complex life cycles that involve multiple hosts. By examining the presence, abundance, or genetic characteristics of the parasites within a host population, researchers can gain insights into various aspects of the host's biology. This information can include migration routes, population connectivity, diet, habitat use, and even reproductive success. For example, researchers may analyze the genetic makeup or stable isotopes of parasites found in different host individuals or populations. By comparing the genetic or isotopic profiles, they can infer patterns of host movement or population structure. Parasite tagging is a non-invasive method as it relies on the natural association between parasites and their hosts.

Parasite tagging as an ecological tool

Parasite tagging is a cost-effective method used by fisheries researchers to differentiate subpopulations of anadromous fish. Instead of physical tags, specific parasites found in certain rivers act as natural identifiers. This approach improves classification accuracy and enables informed fish stock management decisions. Analyzing parasite distribution provides precise identification of subpopulations, preventing overfishing. Next-generation sequencing has replaced morphological identification, allowing rapid analysis of large populations. Parasites contribute valuable information on population structures and environmental factors in the holobiont concept.

Essential characteristics of a parasitic tag

Parasite identification tags for population studies require specific characteristics. These include high infection levels, host specificity, genetic variability, long lifespan, and stable infections. Easy sampling and minimal harm to hosts are important. These characteristics enable parasites to serve as effective identification tags, providing insights into diverse host populations.

Parasite as a biological tag for health and disease diagnosis

Parasites offer valuable insights into various aspects of infectious diseases and host populations. Firstly, parasites can serve as vectors, facilitating the transmission of diseases from one host to another. By monitoring the presence, abundance, and distribution of these parasites, researchers can gain a deeper understanding of disease transmission dynamics. This knowledge is essential for designing effective control strategies, identifying high-risk areas, and implementing targeted interventions to prevent the spread of infections. Furthermore, parasites act as indicators of environmental health. They are highly sensitive to changes in their surroundings, including pollution and ecological disturbances. By examining the parasite populations within ecosystems, researchers can detect early signs of environmental degradation or contamination. These findings not only contribute to the understanding of ecosystem health but also provide valuable insights into potential health risks for both human and animal populations. Identifying and analyzing specific parasites in individuals or populations can aid in diagnosing infections and monitoring disease prevalence and distribution. Parasite surveillance provides valuable data for public health agencies,

enabling them to assess the burden of diseases, identify emerging threats, and guide targeted interventions. Additionally, studying host-parasite interactions offers important insights into disease susceptibility and host health. Parasitic infections can have significant impacts on host immune systems, reproductive success, and overall fitness. Understanding these interactions helps unravel the mechanisms of disease resistance, identify genetic factors influencing susceptibility, and assess the overall health status of individuals and populations. Parasites can also act as biomarkers, indicating underlying health conditions in hosts. Changes in parasite load, diversity, or the presence of specific parasites can serve as indicators of disease or health issues. Monitoring these biomarkers can aid in early disease detection, provide valuable information for disease management and treatment, and contribute to overall health monitoring efforts.

Parasite tagging in fish has been successfully used for disease diagnosis in various cases. For instance, the presence and abundance of Ichthyophthirius multifiliis (Ich) parasites have been employed to identify and monitor the occurrence of ichthyophthiriasis, a disease characterized by white spots on fish. Similarly, Gyrodactylus spp. parasites have been utilized to diagnose and track the spread of gyrodactylosis, which causes skin irritation and respiratory issues in fish. Additionally, the identification and monitoring of Myxobolus cerebralis spores have aided in diagnosing whirling disease in salmonid fish, characterized by skeletal deformities and neurological damage. By studying parasites, including their prevalence and genetic variations, researchers gain valuable insights into disease prevalence, transmission dynamics, and the overall health of fish populations. Such parasite tagging approaches contribute to effective disease management and conservation efforts in fisheries.

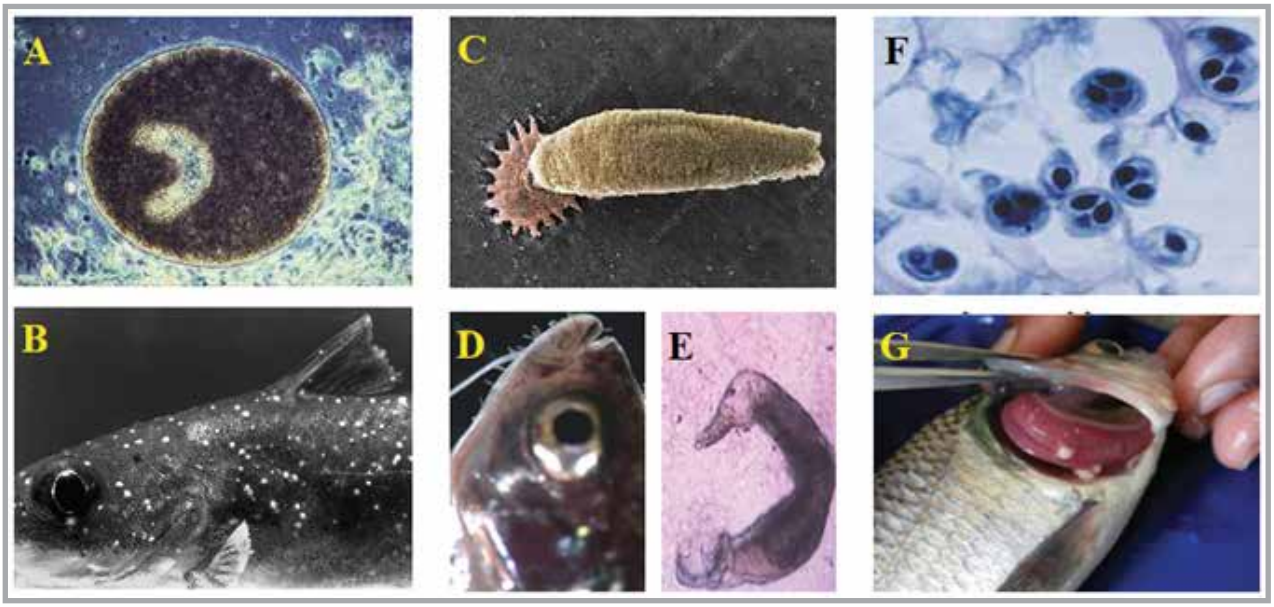

Fig. *Parasites used as tags and their respective disease conditions.* ***A:*** *Ichthyophthirius multifilis (Ich)* ***B:*** *Ich disease* ***C:*** *Gyrodactylus spp.* ***D:*** *Gyrodactylus infection in mouth* ***E:*** *Microscopic view of Gyrodactylus* ***F:*** *Myxobolus cerebralis* ***G:*** *Myxobolus spores in fish gills*

Conclusion

Parasite tagging is considered innovative in disease diagnosis due to its non-invasive nature, high sensitivity and specificity, early detection capabilities, population-level analysis potential, and cost-effectiveness. Unlike traditional diagnostic methods, parasite tagging avoids invasive procedures, leading to reduced patient discomfort. The presence of specific parasites serves as a reliable indicator of certain diseases, enabling accurate and targeted diagnosis. Moreover, parasite tagging allows for early disease detection before clinical symptoms appear, facilitating timely intervention. It also enables population-level analysis, aiding in disease surveillance and control measures. Additionally, parasite tagging is a cost-effective and scalable approach, making it particularly valuable in resource-limited settings. Overall, this innovative technique contributes to improved disease management, early intervention, and effective public health efforts.

Understanding Fish Blood: A Window into Fish Welfare

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Introduction

Fish are an essential part of the aquatic ecosystem, providing vital services such as nutrient cycling and maintaining biodiversity. With an increasing awareness of animal welfare across various species, it has become crucial to study the well-being of fish in captivity and the wild (Barreto et al., 2022). One promising avenue for gaining insights into fish welfare is by examining their blood (Seibel et al., 2021). In this article, we explore how fish blood analysis can provide valuable information about their health, stress levels, and overall welfare.

1. Blood Composition and Function

Fish blood, like that of other vertebrates, serves multiple crucial functions. It transports oxygen, nutrients, and waste products throughout their bodies, regulates body temperature, and plays a significant role in immune responses (Bojarski et al., 2021). Understanding the baseline composition and characteristics of fish blood is essential for establishing a reference point when assessing their welfare.

2. Stress Indicators in Fish Blood

Stress is an inevitable part of a fish's life, whether due to environmental changes, predation threats, or handling during aquaculture practices. Fish respond to stress by releasing hormones and other molecules into their bloodstream (Sadoul and Geffroy, 2019). By analyzing stress indicators in their blood, such as cortisol and glucose levels, researchers can gauge the impact of various stressors on fish welfare. Consistently elevated stress markers may suggest poor living conditions, inadequate nutrition, or overcrowding.

3. Health and Disease Assessment

Fish blood analysis can also provide valuable information about their overall health and disease status. Changes in blood cell counts, presence of pathogens, or abnormal immune responses can indicate the presence of underlying health issues (Chen and Luo, 2023). Monitoring these factors allows for early detection and timely intervention, thus improving fish welfare.

4. Environmental Impact on Fish Blood

Aquatic ecosystems are subject to numerous environmental stressors, including pollution, temperature fluctuations, and habitat degradation. Such factors can affect fish health and welfare. By studying blood samples from fish in different environments, researchers can identify potential risks to fish populations and advocate for better conservation measures.

5. The Role of Genetics

Genetics plays a crucial role in fish health and welfare. Some fish species may possess genetic traits that make them more resilient to stress, while others may be more susceptible to certain diseases. Blood analysis combined with genetic studies can shed light on the genetic basis of fish welfare, enabling targeted breeding programs and conservation efforts (Seibel et al., 2021).

6. Captive vs. Wild Fish Welfare

Fish kept in captivity, such as those in aquaculture facilities or home aquariums, may experience different welfare challenges compared to their wild counterparts. Blood analysis can be used to assess the effects of captivity on fish physiology, allowing for the implementation of better husbandry practices to enhance their well-being.

Conclusion:

The study of fish blood offers a valuable and non-invasive tool for evaluating fish welfare. By analyzing blood samples, researchers gain insights into the

health, stress levels, and overall condition of fish in different environments. Understanding the factors influencing fish welfare is crucial for promoting responsible aquaculture practices, effective conservation measures, and sustainable management of aquatic ecosystems. By prioritizing the welfare of fish, we can ensure the long-term health and survival of these essential creatures in our delicate and interconnected world.

Highlights:

- Fish blood analysis provides insights into fish welfare, health, and stress levels.
- Stress indicators like cortisol and glucose levels offer clues about living conditions and nutrition.
- Blood samples aid in early disease detection and support conservation efforts.
- Genetics play a role in fish resilience, with blood analysis aiding targeted breeding programs.
- Understanding fish blood enhances responsible aquaculture and promotes sustainable management of aquatic ecosystems.

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Matsya Jagat. Promoting reponsible fishing practices with TEDs and BRDs. Vol 1 Issue 3,Jul -Sep 2023, pp 28-30

Promoting Responsible Fishing Practices with TEDs and BRDs

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Introduction

Fishing has been an integral part of India's culture and economy for centuries, providing livelihoods to millions of people along its extensive coastline. However, the rapid growth of the fishing industry, combined with unsustainable practices, has raised concerns about the health of marine ecosystems and the long-term viability of this vital sector. Responsible fishing practices are essential to ensure the sustainability of India's fisheries and protect the delicate balance of marine ecosystems. One of the most effective ways to minimize the broader ecological impacts of harvest fisheries is to improve the selectivity of fishing gear (Alverson et al., 1994; Briggs et al., 1999). The shrimp trawl is a nonselective gear that commonly has an associated catch of non-targeted organisms such as finfish and miscellaneous invertebrates (M. R. Boopendranath and P. Pravin, 2009). Among the many tools and methods available, Turtle Excluder Devices (TEDs) and Bycatch Reduction Devices (BRDs) have emerged as powerful solutions to mitigate the unintentional harm caused to non-target species during fishing operations. In this article, we will explore the significance of these devices and how they contribute to responsible fishing practices worldwide.

Turtle Excluder Devices (TEDs)

A Turtle Excluder Device (TED) is a specialized piece of equipment designed to reduce the accidental capture of sea turtles in fishing nets. TEDs consist of a grid-like structure made of metal bars or mesh that is installed within the fishing net. This grid allows smaller marine creatures, such as shrimp or fish, to pass through and be captured while preventing larger sea turtles from getting trapped. Sea turtles are highly vulnerable to being entangled in fishing gear, which can lead to injury or death. TEDs consist of grids or escape openings positioned in the trawl net (Jenkins, 2010). When a turtle is caught in the net, it encounters the TED, which guides it through the escape opening, allowing the turtle to swim freely and preventing it from being trapped. Turtle Excluder Devices (TEDs) are innovative solutions that play a pivotal role in protecting these magnificent creatures while promoting sustainable fishing practices (Jenkins, 2012).

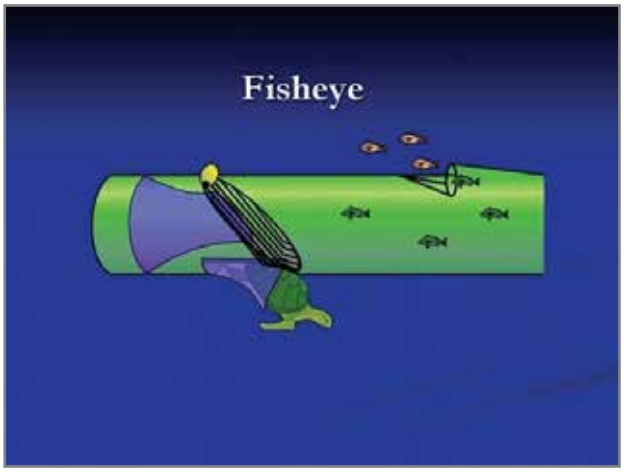

Fig. 1. *Turtle Excluder Device*

Bycatch Reduction Devices (BRDs)

BRDs are mechanisms or modifications applied to fishing gear, such as trawl nets or longlines, to reduce the unintentional capture of non-target species, including juvenile fish, sharks, and other marine life. BRDs function by either allowing these species to escape or discouraging them from entering the fishing gear in the first place. This helps protect vulnerable species and maintain healthy fish populations (Brewer et al., 1998).

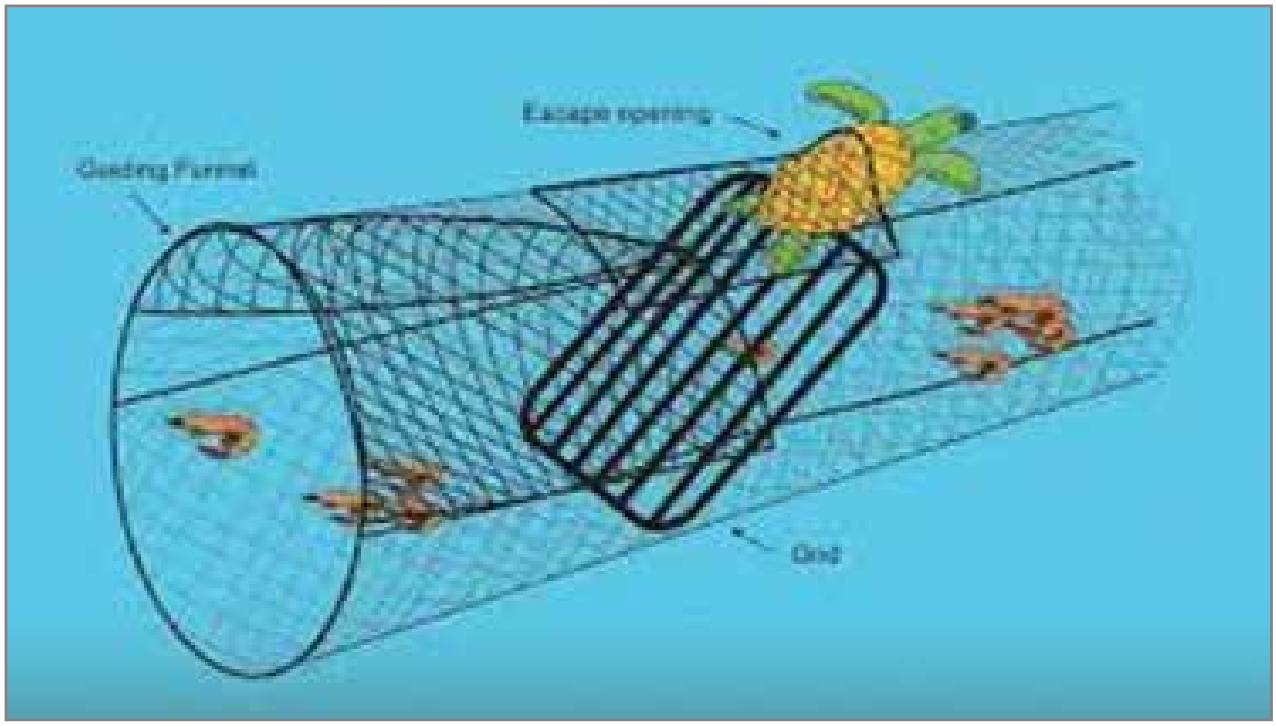

Fig. 2. *By-Catch Reduction*

The Significance of TEDs and BRDs

1. Preserving Biodiversity

TEDs and BRDs play a crucial role in preserving biodiversity in our oceans. By preventing the capture of non-target species, these devices help maintain a balance in marine ecosystems. This, in turn, protects the populations of various species and contributes to the overall health of our oceans.

2. Conserving Endangered Species

TEDs, in particular, are essential for the conservation of endangered sea turtle species. Many sea turtle populations are already at risk due to habitat loss and pollution. TEDs help reduce the threat posed by commercial fishing operations, allowing these majestic creatures to thrive.

3. Sustainable Fisheries

Responsible fishing practices, which include the use of TEDs and BRDs, contribute to the long-term sustainability of fisheries. By minimizing bycatch, fisheries can ensure that their target species remain abundant, leading to increased catch rates and economic stability for fishing communities.

4. Regulatory Compliance

Many countries and international organizations have mandated the use of TEDs and BRDs to enforce responsible fishing practices. Compliance with these regulations is not only a legal requirement but also an ethical commitment to the conservation of marine life.

Challenges and Future Directions

1. Technology and Education

Fishermen need access to modern TEDs and BRDs, and training on their proper use. Governments and NGOs can play a vital role in providing technology and education to fishing communities.

2. Enforcement

Effective enforcement of regulations mandating the use of TEDs and BRDs is essential to ensure widespread adoption. Increased penalties for non-compliance can act as a deterrent.

3. Innovation

Continuous research and innovation are necessary to improve the efficiency of TEDs and BRDs and adapt them to different fishing techniques and environments.

While Turtle Excluder Devices have proven

to be effective in reducing sea turtle bycatch, there are still challenges to overcome. Some fishermen resist using TEDs due to concerns about potential impacts on catch rates and increased costs. Efforts are ongoing to improve the design and efficiency of TEDs to address these concerns. Furthermore, education and awareness campaigns are essential to ensure that fishermen understand the importance of using TEDs and the role they play in conserving sea turtles and maintaining healthy oceans.

Conclusion

The adoption of Turtle Excluder Devices (TEDs) and Bycatch Reduction Devices (BRDs) are indispensable tools in promoting responsible fishing practices worldwide. They help protect non-target species, conserve endangered marine life, and contribute to sustainable fisheries. As the world faces growing challenges of overfishing and the degradation of marine ecosystems, TEDs and BRDs stand as powerful tools in our collective efforts to balance the needs of the fishing industry with the preservation of our oceans. It is imperative that governments, fishing communities, and conservation organizations continue to collaborate and invest in the widespread use and development of these devices to ensure the health of our oceans and the well-being of future generations.well-being of future generations.

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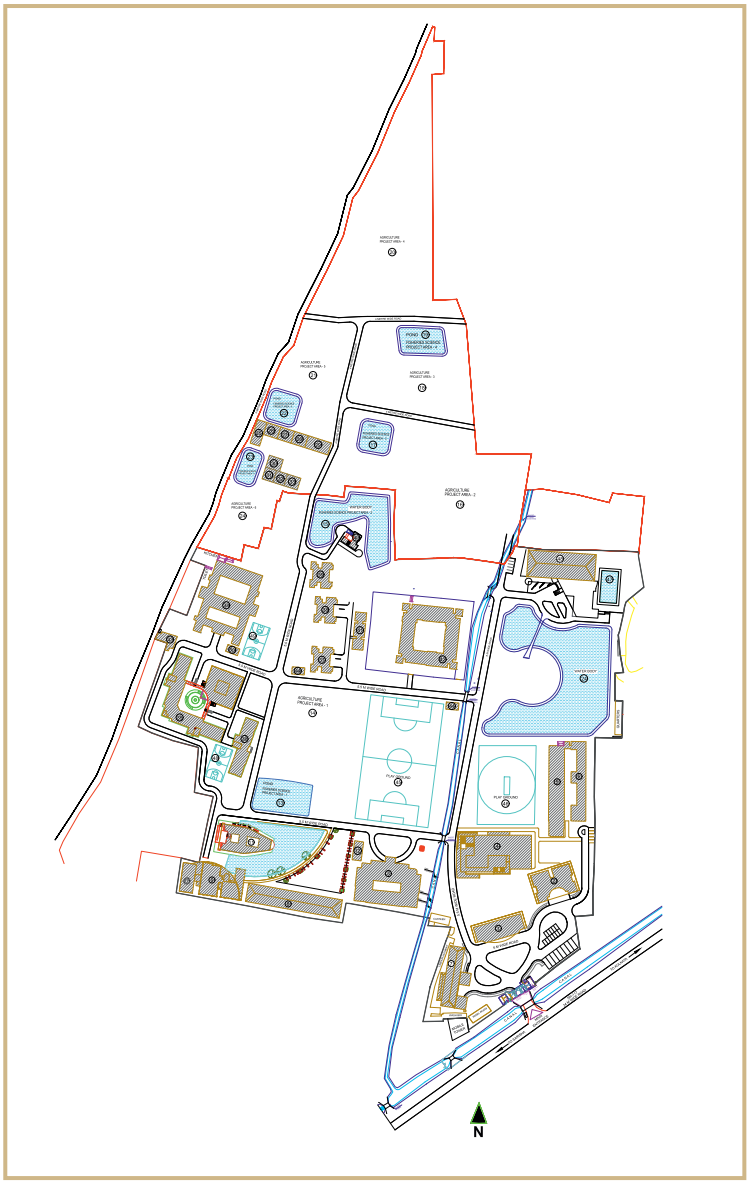


LEGEND- BUILDING

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

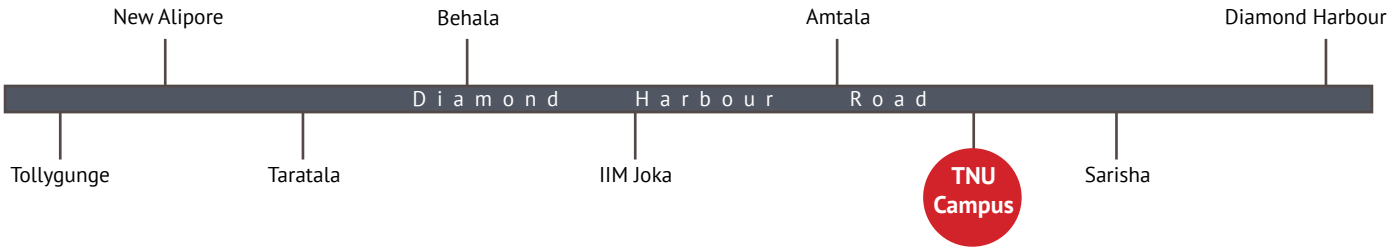
43. ELECTRICAL ROOM
44. PUMP ROOM

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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