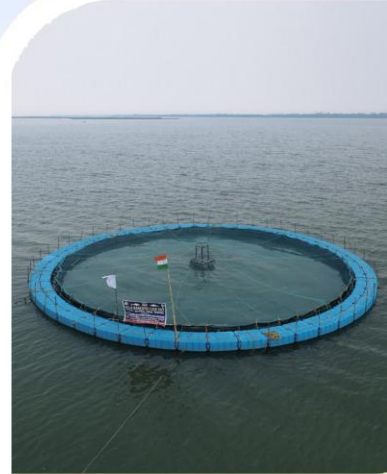


BOOK OF ABSTRACTS

2nd Indian Fisheries Outlook

*Envisaging Blue Transformation in
Indian Fisheries & Aquaculture*

**12-14 July
2025**



**College of Fisheries
OUAT, Berhampur**

Jointly hosted by



Organising Partners



INDIAN BRANCH

BOOK OF ABSTRACTS

2nd

Indian Fisheries Outlook

Envisaging Blue Transformation in Indian Fisheries & Aquaculture

12-14 July 2025

College of Fisheries, OUAT, Berhampur

Jointly hosted by



Organising Partners



Book of Abstracts

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”

ISBN 0970-616X

(©) Copyright 2025 ICAR-CIFRI, Barrackpore.

All rights are reserved. Any part of this book may be reproduced for scientific and educational purposes with prior permission and acknowledgment of ICAR-CIFRI, Kolkata.

Edited by

Basanta Kumar Das
Santosh Kumar Udgata
Dibakar Bhakta
Mitesh H. Ramteke
Vikash Kumar
Pritijyoti Majhi
Canciyal Johnson
Arpit Acharya
Pranaya Kumar Parida

Citation:

B. K. Das, et al., 2025. 2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”. ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700 120, India, pp 375.

Cover page design: Sourav Kundu

Technical support: Debarghya Ghosh Dastidar, Mitali Maity, Ranita Mukherjee, Abhinanda Jena

Published by:

The Director, ICAR-Central Inland Fisheries Research Institute, Monirampore, Barrackpore Kolkata, West Bengal - 700 120, Director: 033-25920177 (O),
E-mail: director.cifri@icar.gov.in, director.cifri@gmail.com,
Web: www.cifri.res.in

Printed at: ICAR-CIFRI, Barrackpore

Year of Publication: 2025

Patrons

Prof. Pravat Kumar Roul, Vice-Chancellor, OUAT
Dr. Joykrushna Jena, DDG (Fisheries Science), ICAR
Shri. Suresh Kumar Vashishth, IAS, Principal Secretary, FARD
Dr. Bijay Kumar Behera, Chief Executive, NFDB

Conveners

Prof. Santosh Kumar Udgata, Dean, College of Fisheries (OUAT)
Dr. Basanta Kumar Das, Director, ICAR-CIFRI

Co-Conveners

Shri. M. R. Mohanty, President, OFCAAR
Dr. B. B. Nayak, Head FRHPHM Division, ICAR-CIFE
Dr. A. K. Balange, Head IARI, Assam & Secretary, PFGF
Dr. A. K. Das, Principal Scientist, ICAR-CIFRI & Secretary, IFSI
Dr. P. C. Das, Principal Scientist & Head APED, ICAR-CIFA
Dr. K. N. Mohanta, Principal Scientist & Head FNBPD, ICAR-CIFE
Dr. A. Panigrahi, Principal Scientist, ICAR-CIBA

Organizing Secretaries

Dr. M. K. Tripathy, Executive Secretary, OFCAAR
Dr. S. K. Majhi, Principal Scientist, RRC, ICAR-CIFRI
Dr. P. K. Parida, Senior Scientist, ICAR-CIFRI
Dr. A. K. Sahoo, Senior Scientist, ICAR-CIFRI
Dr. D. Choudhury, Joint Secretary, OFCAAR
Dr. B. Sahu, Treasurer, OFCAAR
Dr. H. S. Swain, Scientist, ICAR-CIFA

Co-Organizing Secretaries

Dr. J. Parhi, Senior Scientist, ICAR-CIFA
Dr. N. Das, Asso. Prof. CoF OUAT
Dr. S. K. Bhuyan, Asso. Prof. CoF OUAT
Dr. S. K. Patra, Asso. Prof. CoF OUAT

Dr. N. K. Sial, Asst. Prof. CoF OUAT
Dr. A. Acharya, Executive Body Member OFCAAR
Ms. A. Jena, Joint Secretary, OFCAAR

National Advisory Board

Md. S. Alam, IAS, Director, DoF, Govt. of Odisha
Dr. D. Kumar, Former Director & VC, ICAR-CIFE, Mumbai
Dr. W. S. Lakra, Former Director & VC, ICAR-CIFE, Mumbai
Dr. G. Krishna, Former Director & VC, ICAR-CIFE, Mumbai
Dr. S. C. Mukherjee, Former Director & VC, ICAR-CIFE, Mumbai
Dr. P.C. Thomas, Former Director, COF, OUAT
Prof. S. Nanda, Former Director, COF, OUAT
Dr. C. N. Ravishankar, Director & VC, ICAR-CIFE, Mumbai
Dr. C. Vasudevappa, Former VC, NIFTEM, Delhi
Dr. T. P. Kumar, VC KUFOS, Kochi
Dr. I. Singh, VC, BASU
Dr. N. Felix, VC, TNJFU, Chennai
Dr. T. K. Datta, VC, WBUAFS
Dr. D. Pillai, ADG (Inland Fisheries), ICAR, New Delhi
Dr. S. Ghosh, ADG (Marine Fisheries), ICAR, New Delhi
Dr. G. George, Director, CMFRI
Dr. K. Chakraborty, Director, ICAR-NBFGR
Dr. P. K. Sahoo, Director, ICAR-CIFA
Dr. G. Ninan, Director, ICAR-CIFT
Dr. A. Pandey, Director, ICAR-CICFR
Dr. K. K. Lal, Director ICAR-CIBA
Dr. P. Krishnan, Director, BOBP
Dr. R. Mohan M. K., Director (Acting), MPEDA
Dr. A. C. Ranade, Director, NIFPHATT
Dr. N. P. Sahu, Joint Director, ICAR-CIFE
Dr. R. John, Former President, PFGF
Dr. M. K. Gendley, Dean, CoF Chhattisgarh
Prof. K. Dinesh, Dean, CoF, Panangad
Dr. P. C. Bhuyan, Dean, CoF, AAU, Assam
Dr. N. Pandey, Dean, CoF, DUVASU, Uttar Pradesh
Dr. P. K. Pandey, Dean, CoF, RLBCAU, Jhansi
Dr. S. Balasundari, Dean, IFPGS, TNJFU, Chennai
Dr. R. J. Shakila, Dean, Dr. M.G.R FC&RI, Ponneri, TNJFU, Tamil Nadu
Dr. V. Rani, Dean, Dr. M.G.R. FC&RI, Thalainayeru, TNJFU Tamil Nadu
Dr. S. K. Mahajan, Dean, CoF, NDVSU, Jabalpur, Madhya Pradesh
Dr. B. Ahilan, Dean, FC&RI, TNJFU Thoothukudi, Tamil Nadu

Prof. A. B. Patel, Dean, CoF CAU (I) Lembucherra, Tripura
Dr. H. N. Anjanayappa, Dean, CoF, KVAFSU, Mangalore
Dr. V. P. Saini, Dean, CoF, BASU, Patna, Bihar
Dr. P. P. Srivastava, Dean, CoF, RPCAU, Pusa, Bihar
Dr. T. S. Nagesh, Dean, FFS, WBUAFS, West Bengal
Dr. R. A. Kaushik, Dean, CoF, MPUAT, Udaipur, Rajasthan
Prof. F. A. Bhat, Dean, FoFy, SKUAST Kashmir
Dr. B. R. Kharatmol, Dean, COFS, Udgir, Latur, MAFSU, Maharashtra
Dr. C. P. Singh, Dean, CoF, Kumarganj, Faizabad, NDUAT, Uttar Pradesh
Dr. M. D. Ansal, Dean, CoF, Ludhiana, GADVASU, Punjab
Dr. A. Singh, Dean, CoF, CSAUAT, Etawah, Uttar Pradesh
Dr. N. Kumar, Dean, CoFS, CCSHAU, Haryana
Dr. A. Kumar, Dean, CoF, GBPUAT, Pantnagar
Dr. S. I. Yusufzai, Principal, CoFS, Kamdhenu University, Veraval
Dr. M. N. Brahmhatt, Principal, CoFS, Kamdhenu University, Himmatnagar
Dr. R. V. Borichangar, Principal, CoFS, Navsari, NAU Gujarat
Dr. A. K. Singh, Associate Dean, CoFS, Gumla, BAU, Ranchi, Jharkhand
Dr. D. Nagalakshmi, Associate Dean, CoFS, PVNRTVU, Telangana
Dr. B. R. Kharatmol, Associate Dean, CoFS, Udgir
Dr. P. A. Telvekar, Associate Dean, CoFS, MAFSU, Nagpur, Maharashtra
Dr. N. Sawant, Associate Dean, CoF, Ratnagiri, BSKKV, Maharashtra
Dr. A. Balsubramaniam, Associate Dean, CoFS, SVVU, Andhra Pradesh
Dr. T. Neeraja, Associate Dean, CoFS, Narasapuram, APFU
Dr. R. Trivedi, DSW, RPCAU
Dr. Arun S., OIC, CoF, Payyanur

Organising Committee

Dr. V. K. Reddy, CoF, GADVASU
Dr. M. T. Lakshmipathi, COF, KVAFSU
Dr. I. Sivaraman, ICAR-CIFA
Dr. S. Bhusan, ICAR-CIFE
Dr. M. L. Bhowmik, ICAR-CIFRI
Dr. M. A. Hassan, ICAR-CIFRI
Dr. Sajina A. M., ICAR-CIFRI
Dr. R. K. Manna, ICAR-CIFRI
Dr. A. Pandit, ICAR-CIFRI
Dr. Armaan M., ICAR-CIFRI
Dr. D. K. Meena, ICAR-CIFRI
Dr. G. Karnatak, ICAR-CIFRI

Dr. D. Bhakta, ICAR-CIFRI
Dr. S. Kumari, ICAR-CIFRI
Dr. V. Kumar, ICAR-CIFRI
Dr. D. Panda, ICAR-CIFA
Dr. S. N. Sethi, ICAR-CIFA
Dr. K. Murmu, ICAR-CIFA
Mr. S. N. Sahoo, ICAR-CIFA
Ms. S. Mohanty, ICAR-CIFA
Dr. K. Panda, CoF, Chhatishgarh
Prof. G. Dash, CoF West Bengal
Mr. L. Pattnaik, MPEDA, Bhubaneswar
Dr. R. Das, COF, OUAT
Ms. V. Sahoo, COF, OUAT
Md. S. Alam, COF, OUAT
Mr. R. Thamizhmani, CoF, OUAT
Ms. A. Patra, CoF, OUAT
Ms. T. R. Mohanta, CoF, OUAT
Ms. K. Mahapatra, CoF, OUAT
Dr. S. S. Das, KVK, Ganjam-II
Dr. B. Samantray, KVK, Bhadrak
Dr. A. P. Nayak, KVK, Puri
Mr. S. K. Dash, DoF, Odisha
Mrs. M. Mohapatra, DoF, Odisha
Mr. M. Jena, DoF, Odisha
Mr. S. Dash, DoF, Odisha
Mr. B. P. Dwivedy, DoF, Odisha
Mr. G. S. Nanda, DoF, Odisha
Mr. S. C. Behera, DoF, Odisha
Mr. B. B. J. Sahu, DoF, Odisha



Conference on

2nd Indian Fisheries Outlook 2025

(Envisaging Blue Transformation in Indian Fisheries and Aquaculture)

College of Fisheries (OUAT), Rangailunda, Berhampur, Odisha

Email & Contact: fisheriesoutlook2@gmail.com; 9437480608, 0680-2343235

www.pfgf.org.in; www.ofcaar.org; www.ifo2.org

Prof. S. K. Udgata
Convener

Letter no. 207 /IFO2

Date 03.07.2025

NOTICE

This is to inform all that a National Conference entitled as "2nd Indian Fisheries Outlook 2025" with major theme "Envisaging Blue Transformation in Indian Fisheries and Aquaculture" will be held at College of Fisheries, OUAT, Berhampur, Odisha, jointly organized by Professional Fisheries Graduates Forum (PFGF) Mumbai; ICAR-Central Inland Fisheries Research Institute (CIFRI), Barrackpore; College of Fisheries, Berhampur, Inland Fisheries Society of India (IFS), Barrackpore, Kolkata, West Bengal and Odisha University of Agriculture and Technology (OUAT), Bhubaneswar during 12th to 14th July, 2025. The following committees have been formed for smoothly organizing the conference. All the committees should work as a team and lend their full support to make the conference a grand success.

Steering Committee

Dr. B. K. Das, Director, ICAR-CIFRI
Prof. S. K. Udgata, Dean, CoF OUAT
Dr. A. K. Balange, Secretary, PFGF
Dr. A. K. Das, Secretary, IFSI
Dr. M. K. Tripathy, Executive Secretary,
OFCAAR

Transportation Committee

Dr. S. K. Patra, Asso. Prof., CoF. OUAT
Mr. P. Gogoi, S, ICAR-CIFRI
Mr. Mitesh H. Ramteke, S, ICAR-CIFRI
Md. S. Alam, GF, CoF OUAT
Mr. R. Thamizmani, GF, CoF OUAT
Dr. H. S. Swain, S, ICAR-CIFA
Dr. B. K. Pradhan, DDE, OUAT

CoF Students

Mr. Satyabrata Sahoo
Mr. Arobinda Tung
Mr. Debabrata Panda
Mr. Ansuman Routray
Mr. Preetidipan Mendeli
Mr. Aniket Swain
Mr. Sibasundar Patra
Mr. Gouri Shankar Dash
Mr. Kamala Kanta Swain
Mr. Kanha Nahak
Mr. Kaibalya Prasad Pothal

	<p>CIFRI Scholars Mr. Pradyut Malakar Mr. Deependra Singh Mr. Anurag Singh</p>
<p><u>Accommodation Committee</u> Dr. B. Sahu, AP, CoF OUAT Dr. Vikash Kumar, SS, ICAR-CIFRI Dr. V. R. Thakur, SS, ICAR-CIFRI Dr. N. Panda, AP, CA, OUAT Mr. Rakesh Kumar, S, ICAR-CIFRI Mr. Vijay Kumar, TO, ICAR-CIFRI</p> <p>CoF Students Mr. Chandan Roul Mr. Chandan Sahoo Mr. Hitesh Roshan Rout Mr. Ashis Kumar Sahoo Mr. Siddharth Sahoo Miss. Sthithi Prangya Das Miss. Kiran Panda Miss Adyasha Maharana Miss. Disha Debashrita</p> <p>CIFRI Scholars Mr. Arghya Kunui</p>	<p><u>Invitation to Industry and Financial Coordination</u> Dr. A. K Das, PS, ICAR-CIFRI Dr. P. K. Parida, SS, ICAR-CIFRI Dr. M. K. Tripathy, AP, CoF OUAT Dr. N. K. Sial, AP, CoF OUAT Dr. B. Sahu, AP, CoF OUAT Dr. A. Acharya, GF, CoF OUAT</p> <p>CIFRI Scholars Mr. Adipta Chakraborty Mr. Rambhajan Singh</p>
<p><u>PFGF Award committee</u> Dr. B. B. Nayak, PS, ICAR-CIFE Dr. Sashi Bhusan, SS, ICAR-CIFE Mr. Abuthagir Ibrahlim S., S, ICAR-CIFE</p>	<p><u>IFSI awards committee</u> Dr. S. Samanta, PS, ICAR-CIFRI Dr. Sajina A. M., SS, ICAR-CIFRI Dr. Gunjan Karnatak, SS, ICAR-CIFRI</p>
<p><u>Guest / Invitation</u> Dr. P. K. Parida, SS, ICAR-CIFRI Ms. Sunita Prasad, CTO, ICAR-CIFRI Ms. Sumedha Das, Technical, ICAR-CIFRI Dr. Suvra Roy, SS, ICAR-CIFRI Dr. A. Acharya, GF, CoF OUAT</p> <p>Research Scholar of CIFRI Ms. Antra Roy Chowdhury</p>	<p><u>Student interface committee / YFTS</u> Dr. Kedar Nath Mohanta, PS, ICAR-CIFE Dr. D. Choudhury, Asso. Prof., CoF. OUAT Dr. D. K. Meena, SS, ICAR-CIFRI Dr. Vijay Kumar Reddy, AP, CoF GADVASU Dr. Priti J. Majhi, S, ICAR-CIFRI</p> <p>CoF Students Miss. Soumya Priyadarshini Mr. Mrutunjay Das Miss. Srusti Samarпита Beriha Miss. Ankita Behera Mr. Subham Samal Mr. Muni Soham Bhuyan</p>
<p><u>Reception & Registration committee</u> Dr. D. Choudhury, Asso. Prof., CoF. OUAT Dr. Anjana Ekka, SS, ICAR-CIFRI Dr. Suvra Roy, SS, ICAR-CIFRI Dr. Ramya V. L., SS, ICAR-CIFRI</p>	<p><u>Food & Refreshment Committee</u> Dr. S. Samanta, PS, ICAR-CIFRI Dr. R. K. Manna, PS, ICAR-CIFRI Dr. P. Das, SS, ICAR-CIFRI Dr. S. P. Kamble, SS, ICAR-CIFRI</p>

<p>Dr. P. Debroy, S, ICAR-CIFRI Dr. Jesna P. K., S, ICAR-CIFRI Dr. Sonalika Sahoo, S, ICAR-CIFRI Dr. K. K. Sarangi, AP, CA, OUAT Miss. Nirupada Chanu, S, ICAR-CIFRI Ms. A. Jena, GF, CoF OUAT</p> <p>CoF Students Miss Kajal Mohapatra Mr. Paramesh Lenka Miss. T. Sarmistha Patro Miss. Rajashree Jena Miss. Gargi Sethi Mr Bikram Kumar Sethi Mr. Rajashree Behera Miss. Manasa Manaswini Devi Miss Sthiti Prangya Das Mr. Dwitikrushna Shankhua Miss. Priyanka Priyadarshini Nayak Miss. Saswati Behera</p> <p>CIFRI Scholars Dr. Shreya Bhattacharya Dr. Ravali Vallangi Ms. Trupti Rani Mohanty Ms. Debasmita Mohanty</p>	<p>Dr. M. K. Tripathy, AP, CoF OUAT Dr. B. Sahu, AP, CoF OUAT</p> <p>CoF Students Ms. A. Patra Mr. Abhilash Jena Mr. Chinmaya Kumar Nayak Miss Pranita Nayak Miss. Chinmayee Tanty Mr. Debabrata Panda</p> <p>CIFRI Scholars Hirak Jyoti Chakraborty Mr. Ayushman Gadnayak Mr. Karamveer Singh Mr. Aritriya Jana Mr. Sidhartha Sankar Das</p>
<p><u>Souvenir Committee</u> Dr. Arun Pandit, PS, ICAR-CIFRI Dr. P. K. Parida, SS, ICAR-CIFRI Dr. A. K. Sahoo, SS, ICAR-CIFRI Ms. Nirupada Chanu, S, ICAR-CIFRI Dr. H. S. Swain, S, ICAR-CIFRI Dr. S. K Patra, Asso. Prof., CoF. OUAT Dr. J. Parhi, SS, ICAR-CIFA</p>	<p><u>Press/Media Committee</u> Dr. N. Das, Asso. Prof., CoF. OUAT Dr. I. Sivaraman, S ICAR-CIFA Dr. S. Samantray, SMS, KVK, Ganjam-I Mr. Sujit Chowdhury, Ms. Ariyama Bhattacharya Mr. Liton Paul</p> <p>CoF Students Mr. Mrutyunjaya Das Mr. Aditya Prasad Gouda Miss. Kashis Satapathy Miss. Adyasha Parija</p>
<p><u>Abstract committee</u> Dr. Dibakar Bhakta, SS, ICAR-CIFRI Dr. Vikash Kumar, SS, ICAR-CIFRI Mr. Mitesh H. Ramteke, S, ICAR-CIFRI Dr. Priti J. Majhi, S, ICAR-CIFRI Dr. Canciyal Johnson, S, ICAR-CIFRI Dr. A. Acharya, GF, CoF OUAT</p>	<p><u>Event Management and cultural programme</u> Dr. Arman U M, PS, ICAR-CIFRI Dr. Aparna Roy, SS, ICAR-CIFRI Dr. D. Choudhury, Asso. Prof., CoF. OUAT Dr. H. S. Swain, S, ICAR-CIFA Dr. Jeetendra Kumar, S, ICAR-CIFRI Dr. A. Acharya, GF, CoF OUAT</p>

<p>CIFRI Scholars Dr. Sourav Kundu Ms. Ranita Mukherjee</p>	<p>Dr. S. K. Nath, SS & Head, KVK, Ganjam-II Dr. P. K. Panda, S, NCRS, OUAT Dr. I. O. P. Mishra, S, NCRS, OUAT Miss A. Jena, GF, CoF OUAT</p> <p>CoF Students Miss. Pooja Priyadarshini Miss. Dikshya Mohanty Mr. Debabrata Panda Mr. Subhrajit Das Miss Suprita Das Miss Alisha Nayak Miss Manisha Samantray Mr. Ashish Dung Dung Mr. Deepak Kumar Paik Mr. Jeeban Jyoti Mohalik Miss Alibha Jena Mr. Satyajit Rout Mr. Bibhu Sundar Sahoo</p> <p>CIFRI Scholars Ms. Shreya Roy Mr. Biswajit Mondal Ms. Rinku Besra</p>
<p><u>Technical committee (Oral sessions)</u> Dr. A. Balange, PS, IARI Dr. S. K. Bhuyan, Asso. Prof., CoF. OUAT Dr. J. Parhi, SS, ICAR-CIFA Dr. Sajina A.M., SS, ICAR-CIFRI Dr. Dibakar Bhakta, SS, ICAR-CIFRI Dr. A. Alam, SS, ICAR-CIFRI Dr. Gunjan Karnatak, SS, ICAR-CIFRI Dr. K. Sethy, AP, CVSc & AH, OUAT Ms. V. L. Sahoo, GF, CoF OUAT</p> <p>CoF Students Mr. Anupam Sahoo Mr. Amaresh Ch. Majhi Miss. Kashis Satapathy Mr. Biswranjan Ojha</p> <p>CIFRI Scholars Dr. Saurav Nandi Mr. Archisman Ray Mr. Arghya Kunui Dr. Susmita Jana</p>	<p><u>Technical committee (Poster sessions)</u> Dr. S. C. S. Das, SS, ICAR-CIFRI Dr. Lianthumluaia, SS, ICAR-CIFRI Dr. Rahul Das, SS, ICAR-CIFRI Dr. N. Das, Asso. Prof., CoF. OUAT Mr. P. Gogoi, S, ICAR-CIFRI Dr. A. Acharya, GF, CoF OUAT Dr. S. S. Das, SMS, KVK, Ganjam-II</p> <p>CoF Students Miss P. Vaishanabi Mr. Aditya Ram Mr. Gyanendra Kumar Nayak Mr. Aditya Prasad Gouda</p> <p>CIFRI Scholars Mr. Abhijit Das Mr. Abhilash W. Mr. Sanatan Bera</p>
<p><u>Campus beautification committee</u></p>	<p><u>Farmer Interaction committee</u></p>

<p>Dr. N. Das, Asso. Prof., CoF. OUAT Mr. D. Venketaswar Patra Mr. N. Praveen Mr. Simanchal Das</p> <p>CoF Students Ms. Manisha Samantaray Ms. Alisha Nayak Mr. Subhrajit Das Mr. Ashis Dung Dung Mr. Deepak Kumar Paik</p>	<p>Dr. A. Panigrahy, PS, ICAR-CIBA Dr. S. K. Majhi, PS, ICAR-CIFRI Dr. L. N. Murthy, PS, ICAR-CIFRI Dr. D. N. Jha, SS, ICAR-CIFRI Dr. S. Satapathy, SS & Head, KVK, Ganjam-I Dr. S. K. Nath, SS & Head, KVK, Ganjam-II Mr. B. B. J. Sahoo, DFO, Ganjam</p> <p>CoF Students Mr. Abhilash Jena Mr. Rakesh Samal Mr. Chinmay Nayak Ms. Sushree Monali Priyadarshini Ms. Suchitra Mandal</p>
<p><u>Exhibition Stall Committee</u> Dr. N. Das, Asso. Prof., CoF. OUAT Dr. S. K. Nath, SS & Head, KVK, Ganjam-II Ms. V. L. Sahoo, GF, CoF OUAT Ms. A. Patra, LA, CoF OUAT</p> <p>CoF Students Ms. Priyanka Satapathy Ms. Dwitimayee Sahu Mr. Jagamohan Dash Mr. Satyajit Rout Mr. Sunil Kumar Nayak</p>	



Convener

Preface

We are pleased to present the Book of Abstracts for the 2nd Indian Fisheries Outlook 2025, themed “*Envisaging Blue Transformation in Indian Fisheries and Aquaculture*”. This conference is jointly organised by the College of Fisheries, OUAT, Rangeilunda; the Professional Fisheries Graduates Forum (PFGF), Mumbai; the Inland Fisheries Society of India (IFSI), Barrackpore; the Odisha Fisheries College Alumni Association (OFCAAR), Rangeilunda; and the ICAR-Central Inland Fisheries Research Institute, Barrackpore. It is being held on July 12–14, 2025, at the College of Fisheries, Rangeilunda.

This event brings together a diverse community of scientists, researchers, scholars, students, development agencies, and fishers to share knowledge and ideas aimed at achieving resource sustainability, environmental stewardship, and economic growth in fisheries and aquaculture. The conference covers a comprehensive range of topics, including aquaculture, fish health and disease management, socio-economic aspects, responsible fisheries and ecosystem management, post-harvest processing, fish nutrition, genetics, and emerging biotechnological challenges.

A total of 366 abstracts has been received and included in this volume, reflecting cutting-edge research and innovations in the field. This book of abstracts features theme lectures, keynote addresses, lead talks, and invited presentations as well as oral and poster presentations, all organised according to the technical program. Each abstract is assigned a serial number, and an author index is also provided for easy reference.

We extend our heartfelt thanks to all contributors for their timely and high-quality submissions and to the editorial team for their dedication in compiling and publishing this volume. We hope this book will serve as a valuable resource for all the participants and a lasting record of this important conference.

Date: July 12, 2025

Convenors

B. K. Das
Director, ICAR-
CIFRI

S. K. Udgata
Dean, College of
Fisheries, OUAT

Content

Abstract ID	Author(s)	Abstract title	Page No.
Eco-Conscious & Climate-Adaptive Aquaculture (ECAA)			
ECAA-01	Venkatesh K.	Comparative study on growth performance of Indian major carp and Exotic carp in aquaponics system with cucumber plant	2
ECAA-02	Reshmarani Mohanty	Evaluation of carp mola polyculture in seasonal pond	3
ECAA-03	Subhashree Dash	Smart aquaculture technology for enhancing aquaculture productivity	4
ECAA-04	Subhashree Dash	Productivity assessment of Genetically Improved Farmed Tilapia (<i>Oreochromis niloticus</i>) and Spinach (<i>Spinacia oleracea</i>) with varied stocking densities in an aquaponic system	5
ECAA-05	Ritesh Kumar Padhi	Comparative growth performance of Amur carp (<i>Cyprinus carpio haematopterus</i>) under the aquaponic system with water spinach (<i>Ipomoea aquatica</i>)	6
ECAA-06	Chinmayee Subhasmita	Optimization of stocking density and its effects on climbing perch (<i>Anabas testudineus</i>) cum spinach (<i>Spinacia oleracea</i>) based aquaponic system	7
ECAA-07	Aritriya Jana	Impact of thermal discharge on fish assemblage pattern in tropical river Ganga, India	8
ECAA-08	Bikram Kumar Sethy	Exploring the role of seaweed culture in the reduction of greenhouse gas emissions in the atmosphere: a nature-based solution for climate change mitigation	9
ECAA-09	S. S. Das	Comparative evaluation of growth and economic performance of different species in Biofloc System	10
ECAA-10	Gargi Sethi	Embryonic Development and Hatching Success under Varying Water Temperatures	11
ECAA-11	S. S. Das	Production and economic performance of genetically improved freshwater prawn (CIFA-GI Scampi) under field trial in Ganjam, Odisha	12
ECAA-12	Bibhuti Bhusan Pradhan	Stocking density influences economic feasibility & yield in a gift (<i>oreochromis niloticus</i>) and fodder maize (<i>zea mays</i>) based aquaponic system	13

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ECAA-13	Yagnesh B. Motivarash	Marine Debris and Its Impact on Physiological Functions in Marine Fishes	14
ECAA-14	Dibakar Gogoi	Effect of vermiwash on plankton production and growth performance of <i>Labeo catla</i>	15
ECAA-15	Angshuman Saikia	Evaluation of potential beneficial microorganisms from fish waste compost	16
ECAA-16	S. P. Kamble	Sustainable Fingerling Production in Gujarat Reservoirs: A Study on CIFRI HDPE Pen Technology	17
ECAA-17	Anupam Kumar Sahu	Assessment of nutritional composition and health of fish to anthropogenic stressors in sewage-fed aquaculture system	18
ECAA-18	Prem Kumar	Different methods of hormone delivery for captive maturation and induced breeding of fish	19
ECAA-19	Dinesh Palanisamy	Effect of Biofloc Technology on Hatchery Performance of Indian White Shrimp (<i>Penaeus indicus</i>) Using Different Carbon Sources	20
ECAA-20	Gopinath Janadevados	Effect of Biofloc Systems on the Growth and Health of Indigenous <i>Penaeus indicus</i> and Exotic <i>Penaeus vannamei</i> Shrimp Species – Comparative studies	21
ECAA-21	Saranya Chakrapani	Enhanced Shrimp Culture Performance Using a Customized Biofloc Consortium (CIBAFLOC): A Novel Approach to Sustainable Aquaculture	22
ECAA-22	Gunjan Karnatak	Climate-Driven Reproductive Vulnerability in Freshwater Fishes: A Multi-Approach Assessment	23
ECAA-23	Harshavarthini M	Effects of fish waste silage and vitamin C supplementation diet on growth and haematological parameters of rohu, <i>Labeo rohita</i> (Hamilton, 1822) fingerlings	24
ECAA-24	Rajashree Jena	Studies on growth performance, survival and haematological response of Amrit Catla to varying levels of salinity.	25
ECAA-25	Rakesh Kumar	Seasonal Dynamics of Phosphorus Fractions in the Sediments of Bhojtal Wetland, Bhopal	26
ECAA-26	Thangjam Nirupada Chanu	Greenhouse gases (GHGs) emission from a highly polluted and a less polluted freshwater wetlands: Understanding the dynamics of GHGs in the era of climate change	27
ECAA-27	Sonalika Sahoo	Assessment of trophic Status and Water Quality Index for Fisheries Sustainability in a Tropical Reservoir of India	28

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ECAA-28	Tanushree Banerjee	Characterization of Soil Organic Carbon Pools in a Sewage-fed Wetland of East Kolkata, India	29
ECAA-29	Pujadebi Bera	Effect of selenium on salinity tolerance and disease resistance of <i>Labeo rohita</i>	30
ECAA-30	Manoj Kumar Tripathy	Influence of probiotic on the relative condition factor and relative growth co-efficient of <i>Carassius auratus</i>	31
ECAA-31	Jitender Kumar Jakhar	Effect of dietary supplementation of vitamin E on flesh quality parameter of striped catfish, <i>Pangasianodon hypophthalmus</i> (Sausage 1878)	32
ECAA-32	M. H. Ramteke	Optimizing Stocking Density for Nursery Rearing of Amur Carp in a Recirculatory Aquaculture System	33
ECAA-33	A. L. Aruna	Evaluation of raw and fermented sesame oil cake on growth performance and nutritional composition of Amur carp (<i>Cyprinus carpio haematopterus</i>) fingerlings	34
ECAA-34	Gyanendra Kumar Naik	Biofloc Technology: An "Green approach" To Boost up Aquaculture Production	35
ECAA-35	Sarita Das	Effect of feeding probiotic on the gut health of Rohu (<i>Labeo rohita</i>)	36
ECAA-36	Silpa Sahu	Effect of frequency of probiotic application on the fry rearing of Rohu in biofloc system	37
ECAA-37	P.V. Kaveri Raman	Effect of Bottom Substrate on Growth and Survival of Advanced Post Larvae of Giant River Prawn, <i>Macrobrachium rosenbergii</i> (De Man, 1879)	38
ECAA-38	P. A. Patil	Density optimization of pearlspot fry and fingerlings for live transportation	39
ECAA-39	M. Jayanthi	Aquaculture spatial planning for blue transformation in coastal regions and beyond in Odisha, India	40
ECAA-40	Sushree Ratnamanjari Senapati	Blue Transformation in Odisha Fisheries and Aquaculture	41
ECAA-41	Alaka Tandi	Impact of herb Ashwagandha <i>Withania somnifera</i> incorporated diets on growth and reproductive performance of Goldfish <i>Carassius auratus</i>	42
ECAA-42	Rumali Sahoo	Indigenous Fish culture in wastewater fed pond of East Kolkata Wetlands	43
ECAA-43	Aditya Ram	Biodegradable Alternatives to Microplastics in Aquaculture Infrastructure	44

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ECAA-44	Ayan Biswas	Human Health Risk and Bioaccumulation Pattern of Potentially Toxic Elements in Edible Fish from the Lower Stretch of the Damodar River	45
ECAA-45	M. Samynathan	Assessment of aquaculture impact on land use changes through spatial technologies: A model case study of Ramanathapuram District, Tamil Nadu, India	46
ECAA-46	Swapna Behera	Possible effects of fingermillet-based biofloc technology at various C:N ratios on butter catfish (<i>Ompok bimaculatus</i>) water quality, growth performance, and haematological and serum biochemical profiles	47
ECAA-47	Nitish Kumar Chandan	Effect of Dietary n-3/n-6 Fatty Acid on Reproduction and Egg Quality of Climbing Perch, <i>Anabas testudineus</i>	48
ECAA-48	Pooja Priyadarshini	Aquatic Carbon Cycling: Implications for Climate Change	49
ECAA-49	Basant Singh	Effects of fish waste silage and vitamin-C supplemented diet on growth and haematological parameters of common carp, <i>Cyprinus carpio</i> (Linnaeus, 1758) fingerlings	50
ECAA-50	S. Thirumurthy	Vulnerability assessment in ecologically important coastal regions: A model case study in Chengalpattu District, Tamil Nadu	51
ECAA-51	D. Panda	Scampi Seed Production in Brackishwater Ponds in India: A Case Study	52
ECAA-52	M. Kailasam	Brackishwater Finfish Farming in India: Emerging Practices, Opportunities and Future Strategies	53
ECAA-53	Biswajit Mishra	Studies on seasonal phytoplankton indicative communities in Tampara Lake, Odisha	54
ECAA-54	Md Shadab Alam	Integrated Farming of Catfish and Carps: A Paradigm for Enhanced Productivity and Income Generation	55
ECAA-55	Karuppannan Iswarya	The aquatic environmental stress modulates quinolone and nitrofurantoin resistance of <i>Salmonella</i> Montevideo to the climatic variations: A new perspective on evolution	56
ECAA-56	Archan K. Das	Stock enhancement in inland open waters through transparent stocking program	57

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ECAA-57	Maibam Malemngamba Meitei	Balancing Productivity and Ecology: Integrated multi-trophic aquaculture (IMTA) system of Indian pompano, <i>Trachinotus mookalee</i> , Pacific white-leg shrimp, <i>Penaeus vannamei</i> , and red seaweed, <i>Kappaphycus alvarezii</i>	58
ECAA-58	Soumya Priyadarshini	From Vulnerability to Resilience: Climate Adaptation in Aquaculture	59
ECAA-59	Amanjit Nayak	Observation on growth and survival of silver barb, <i>Barbonymus gonionotus</i> (Bleeker, 1849) under varied stocking densities reared in small concrete tank culture system	60
ECAA-60	Nabakishor Sial	Culture and fattening of mudcrab, <i>Scylla serrata</i> in shallow water cages in Gopalpur creek, East Coast of India	61
ECAA-61	Velmani Vignesh	Impact of synthetic hormone on sex and stress steroid levels, breeding performance, spawning success, and embryonic development in <i>Labeo gonius</i> (Hamilton, 1822)	62
Innovations in Aquatic Animal Health & Disease Management (IAHM)			
INVT-01	S. N. Sahoo	Prevalence of Antimicrobial Resistance in Freshwater Aquaculture Systems of Odisha, India	64
IAHM-1	Santosh Kumar Udgata	Physico-chemical parameters and disease occurrence in some fish farms of Ganjam and Kalahandi districts of Odisha, India	65
IAHM-2	Santosh Kumar Udgata	Evaluation of effective antimicrobial therapy for Aeromoniasis in carps	66
IAHM-3	Abhijit Das	Prevalence and Dissemination of Carbapenem-Resistant <i>Klebsiella</i> spp. in the Lower Ganga River Basin	67
IAHM-4	Bhagchand Chhaba	Toxic effect of Organophosphate (Chlorpyrifos) on Hematological, Biochemical, Enzymatic and Histological parameters in striped catfish (<i>Pangasianodon hypophthalmus</i> , Sauvage, 1878)	68
IAHM-5	Biswajit Mandal	Genetic Footprints of Invasion: eDNA-Driven High-Resolution Surveillance of Nile Tilapia (<i>Oreochromis niloticus</i>) Across Eastern India's Freshwater Landscapes	69

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

IAHM-6	Hena Chakraborty	Weight-Specific Serum Proteomics of Male Hilsa (<i>Tenualosa ilisha</i>): Unveiling Developmental and Immune Adaptations	70
IAHM-7	S. S. Das	Integrated methods of controlling Argulosis in carp culture pond	71
IAHM-8	Debasmita Mohanty	Prodigiosin from Bivalve-Associated <i>Serratia marcescens</i> : A Natural Antimicrobial and β -Lactamase Inhibitor Against Fish Pathogens	72
IAHM-9	Priyadarshini Michael	Prevalence of Snakehead rhabdovirus - Indian strain (SHRV-In) in Tamil Nadu, India and susceptibility of Nile tilapia to the virus	73
IAHM-10	Angana Majumder	Anthropogenic Modulation of Microbial Abundance and Community Dynamics in the East Kolkata Wetlands (EKW)	74
IAHM-11	Mala Kumari	Prevalence of Multidrug-Resistant and ESBL-Producing <i>Aeromonas</i> spp. in the Adi Ganga River, West Bengal, India	75
IAHM-12	Santosh Kumar Udgata	Evaluation of effective antimicrobial therapy for aeromoniasis in carps	76
IAHM-13	Debapriyo Mukherjee	The Use of Some Alternative Therapies in the Healing of Diseases of Fish in West Bengal	77
IAHM-14	Sohini Chatterjee	Dietary oxolinic acid administration induces behavioural, haematological and biochemical alterations in catfish <i>Pangasianodon hypophthalmus</i>	78
IAHM-15	Nabanita Chakraborty	Spatio-Temporal Patterns and Correlates of Aquatic Animal Diseases in West Bengal: Insights from Disease Surveillance under NSPAAD by Faculty of Fisheries, WBUAFS (2022–2025)	79
IAHM-16	Rahul Thaware	Temporal dynamics of oxytetracycline residue in the muscle tissue of <i>Anabas testudineus</i> following oral administration and assessment of its withdrawal period	80
IAHM-17	Astha Deshmukh	Beyond Immediate Defence: Decoding the Mechanisms of Trained Immunity in Tilapia	81
IAHM-18	Nagarajan Arun	Surveillance and detection of asymptomatic infection of WSSV and ehp in wild <i>Penaeus indicus</i> broodstock from Indian coastal zones	82
IAHM-19	Kulothungan Balasundaram	In Silico Screening of Neem Phytocompounds Against <i>Vibrio parahaemolyticus</i> Virulence Proteins	83
IAHM-20	Arpit Acharya	Evaluation of reference gene stability in <i>Labeo catla</i> under bacterial and hypoxic stress conditions	84
IAHM-21	R. Bharathi Rathinam	Harnessing the potential of probiotic microbial proteins for bacterial disease management in aquaculture	85

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

IAHM-22	Deepakrajasekar Padmanaban	Next generation therapeutics from the marine organism: biomedical roles of natural and synthetic aquatic biomolecules	86
IAHM-23	Modi Kiran Piyushbhai	In silico approach to inhibit <i>Vibrio alginolyticus</i> infection via targeting the porin proteins using isoflavonoids compounds	87
IAHM-24	Pranaya Kumar Parida	Mass Mortality in <i>Labeo bata</i> Linked to Co-infection by <i>Aeromonas veronii</i> and <i>Megasporoporia</i> sp.: Pathological and Immunological Insights	88
IAHM-25	Vikash Kumar	Effect of repeated bacterial culture on virulence and antibiotic resistance characteristics: a study of gram-positive and gram-negative fish pathogens	89
IAHM-26	Chinmayee Muduli	Dietary Supplementation of <i>Bacillus amyloliquefaciens</i> , <i>B. subtilis</i> and <i>B. cereus</i> Individually or in Consortium Effected Growth Performance, Skin Mucosal Immunity, mRNA Expression, and Disease Resistance Against <i>Aeromonas hydrophila</i> and <i>Edwardsiella tarda</i> in Asian Stinging Catfish, <i>Heteropneustes fossilis</i> (Bloch 1793)	90
IAHM-27	Ramesh Chandra Malick	Characterization of <i>Aeromonas veronii</i> in Cage-Cultured Pangasius: A Case Study from Hirakud Reservoir, India	91
IAHM-28	Nityananda Das	Status of antimicrobial resistance (AMR) of <i>Pseudomonas aeruginosa</i> bacteria in rohu (<i>Labeo rohita</i>) in the Ganjam district of Odisha	92
IAHM-29	Swagatika Sahu	Enhancement of antibody production by herbal dietary intake in <i>Labeo rohita</i>	93
IAHM-30	Narendra Kumar Maurya	Bioaccumulation and Human Health Risk Assessment of Heavy Metals in Different Edible Fish Species from Mangaluru Coast	94
IAHM-31	Sourav Kundu	Occurrence of environmental bisphenol A in surface waters from the Ganga River Basin, India: Seasonal Changes and Risk Assessment	95
IAHM-32	Subhasrita Nayak	Physio-metabolic responses of <i>Catla catla</i> (Hamilton, 1822) fry against ammonia toxicity	96
IAHM-33	Aditya Pratap Acharya	One Health Approach to Reduce AMR Load from Poultry Waste through Circular Economy Model	97
IAHM-34	Paidi Srivaishnavi	Herbal Medicines in Aquaculture: A Natural Way to Healthier Fish Farming	98
IAHM-35	Souvik Dhar	Biochemical and molecular insights into <i>Argulus bengalensis</i> induced stress in <i>Labeo rohita</i>	99
IAHM-36	Anupam Adhikari	Tissue-Level Analysis of Immune Modulation by Endocrine Disruptors in <i>Labeo catla</i>	100

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

IAHM-37	M. Shaya Devi	Disease outbreak caused by <i>Aeromonas veronii</i> in <i>Labeo bata</i> in a freshwater wetland of Eastern India	101
IAHM-38	Richa Pathak	Integrated Assessment of Pharmacokinetics, Residue Depletion, and Histopathological Effects of Emamectin Benzoate in Rainbow Trout	102
IAHM-39	Bera A. K	Winter stress leads infection by multiple pathogens of bacteria and parasite in <i>Pangasianodon hypophthalmus</i>	103
IAHM-40	Krishna Kala	Assessment of Emamectin Benzoate Efficacy and Withdrawal Period for Controlling Argulus Infestation in Rainbow Trout, <i>Oncorhynchus mykiss</i> (Walbaum, 1792)	104
IAHM-41	Mohan Singh	Prevalence and Antibiotic Resistance of <i>Enterococcus</i> Species Isolated from Farmed Fish	105
IAHM-42	Dhruba Jyoti Sarkar	Peroxidase mimic ferrioxalate (FeOOH) nanoparticles enabled highly specific colorimetric detection of arsenate in water and fish	106
IAHM-43	Mrutyunjaya Das	A Smart and Accessible Solution for Aquatic Animal Health Management	107
IAHM-44	Richa Pathak	Pharmacokinetics and Tissue Distribution of Lufenuron in Juvenile Rainbow Trout (<i>Oncorhynchus mykiss</i>) Following Single Dose Oral Administration	108
IAHM-45	Richa Pathak	Absorption, distribution and excretion of an anthelmintic drug praziquantel in rainbow trout, <i>Oncorhynchus mykiss</i> (Walbaum 1792) following a single dose oral administration	109
IAHM-46	Amrita Mohanty	Identification of a Novel Potential Vaccine Candidates Against <i>Aeromonas hydrophila</i> using Immunoinformatic Approach	110
IAHM-47	Manish Kumar	Smart Diagnostics in Aquaculture: Lab-on-Chip Systems for Rapid Onsite Pathogen Detection	111
IAHM-48	Swati Surabhi	Immunological responses of Nile tilapia (<i>Oreochromis niloticus</i>) to tilapia parvovirus (TiPV) infection	112
IAHM-49	Krishna Kala	Therapeutic Evaluation and Residual Kinetics of Oxytetracycline dihydrate in Rainbow Trout, <i>Oncorhynchus mykiss</i> (Walbaum, 1792)	113
Socio-Economic Dimensions for Sustainable Fisheries & Aquaculture (SSFA)			
SSFA-1	Karthik Kumar Goud Palsam	Technical Efficiency Analysis of Asian Seabass Farming in Andhra Pradesh: A Stochastic Production Frontier Approach	115

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

SSFA-2	P. K. Parida	Leveraging Recreational Fisheries for Aqua-Tourism and Resilience Building in the Wetlands of the Lower Gangetic Plains	116
SSFA-3	Anurag Singh	Assessing Climate-Induced Livelihood Vulnerability in Fishing Communities of the Lower Gangetic Estuarine Region	117
SSFA-4	Gitashree Thengal	Assessing the Socioeconomic Impacts of Pollution in the Jalangi River on Fishers' Livelihoods	118
SSFA-5	B. Nightingale	Socioeconomic determinants and constraints of fish consumption in Kabirdham District, Chhattisgarh	119
SSFA-6	Ayan Samaddar	The integrated rice-fish system and opportunities in South Asia: an agroecological perspective	120
SSFA-7	Aryama Bhattacharya	Hilsa Conservation and Restoration in River Ganga: Steps Towards Sustainable Fisheries	121
SSFA-8	P. Das	Mixed carp culture in a leased community pond operated by SHGs under MMKY was successful Intervention for rural income and livelihood	122
SSFA-9	B. B. J. Sahoo	Early breeding of carps – a beacon of self-reliance in fish seed production in Odisha	123
SSFA-10	Deshmukh D. R	A Strategy to Improve the Socio-Economic Condition of the Fishermen Community of Paithan, Aurangabad, of the Marathwada Region, Maharashtra	124
SSFA-11	Shreya Bhattacharya	Small-scale Hilsa fishery of West Bengal is in Stress: Assessing Vulnerability and a Roadmap to Sustainability	125
SSFA-12	Liton Paul	Supply Chain Mapping and Market Economics of the Mud Crab Fishery in the Sundarbans Region	126
SSFA-13	Siddharth Sankar Das	Studies on Nucleus Implantation and Development of Designer Pearl in Freshwater Mussel, <i>Lamellidens marginalis</i> (Lamark, 1819)	127
SSFA-14	Yateesh D. C.	Evaluation of the impact of Awareness Programs on Fish & Dolphin Conservation along the River Ganga, India: A Cross-Sectional study	128
SSFA-15	Rajiv Ranjan	Inland fisheries of Gujarat: status, opportunities and future perspective	129
SSFA-16	Amar Gaikwad	Understanding Knowledge and Attitude Towards Harvest and Post-Harvest Handling of Fish: Insights from Aquaculture Farmers of Minor Irrigation Tanks in Odisha, India	130
SSFA-17	Naresh Mugada	Domestic Consumption of Shrimp in India: A Review of Challenges and Opportunities	131

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

SSFA-18	Dharm Nath Jha	Statistical estimation of riverine fish catch: An example with Gomti river in India	132
SSFA-19	Arun Pandit	Attaining Sustainable Development Goals: Role of Ecosystem Services of Floodplain Wetlands	133
SSFA-20	H. K. De	Evaluating Women’s Empowerment in Small-Scale Aquaculture Using WEAI in Odisha	134
SSFA-21	Pradip Chandra Bhuyan	Fisheries and Aquaculture sector of Assam: A path to Economic Prosperity in Northeast India	135
SSFA-22	Pronob Das	Evaluating cage culture of <i>Hypophthalmichthys molitrix</i> in mid-altitude reservoir of Northeast India through participatory mode	136
SSFA-23	Ranjan Kumar Manna	Socio-ecological implication of algal eutrophication in Kholsi beel, a floodplain wetland of Ganga basin, India	137
SSFA-24	Aparna Roy	Socio-Economic Dynamics of Native and Migrant Labours in Marine Fisheries of West Bengal	138
SSFA-25	Aparna Roy	'Bandh' Fisheries for Tribal Livelihood and Nutrition in the Chhotanagpur Plateau	139
SSFA-26	B. Nightingale devi	Comparative Analysis of Community-Based Fisheries Governance: Cooperatives vs. Self-Help Groups in Kabirdham district, Chhattisgarh	140
SSFA-27	B. Nightingale Devi	Dynamics of domestic fish marketing system in Raipur city, Chhattisgarh	141
SSFA-28	I. Sivaraman	Geo-Spatial Decision Support for Aquaculture Planning: A Case Study of Maharashtra using CIFA AquaNIRNAY	142
SSFA-29	Sanjeevan Kumar	"Assessment of the Economic Efficiency of Satellite-Derived Potential Fishing Zones (PFZs) Versus Non-PFZ Areas through Benefit-Cost Ratio Analysis in Case-2 Waters of India"	143
SSFA-30	Pratap Chandra Das	Enhancing freshwater fish seed supply chains in Odisha: A strategic initiative through demonstration of cluster seed villages approach	144
SSFA-31	Anjana Ekka	Towards a Resilient Blue Economy: A Conceptual Framework for Sustainable Development in the Indian Sundarbans	145
SSFA-32	Swagatika Sahu	Seed Production of freshwater prawn in brackishwater pond: An alternative source of income generation in coastal district of Odisha	146
SSFA-33	Maguni Ch. Moharana	Growth and Survival of <i>Puntius gonionotus</i> Fingerlings in Cages at Surada Reservoir, Ganjam district, Odisha	147

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

SSFA-34	Pritam Tripathy	Exploring Determinants of Empowerment among Women SHG Members in Aquaculture: Evidence from Rural Southern Odisha, India	148
SSFA-35	Piyashi DebRoy	Drivers of Supply-Side Dynamics in Wetland Fisheries of Gangetic Floodplains: Exploring the Social Aspects	149
SSFA-36	S. Gojendro Singh	Transforming tribal livelihoods through integrated farming: a success story from Meghalaya	150
SSFA-37	S. S. Das	Pond based Integrated Farming System-Science for better livelihood	151
SSFA-38	A K Das	Food & Feeding Protocol for Scampi Fisheries Enhancement in Small Reservoirs of Jharkhand	152
SSFA-39	Jitender Kumar Jakhar	Evaluating Causes and Solutions for Fish Wastage in Inland Fisheries: A Case Study from Chhirpani Dam	153
SSFA-40	Pooja Priyadarshini	Inclusivity of Transgender in Fisheries Sector: Call for a paradigm shift in Gender Mainstreaming	154
SSFA-41	Ratul Chakraborty	An insight into the prospects of cage culture management in the Hirakud reservoir	155
Responsible Fisheries & Aquatic Ecosystem Management (RFEM)			
INVT-01	Sukham Munilkumar	Towards Sustainable Fisheries: Ecological Insights and Developmental Strategies for the Sardar Sarovar Reservoir, Maharashtra	157
RFEM-01	Manoj Kumar Tripathy	Assessment of Carlson’s Trophic State Index of Tampara Lake, Odisha	158
RFEM-02	Abhilash W.	Assessing Habitat Disturbance Effects on Fish Community Structure: Patterns in Species Richness, Taxonomic Distinctness, and Functional Diversity in a Tropical Indian River	159
RFEM-03	Absar Alam	Ichthyofaunal biodiversity, fish catch and composition of the River Sutlej: Present status	160
RFEM-04	D. Choudhury	Studies on reproductive biology of Orange fin pony fish, <i>Leiognathus bindus</i> (Valenciennes) along Gopalpur coast, Odisha	161
RFEM-05	Subal Kumar Roul	Navigating Hilsa Sustainability: A Comparative Assessment of Stock Status using Length and Catch-based dual Approaches in the Northwestern Bay of Bengal	162

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

RFEM-06	Sayan Mandal	East Kolkata Wetlands: A natural wonder functioning as the ecological kidney of Kolkata and also supporting livelihood of fishers and farmers	163
RFEM-07	Snehasis Dalal	GIS-Based Monitoring and Management of the East Kolkata Wetlands for Sustainable Aquaculture Practices	164
RFEM-08	Pralaya Ranjan Behera	Species diversity and distribution of seaweeds along the coast of north Andhra Pradesh	165
RFEM-09	Archisman Ray	Intraspecific Morphometric Diversity in Native Gangetic Fish Species using Multivariate and Discriminant Methods	166
RFEM-10	Dibakar Bhakta	Set bag net fishery in the Hooghly-Matlah estuarine system: status, challenges, and pathways to responsible management	167
RFEM-11	Tania Bhowmick	Assessing Long-Term Wetland Transformation through Remote Sensing and GIS: A Case Study of the Panpara Wetland	168
RFEM-12	Absar Alam	Dynamics of Fish Diversity and assemblage in relation to environmental factors in a tropical wetland	169
RFEM-13	Adipta Chakraborty	Optimizing Larval Rearing of <i>Chitala chitala</i> : A Comparative Study on the Growth Performance and Survival by using Live, Mixed, and Formulated Feeds	170
RFEM-14	Ashish Singh	Zooplankton Diversity and Water Quality Assessment: A case study from the upper and middle Ganga River	171
RFEM-15	Chandan Roul	Future Directions in Fisheries Management: An Ecosystem Based Approach	172
RFEM-16	Deependra Singh	Spatio-temporal Dynamics of Fish Guilds and Environmental Influences on Ichthyofaunal Assemblage in the Gandak River, Bihar, India	173
RFEM-17	Poonam Majumder	Guild structure and ecological dynamics of fish assemblage in the Ichamati River, West Bengal, India	174

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

RFEM-18	Sushil Kumar Verma	Fish diversity, ecological factors, conservation and management issues of a non-glacial river upstream of the Ganga basin, India	175
RFEM-19	Rinki Kumari	Potential Impact of Exotic Fish in the River Ganga	176
RFEM-20	Tania Kayal	Mapping of water bodies of Manipur - a north-eastern state of India for sustainable management of water resources	177
RFEM-21	Rayees Ahmad Bhat	Length-weight relationships of eighteen fish species from river Ganga at Prayagraj, India	178
RFEM-22	Bijay Kumar Gupta	River Guardian as Citizen Science Model for Riverine Fisheries Resource Management	179
RFEM-23	Ram Bhajan Verma	Ecological Assessment of Phytoplankton Communities in the River Ramganga: Indicators of River Health	180
RFEM-24	Sanjeev Kumar Sahu	Utilizing Data Science to unravel discovery pattern of Native Indian Freshwater Fish Taxa	181
RFEM-25	Karmveer Singh	Traditional fishing crafts and gears operated in Ganga River along Farakka, West Bengal, India	182
RFEM-26	Ravali Vallangi	Seasonal Variation in Ichthyofaunal Diversity and its Environmental Drivers in two Snow Fed Himalayan Rivers, India	183
RFEM-27	Rinku Besra	Community Structure of the Benthic Macroinvertebrate Fauna of the River Adi Ganga and Its Response to Microplastic Pollution	184
RFEM-28	Sanatan Bera	Assessment of the Correlation Between Reproductive Parameters and Their Efficiency in <i>Tenualosa ilisha</i> (Hamilton, 1822) During the Spawning Season in the Ganga River	185
RFEM-29	Suraj Kumar Chauhan	Impact of environmental factors on the Spatio-temporal distribution of fish community structure in the Kosi River	186
RFEM-30	Susmita Jana	Assessing Fish Diversity in the Adi Ganga River: Ecological Insights from a Degraded Urban Waterway	187
RFEM-31	Santosh Kumar Udgata	Physico-chemical parameters and disease occurrence in some fish farms of Ganjam and Kalahandi districts of Odisha, India	188
RFEM-32	Sandhya K. M	Tackling Ghost Fishing: Assessment of Gear Losses, Fishers' Perceptions, Causes, and Mitigation Strategies	189

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

RFEM-33	Deepa Sudheesan	Exploring fish diversity and fisheries of Pamba River, Kerala	190
RFEM-34	Thankam Theresa Paul	Meenkara reservoir: A platform for blue growth in Kerala	191
RFEM-35	Srikanta Samanta	Present status of water and sediment quality and trace metal contamination aspects of bheries of East Kolkata Wetlands	192
RFEM-36	Pawan Kumar	Otolith Morphometrics as a Tool for Differentiating Two <i>Scomberomorus</i> Species Along the North West Coast of India	193
RFEM-37	Vandana Pal	Assessment of stomach contents of Gangetic Ailia of Ganga River at Prayagraj, Uttar Pradesh, India	194
RFEM-38	Bhukya Bhaskar	Identification of Ecosystem Services of Urban Lake Powai, its contribution in environmental diversity and human well-being in Mumbai, India	195
RFEM-39	Subhasrita Nayak	Physio-metabolic responses of <i>Catla catla</i> (Hamilton,1822) against ammonia toxicity	196
RFEM-40	Roshith C. M	Fish community structure and dynamics across the different estuaries of the Sundarban mangrove ecosystem, India	197
RFEM-41	S. K. Koushlesh	Exploratory survey for assessment of prawn fishery resources in Subarnarekha River, Jharkhand	198
RFEM- 42	Jesna P. K.	Plankton diversity as an indicator of ecosystem health in a medium reservoir in Peninsular India	199
RFEM-43	Simanku Borah	Nutritional profiling of fishes from Sessa river, Brahmaputra basin, Assam	200
RFEM-44	Shubham Kanaujiya	Assessment of optimal fish habitats in keetham lake, agra using geospatial techniques for conservation and sustainable management	201
RFEM-45	Ajay Baldaniya	Responsible management of <i>Carcharhinus falciformis</i> fisheries: A population dynamics approach from North-west coast of India	202
RFEM-46	Anil Kumar Yadav	Modeling Harmful Algal Bloom Dynamics Using Generalized Additive Models: Insights from a Tropical Ramsar Wetland in India	203
RFEM-47	Simanku Borah	Hydrological connectivity is the major determining factor influencing ichthyofaunal diversity in tropical wetland ecosystems	204

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

RFEM-48	Pritijyoti Majhi	Modulating effects of submerged macrophytes on phytoplankton structure and limnological parameters in a tropical floodplain wetland of the Gangetic basin	205
RFEM-49	Shyamal Chandra Sukla Das	Spatio-temporal variability of macrobenthic invertebrates in the middle and lower stretch of the Teesta River, Sikkim	206
RFEM-50	Sibina Mol S	Morphology of the largest otolith in <i>Oreochromis niloticus</i> , <i>Systemus sarana</i> and <i>Mystus vittatus</i>	207
RFEM-51	Kamalesh Panda	Evaluation of Plankton Diversity and Physico-Chemical Characteristics in Selected Reservoirs in Kabirdham District, Chhattisgarh, Central India	208
RFEM-52	V. L. Ramya	Spatial and seasonal patterns of fish diversity and functional traits in a tropical small reservoir in India	209
RFEM-53	Lianthuamluaia	Ecology and fisheries of selected lower Gangetic floodplains wetlands for sustainable fisheries development	210
RFEM-54	S.N. Sethi	Natural Farming practices for Small Indigenous species of fish	211
RFEM-55	Pranab Gogoi	An integrative water quality index and multivariate modeling approach to assess surface water quality, trophic status and nutrient source apportionment in a large tropical reservoir, Hirakud – the longest earthen dam in Asia	212
RFEM-56	Sumanta Dey	Fish assemblage and trophic guild structure of Thane creek, an urban Ramsar site in India	213
RFEM-57	Karankumar K. Ramteke	Geospatial Analysis of Trawl Catch Composition and Spatio-Temporal Distribution of Marine Species off the Mumbai Coast	214
RFEM-58	Thamizhmani	Fishing Effort and Catch Dynamics in Nethravathi Estuary	215
RFEM-59	Ananya Hrishita	Comparative Study of Fish Production in Bay of Bengal vs Indian Ocean	216
RFEM-60	Pradyut Malakar	Interaction of Physicochemical Factors and Plankton Diversity of a floodplain Wetland: A Study in Bijpur Wetland of Ganga River Basin	217
RFEM-61	Siddharth Sankar Das	Comparative Environmental Impact Assessment of cage culture in Maithon and Hirakud Reservoirs: a step towards responsible fisheries and aquatic ecosystem management	218
RFEM-62	Trupti Rani Mohanty	Phytoplankton Community Structure in the Ganga River: Influence of Ecohydrological and Climatic Factors	219
RFEM-63	Adyasha Sahu	Planktonic Diversity Assessment in Manakudy Estuary, Kanyakumari, Tamil Nadu, India	220

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

RFEM-64	Ashpel Mano	Understanding Jellyfish Stings: Insights from Juhu Beach, Mumbai	221
RFEM-65	Thamizhmani	Immersive VR in Fishing Gear Technology for Responsible Fisheries	222
RFEM-66	S. Emiema	Alternative fish baits from seafood processing wastes as an artificial fish bait for longline fishing	223
RFEM-67	Abuthagir Ibrahim. S	Abandoned, Lost, and Discarded Fishing Gear (ALDFG): A Meta-Analysis of Global Trends, Environmental Impact, and Scientific Advancements	224
RFEM-68	Payoja Mohanty	Plastisphere in Aquatic Ecosystems: Microplastic Associated Biofilms as Emerging Threats	225
RFEM-69	Gyanaranjan Dash	Evaluating the Stock Health Status of Three Commercially Important Marine Crabs in Odisha: A Bayesian Approach	226
RFEM-70	Canciya Johnson	Fish Production Variability in the Ganga River Basin: A Multi-State Analysis	227
RFEM-71	Sajina A. M.	Fisheries Development-driven Ecological Degradation and Non-Native Fish Invasions in Newly Created Small Reservoirs: Insights from Bhairavi Reservoir, Jharkhand	228
RFEM-72	Saurav Kumar Nandy	Spatio-Temporal Dynamics of Sediment Composition and Water Quality in the Jalangi River, West Bengal, India	229
RFEM-73	Sarita Kumari Das	Spatial and temporal distribution of plankton Diversity in Madamsilli Reservoir, Chhattisgarh, India	230
RFEM-74	Anil Kumar Yadav	Statistical Modelling of Catfish Landings in a Tropical River System Using SARIMA Models	231
RFEM-75	Swatipriyanka Sen	Sustainable management prospects for <i>Scoliodon laticaudus</i> : stock evaluation in the northern Bay of Bengal	232
RFEM-76	Rajesh Kumar Pradhan	Cephalopod Fisheries of Odisha: Stock Status and Biological Assessment	233
RFEM-77	Jeetendra Kumar	Assessment of seasonal variation of phytoplankton and chlorophyll a in the Sutlej River, India	234
RFEM-78	Jeetendra Kumar	Assessment of seasonal variation of phytoplankton and chlorophyll a in Gomti River, Uttar Pradesh, India	235
RFEM-79	Thakur V. R	Assemblage pattern and community structure of the macrobenthos from Haiderpur wetland of the Ganga basin, India	236
RFEM-80	Vikas Kumar	Spatiotemporal assessment of water quality of the river Sutlej	237
RFEM-81	Vijay Kumar	A study on the Physico-chemical characteristic of River Gomti	238

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

RFEM-82	Rumali Sahoo	Indigenous Fish culture in wastewater fed pond of East Kolkata Wetlands	239
RFEM-83	Thankam Theresa Paul	Structural heterogeneity: A prominent ecosystem vulnerability driver of Malampuzha reservoir, Kerala	240
RFEM-84	Sarita Kumari Das	Evaluation of the Diversity of Ichthyofauna in Madamsilli Reservoir, Chhattisgarh, India	241
RFEM-85	B. K. Bhattacharjya	Fisheries of Brahmaputra River in Assam, India: Emerging issues	242
RFEM-86	Malay Naskar	Threat risk assessment of native Indian freshwater fishes using Machine Learning	243
RFEM-87	Gunjan Karnatak	Mapping Fisheries and Ecological Parameters in Beledanga Wetland Using GIS Tools	244
RFEM-88	Bigan Kumar Sahoo	A Comprehensive Overview of the Seasonal Dynamics and Environmental Influences on Fish Diversity in the Downstream of the Narmada River Basin, Gujarat, India	245
RFEM-89	Niti Sharma	Distribution pattern of ichthyofaunal diversity and its conservation status in major rivers of Himalayan state Sikkim, India	246
RFEM-90	Ravali Vallangi	Reproductive Biology of Four Species of Torpedinoid Electric Rays (Pisces: Torpediniformes) from Indian waters	247
RFEM-91	Malay Naskar	A Web application software for assessment of native Indian freshwater fishes and their conservation status	248
RFEM-92	Adithyan A. R.	MeenMozhi: Breaking Language Barriers in Fish Identification Through a Smart Vernacular Name-Based Android Application	249
RFEM-93	Ratul Chakraborty	A study on the plankton assemblage pattern of Hirakud reservoir	250
RFEM-94	Nabakishor Sial	Population parameters of <i>Mugil cephalus</i> in Jatadhari river, Jagatsinghpur district, Odisha	251
RFEM-95	Sandeep Kumar Mishra	Assessment of the mass bathing event impact on the water quality of the river Ganga at Prayagraj, during Magh Mela 2021- 2024	252
RFEM-96	Manas H. M.	Sex Ratio, Gonadal Development and Reproductive Characteristics of <i>Ariomma indica</i> (Day, 1871) in the Trawl Bycatch from Visakhapatnam	253
POST-HARVEST PROCESSING, VALUE ADDITION & FOOD SAFETY (PPAS)			
PPAS-01	Shivbhajan, Bahni Dhar	Sustainable valorization of Catla (<i>Catla catla</i>) visceral waste for peptone production and application as a potential ingredient in culture media	255
PPAS-02	Diwakar kumar	Enhancing Shelf Life of Croaker Fillets Using Roselle Calyces Extract: A Natural	256

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

		Preservation Approach	
PPAS-03	Sayani Roy	Licorice Root Extract (<i>Glycyrrhiza glabra L</i>): A natural solution for prolonging shelf life of frozen fish croquette	257
PPAS-04	Bipul Kakati	Studies on quality parameters and microbial diversity of Shidal - A traditional fermented fish products of Northeast India	258
PPAS-05	Jai Bansal	Enhancing nutritional profile of chapati through Pangas fish powder supplementation: Influence on physicochemical quality, dough rheology and acceptability	259
PPAS-06	Ankita Kataria	Nutritional value and acceptability of balls incorporated with shrimp protein isolate powder extracted from (<i>Litopenaeus vannamei</i>) head waste	260
PPAS-07	Barsha Baisakhia	Harvesting the Unharvested: Converting Shrimp Shell Waste into Nano-biomaterials for Sustainable Aquaculture, Antimicrobial Defense, and Post-Harvest Preservation	261
PPAS-08	Soibam Ngasotter	From shrimp shell waste to sustainable packaging: Chitosan–nanochitin composite films for eco-friendly food applications	262
PPAS-09	Parmeet Kaur	Valorization of shrimp shell waste into chito-oligosaccharides: a potential functional component for food industry applications	263
PPAS-10	Viji P.	Development of a health drink from bio-fermented <i>Nannochloropsis gaditana</i> : Advancing microalgae-based human nutrition	264
PPAS-11	B. Sivarama	Production and Antioxidant Profiling of Bioactive Peptides Derived from Squid Proteins	265
PPAS-12	Rupali Das	Effect of Chitosan and Spice Addition on the Quality and Shelf Life of <i>Sous-vide</i> Processed Ready-to-Serve Shrimp under Storage Conditions	266
PPAS-13	Abhinanda Jena	Valorization of Fish Scales through Extraction and Characterisation of Gelatin and its Hydrolysate	267
PPAS-14	Bhagaban Barik	Evaluation of fish silage as a replacement to fish soluble in the diet of Amur carp (<i>Cyprinus carpio hematopterus</i>)	268
PPAS-15	Vijay Kumar Reddy Surasani	Development of Rohu fish mince-based paneer-like product with enhanced whiteness, texture and sensory acceptability	269
PPAS-16	Geetanjali Jena	Development of Ready to Cook Fish Fingers from Croaker (<i>Johnius dussumieri</i>) and its Frozen Storage study	270
PPAS-17	Geetanjali Jena	Study on the Development and Frozen Stability of Ready to Cook Fish Fingers	271

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

		from Grass carp (<i>Ctenopharyngodon idella</i>)	
PPAS-18	S. Emiema	Alternative Fish Baits from Seafood Processing Wastes as an Artificial Fish Bait for Longline Fishing	272
PPAS-19	Bikash Kumar Pati	3D Food Printing from Design to Dish: A Novel Approach for Customizing Fish-Based Products	273
PPAS-20	Baishnaba Charan Ratha	Impact of Including Small Fish Powder in Children's Diet Plans: A potential strategy for alleviating Assam's Dual Burden Malnutrition	274
PPAS-21	Sushree Ratnamanjari Senapati	Distribution of Key Melanin-Inducing Compounds (MICs) in Post-Harvest Melanosis of White Leg Shrimp (<i>Litopenaeus vannamei</i>)	275
PPAS-22	Debayan Rana	Evaluation of fish silage for replacement of fish meal in the diet of Magur (<i>Clarias batrachus</i>)	276
PPAS-23	Siddhnath	Effect of shrimp shell chitosan spray on microbiological and sensory quality of pangas fillets during refrigerated storage	277
PPAS-24	Shanmugam Sundhar	Safety evaluation and risk assessment of edible seaweeds of Gulf of Mannar for Micropollutants	278
PPAS-25	Layana P	Extraction, purification and utilization of <i>Pangasius</i> visceral oil for functional fish product development	279
Aquafeed technology & Nutrigenomics applications (ATNA)			
ATNA-01	Manoj Kumar Tripathy	Assessment of growth pattern with probiotic-supplemented diet in <i>Carassius auratus</i>	281
ATNA-02	S. S. Das	Assessment of different wet feeds on growth parameters and economics of mud crab <i>Scylla serrata</i> during fattening in field condition	282
ATNA-03	D. Choudhury	Ameliorated linseed oil cake through solid state fermentation as improved feed ingredients in rohu fingerlings	283
ATNA-04	Ranjana Damle	Effect of dietary supplementation of vitamin-c and spirulina (<i>Arthrospira platensis</i>) on growth performance and haematology of rohu, <i>Labeo rohita</i> (Hamilton, 1822)	284
ATNA-05	Chandan Kumar Sahoo	Tulsi Mediated Immunostimulation in Fish: A Promising Approach for Aquaculture	285
ATNA-06	Dikshya Mohanty	From Genes to Feed: Nutrigenomics for Sustainable Fish Production	286

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ATNA-07	Satabdi Ganguly	Nutritional composition of thirteen commercially important fishes from the river Damodar, a major tributary of river Ganga	287
ATNA-08	Pallath Muhammed Nuzaiba	Dietary Supplementation of Folic Acid Enhanced Vitellogenesis in Soybean Meal-Fed Female <i>Cyprinus carpio</i>	288
ATNA-09	Satabdi Saibalini	Determination of Optimum Dietary Protein and Lipid level of Stinging Catfish, <i>Heteropneustes fossilis</i> fingerling	289
ATNA-10	D.K. Meena	Investigating the Effects of Terminalia Arjuna Extracts on Growth, Immunity, and Disease Resistance in <i>Labeo Rohita</i>	290
ATNA-11	Vijayakumar Sidramappa Mannur	Effect of dietary phytase on phosphorous excretion and growth performance of GIFT juveniles reared in Recirculatory Aquaculture System	291
ATNA-12	Khusbu Samal	Dietary Melatonin Boosts Reproduction and Growth Performance of Ornamental Fish Giant Danio (<i>Devario aequipinnatus</i>): A Transformative Approach for Scrapping Wild-Caught Fish Business	292
ATNA-13	Neha Swain	Growth, antioxidant enzyme and immunological responses of <i>Pangasianodon hypophthalmus</i> Juveniles fed on diets supplemented with microalgae (<i>Nannochloropsis oceanica</i>)	293
ATNA-14	Priyanka Acharya	Recycling Agro-Waste in AQUAFEED: Growth Performance of Fish Fed Diets Containing Banana Peel Powder	294
ATNA-15	Swagatika Sahu	Study on performance of growth promoter for fry production in nursery pond of Balasore district	295
ATNA-16	K.A. Martin Xavier	Microplastic contamination pattern in dried seafood through environmental sources: Need for managerial action in coastal regions	296
ATNA-17	Shreya Roy	Impact of Bisphenol A on Physiological Responses in the Freshwater Bivalve, <i>Parreysia corrugata</i> (O. F. Müller, 1774)	297
ATNA-18	Manoj Kumar Tripathy	Influence of probiotic on the relative condition factor and relative growth co-efficient of <i>Carassius auratus</i>	298

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ATNA-19	Swapna Behera	Evaluation of Growth Performance, Survivability and Biomass Production of Amur Carp <i>Cyprinus carpio haematopterus</i> Fingerlings in Cages in Sorada Reservoir, Odisha	299
ATNA-20	Topsy Rojalin Mohanta	Fatty Acid Profiling of Selected Fish Species of Genus <i>Mystus</i> Collected from Manika Oxbow Lake, Bihar	300
ATNA-21	Jham Lal	Effects of fish waste silage and vitamin C supplementation diet on growth and haematological parameters of Nile tilapia, <i>Oreochromis niloticus</i> (Linnaeus, 1758) fingerlings	301
ATNA-22	Sushanta Kumar Patra	Efficiency of seaweed in reduction of methane emission: a global prospective	302
ATNA-23	Md Shadab Alam	Effect of Fermented Lemna (<i>Lemna minor</i>) Powder on Growth, Survival and Immune Response of <i>Oreochromis niloticus</i> Fry Against <i>Streptococcus agalactiae</i>	303
ATNA-24	Puneet Kumar Patel	Optimizing Nursery Nutrition: The Role of Moringa Leaf Meal in Enhancing Rohu Fry Growth and Survival	304
ATNA-25	Karuppannan Iswarya	Adaptive responses of <i>Salmonella Montevideo</i> to pH and temperature variations in shrimp culture systems linked to antibiotic resistance emergence	305
ATNA-26	S. Ferosekhan	Smart Pond Feeder: An IoT-Enabled Solar-Powered Feeding System for Sustainable Aquaculture	306
ATNA-27	Arghya Kunui	Transport Stress in Hilsa (<i>Tenualosa ilisha</i>); Evaluating Haematological and Biochemical Responses Under Different Transport Conditions	307
ATNA-28	Madhulika	Unlocking the Multifaceted Benefits of Prebiotics: Enhancing Growth, Gut Health and Immune Resilience in <i>Labeo rohita</i>	308
ATNA-29	Saiprasad Bhusare	Differential Responses to Insect Meal in Growth and Reproduction of Wild and Selectively bred <i>Clarias magur</i>	309

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ATNA-30	Neeraj Kumar	Unravelling Stress Response Mechanisms to Arsenic, Ammonia, and High Temperature in <i>Pangasianodon hypophthalmus</i>	310
ATNA-31	Priyanka Acharya	Amelioration of Anti-Nutritional Factors of Moringa Leaves Using Microbial Fermentation for utilization as a fish Feed Ingredient	311
ATNA-32	Simon Sandey	Dietary Inclusion of Black Soldier Fly Larval Protein Concentrate in <i>Penaeus vannamei</i> Juvenile Feeds: Effects on Growth and Immunity	312
ATNA-33	Rahul Das	Evaluation of the nutraceutical value of tasar pupae meal, displaying its potential for animal diet	313
ATNA-34	Brundaban Sahu	Determination of optimum protein requirement of Amur carp (<i>Cyprinus carpio haematopterus</i>) in biofloc culture system	314
ATNA-35	Paramesh Prasad Lenka	Effect of Shrimp Head Meal as a Feed Attractant on Feed Intake and Growth of GIFT tilapia (<i>Oreochromis niloticus</i>)	315
ATNA-36	T Sarmista Patro	Evaluation of oxytetracycline medicated diets against <i>Aeromonas veronii</i> infection in <i>Labeo rohita</i> fingerlings	316
Emerging Trends in Fish Genetics & Biotechnology (ETGB)			
ETGB-01	Praveen Maurye	Innovative spherical-shaped gel electrophoresis apparatuses for scientific demonstrations to high school students	318
ETGB-02	Ayushman Gadnayak	Metagenomic analysis of riverine microbiomes to monitor fish health	319
ETGB-03	Biswajit Mandal	Molecular traces of invasion: eDNA-based high-resolution mapping of Nile tilapia (<i>Oreochromis niloticus</i>) across eastern India's freshwater habitats	320
ETGB-04	V. L. Ramya	Genetic and morphometric structuring of <i>Mystus cavasius</i> populations across Indian river systems	321
ETGB-05	Sthitaprangya Chand	Identification of Quantitative Trait Loci in <i>Machrobrachium rosenbergii</i> : An essential genomics resource for genetic improvements of economic traits	322
ETGB-06	Gresha Armstrong	Fishonix - NextGEN Longlining	323
ETGB-07	Tanuja Abdulla	Microbial Community-Based Index of Biotic Integrity (MC-IBI) –an assessment tool in aquatic environment management	324
ETGB-8	Ramesh Chandra Malick	Detection and Molecular Characterization of <i>Isoparorchis hypselobagri</i> in Wild-Caught <i>Sperata seenghala</i> from Hirakud Reservoir	325

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ETGB-9	Tadasa Priyadarshini	Genetic Diversity of <i>Systemus sarana</i> in Different River Systems of India	326
ETGB-10	S.K. Udgata	Molecular Diagnostics and Epidemiology of Shrimp Diseases in Ganjam District of Odisha	327
ETGB-11	Khuntia Murmu	Genetic Improvement Program of Carps in India: An Update	328
ETGB-12	Janmejay Parhi	Transcriptome Insights into Key Genes Regulating Lipid metabolism and Meat Quality in <i>Systemus sarana</i>	329
ETGB-13	Suvra Roy	Dynamics of antibiotic resistance, heavy metal tolerance, bioremediation, and plastic degradation in the microbiome of constructed wetlands	330
ETGB-14	Sumit Mallick	Characterisation and Expression of <i>IGFBP-1</i> in <i>Labeo rohita</i> (Hamilton, 1822) under Iron Induced Stress	331
ETGB-15	Manu Jena	Development of a High-Resolution Multiplex SSR Panel for Genetic Characterization of Indian White Shrimp (<i>Penaeus indicus</i>)	332
ETGB-16	Praveen Maurye	A semi-automated kit with improved solution exchange mechanisms for an efficient acid-soluble collagen extraction method	333
ETGB-17	Jampana Nandini	Advances in fish genetics and cell- based fish meat	334
ETGB-18	Ravali Vallangi	Species Identification and Genetic Diversity of Electric Rays (Pisces: Torpediniformes) from Indian waters	335
Young Fisheries Talent Award (YFTA)			
YFTA-1	Ajmi Sabu	Lustre Tiles from Mussel Shell	337
YFTA-2	Athulya Babu	Instant Seaweed Soup Capsule	338
YFTA-3	Anshuman Routray	AquaZen Transit Tech	339
YFTA-4	Omm Anubhab Mohanty	Herb-Enhanced Canned Tilapia: Boosting Shelf Life, Flavor, and Nutrition	340
YFTA-5	Subhalaxmi Pradhan	Resource Optimization through Pond-Based Multiple Integrated Farming System (PMIFS)	341
YFTA-6	Manasa Manaswini Devi	Preparation of frozen fish cutlet using freshwater fish surimi	342
YFTA-7	Bibhas Ranjan Das	पञ्चसौधि मत्स्याहारः” (PañchasaudhiMatsyāhārah)- Leaf to Life: Herbal Fish Nutrition	343
YFTA-8	Muni Soham Bhuyan	IchiBItes– From Tide to Table	344
YFTA-9	Abhilash Jena	AQUA-VERMIN-CORE: Hidden Alchemy of Fish Waste	345
YFTA-10	Anshuman Jha	Fish scales to green energy transformation	346
YFTA-11	Kensina Borang	Beyond the Target: Advancing Gear Selectivity and Bycatch Mitigation for Responsible Fisheries	347

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

YFTA-12	P. Sharma	Guiding Turtles to Safety: LED Light-Based Bycatch Reduction in Trawlers	348
YFTA-13	Adyasha Maharana	Re-inventing Cigarettes from whole marine Seaweed"	349
YFTA-14	Manasa Manaswini Devi	Umami Tide Dumplings	350
YFTA-15	Aniket Swain	FIN-E-FEAST – A FISH BASED PROTEIN BAR	351
YFTA-16	Aleena Joji	Automated Water Quality Management System	352
YFTA-17	Raushan Kumar	AquaBioenergy: Remodeling Fish Waste into Energy	353
YFTA-18	Juhi Bharti	EcoFlame: Innovation in Light, Responsibility in Life	354
YFTA-19	Vachas Vadini Mani	BoneBeads: Turning Fish Bones Into BioCeramic Balls	355
YFTA-20	Shweta Suman	BioShield: Tempered glass rooted in fish waste	356
YFTA-21	Krishnaveni K B	Kadukka360: “From Seed to Sale – All in One Shell”	357
YFTA-22	Nandana S Nair	Integrated Solar Mussel Shell Processing Unit	358
YFTA-23	Harshavardhanan T. S.	Aqua guide: Digitalizing Fisheries Extension through Mobile-Enabled Service Delivery and Real-Time Support	359
YFTA-24	Sushree Monali Priyadarshini	Low Fat Cutlet	360
YFTA-25	Aradhana Kumari	Weed to Wonder: Transforming Invasive Weeds into Sustainable Art	361
YFTA-26	Kensina Borang	AquaSwasthya – A Low-Cost, Offline Water Quality Monitoring Device for Small Aquaculture Farms	362
YFTA-27	Sudhanshu Kumar	Matsya Sanrakshak – A demand based Automatic feeder	363
YFTA-28	Eldho Saji	Convolutional Neural Network (CNN) for intelligent disease detection in Aquaculture	364
YFTA-29	Bishal Mandal	Aqua V-Cell: Turning Seafood Waste into Eco-Friendly Batteries	365
YFTA-30	Subhalaxmi Pradhan	Enclosure based IMTA in Reservoir: A natural way to balance ecosystem	366
Precision Farming, ICT, Sensors, GIS, Robotics in Fisheries (ICT)			
ICT-01	Swarup Dasgupta	Development of low-cost water flow meter with GPS module	368

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

ICT-02	Chayna Jana	Drone based imaging for estimation of macrophyte coverage in inland open waters	369
ICT-03	Basanta Kumar Das	IoT system for real-time monitoring and management of Dissolved Oxygen in culture fishery	370
ICT-04	Aryasnata Roy	Integrating Drone Technology in Inland Fisheries: Innovations in Fish Health Management	371
ICT-05	Nirnoy Haldar	User-friendly Mobile App for real-time DO monitoring for Aquatic Ecosystem Management	372
SSFA-42	Nishant Kumar	Potential Acceptance of Bone Char for Heavy Metal Removal in Aquaculture Using the Technology Acceptance Model Among Fisheries Professionals	373
ECAA-62	C.K. Mishra	Captive Breeding and Larval Rearing of Moustached Danio (<i>Danio dangila</i>) – A Successful Initiative Towards Propagation of Economically Important Indigenous Ornamental Fish	374
ECAA-63	C.K. Mishra	IoT-Enabled Smart Feeders for Precision Feeding in Recirculating Aquaculture Systems and Aquariums: Innovations from ICAR-CIFA	375

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

Sub-Theme - I
Eco-Conscious & Climate-Adaptive Aquaculture
(ECAA)

Comparative study on growth performance of Indian major carp and exotic carp in aquaponics systems with cucumber plants

Venkatesh K, Manoj Kumar Tripathy*, Santosh Kumar Udgata, Brundaban Sahu, Sushanta Kumar Patra, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

A 120-day experimental study was conducted to reveal the best species combination of indigenous carps (*Catla catla*, *Labeo rohita*) and exotic carps (*Cyprinus carpio*, *Ctenopharyngodon idella*) with the cucumber plant (*Cucumis sativus*) in an aquaponic system. The species composition in different treatments were rohu + catla, rohu + common carp and grass carp + common carp in a 70:30 ratio @ 2000 g/m³ integrating cucumber plantlets @ 32/m² in T1, T2 and T3, respectively. The control in each treatment consisted of the same species composition but without plants. The fish growth parameters revealed that highest body weight gain was in catla in the T1 (89.76±0.20g) followed by common carp in T3 (85.43±0.06 g) and grass carp in the T3 (81.76±0.41g) and the lowest in the rohu in T2 (66.03±0.29g). The plant parameters, such as height gain (cm), percentage height gain, plant growth rate (cm/day), and yield (kg/m²), were observed, and no significant variation between treatments and controls was found. Among treatments, the highest yield of fruit was observed in T3 (2580±19.3 g), followed by T1 (1782.4±14.6 g) and T2 (1082.2±15.4 g). The BCR during the economic analysis was found to be highest in T3 (1.62), followed by T1 (1.57) and T2 (1.11). From the experiment it was concluded that in an aquaponic system with grass carp with common carp, 2000 g/m³ in combination with cucumber at 32 plants/m² will be economically viable for farming practices.

Keywords: Aquaponic, indigenous carp, exotic carp, *Cucumis sativus*, BCR

Evaluation of carp mola polyculture in seasonal pond

Reshmarani Mohanty, Manoj Kumar Tripathy*, Santosh Kumar Udgata, Brundaban Sahu, Sushanta Kumar Patra, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

An experiment was conducted on the polyculture of mola with carps to evaluate the production of carp-mola polyculture in seasonal ponds. Ten earthen ponds of 1ac in size were taken for the experiment. 3 treatments with three replicates for each kind were tried. The ponds of treatments 1, 2 and 3 were stocked with carp fingerlings at the rate of 4000 no./ac in the ratio 40:30:30 of catla, rohu and common carp. Mola were stocked at different stocking densities, i.e., 7500 no./ac, 10000 no./ac and 12500 no./ac in 1, 2 and 3 treatment ponds, respectively. One control pond is taken which contains only carps at 4000 no./ac. The fish production in all treatments was not significantly different. A comparatively higher yield was obtained in the control pond (without mola); however, carp with the lowest density of mola were recommended from a nutritional and production point of view.

Keywords: Carp, Mola, Polyculture, Seasonal Ponds

Smart aquaculture technology for enhancing aquaculture productivity

Subhashree Dash, Manoj Kumar Tripathy*, Santosh Kumar Udgata, Brundaban Sahu, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena and Md. Shadab Alam

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

Smart fish farming systems show how complicated science and technology may be made simple to use in aquaculture systems while remaining sustainable. Maintaining an ecological environment with good water quality is of utmost importance for survival, growth and all other living activities of captive stocks of fish and to ensure high production efficiency in aquaculture. Industrialisation is associated with the introduction of technology since many parameters need to be controlled in modern-day aquaculture systems. These operations require sophisticated tools and specially designed facilities evolved through intensive research and a great deal of innovation. Semisubmersible cages, autonomous time-controlled feeders, and water recirculation and purification systems, for example, necessitate specialised technology applications based on good scientific understanding. These technologies have provided a supporting basis for advancing the aquaculture systems to the next higher level, which is the application of artificial intelligence and computers for a greater degree of automation, effective management, and decision-making. Smart aquaculture can not only monitor, anticipate, warn, and manage the physical and chemical components in the aquaculture environment in real time, but it can also monitor the fish's traits and behaviours in real time.

Keywords: Smart aquaculture, artificial intelligence, innovative technology

Productivity assessment of genetically improved farmed tilapia (*Oreochromis niloticus*) and spinach (*Spinacia oleracea*) with varied stocking densities in an aquaponic system

Subhashree Dash, Manoj Kumar Tripathy*, Sushanta Kumar Patra, Santosh Kumar Udgata, Brundaban Sahu, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam and Gyanendra Kumar Naik

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

A 60-day experiment was conducted to examine the growth performance of genetically improved farmed tilapia (*Oreochromis niloticus*) and spinach (*Spinacia oleracea*) with varied stocking densities in an aquaponic system to evaluate the growth performance, the best stocking density and the economics of both plant and animal. The plantlets were planted in the hydroponic beds at 40 plants/m², and fish were stocked at 100/m³, 200/m³, and 300/m³ as T1, T2, and T3, respectively, in triplicate. The growth performance was found to be greater in T1, followed by T2, and least in T3. The total yield of the fish was found to be larger in T2 (608.38 ± 5.5 g), followed by T3 (598.78 ± 5.9 g) and least in T1 (363.96 ± 4.3 g). Growth performances of plants, viz., plant length (cm), plant growth rate (cm/day), and yield (kg/m²), were recorded. The trial revealed that T2 has the highest values of all the plant growth parameters, followed by T3 and T1. The total yield of the spinach was found to be higher in T2 (808.05 ± 8.1 g), followed by T3 (740.7 ± 9.7 g) and least in T1 (353.3 ± 7.7 g). Economic analysis revealed that T2 had the highest benefit-cost ratio (BCR) (1.84), followed by T3 (1.59), while T1 had the lowest (1.37). This could be because of the higher stocking density and survivability of fish, which contribute to higher plant and fish yields. It was concluded that an aquaponic system will be more profitable with 200 GIFT/m³ and plants at 40 plants/m².

Keywords: GIFT (*Oreochromis niloticus*), aquaponic system, spinach, stocking density, BCR

Comparative growth performance of Amur carp (*Cyprinus carpio haematopterus*) under the aquaponic system with water spinach (*Ipomoea aquatica*)

Ritesh Kumar Padhi, Manoj Kumar Tripathy*, Santosh Kumar Udgata, Brundaban Sahu, Sushanta Kumar Patra, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India
*mtripathy.ouat@gmail.com

A 90-day trial was carried out to compare the growth performance of Amur carp (*Cyprinus carpio haematopterus*) under the aquaponics system with water spinach (*Ipomoea aquatica*). Comparative growth performance was done based on the growth rate and yield as well as the economic efficiency of the system. In the present study, fishes were stocked with four different stocking densities, including control, i.e., 100/m³, 200/m³ and 300/m³ as T1, T2 and T3, respectively, in triplicates with water spinach as a plant component in hydroponic beds at 40 plants/m². In control (T0), Amur carp fishes were stocked @ 100 /m³ with triplicates, where no aquaponics was done. Among various growth parameters of fish, weight gain, weight gain percentage, and specific growth rate were observed to be higher in T1, followed by T2, T0, and least in T3. The result showed that with an increase in stocking density up to 300/m³, the survival rate also decreases as that increases in lower stocking densities. Hence, the yield of the fish was found to be higher in T3. Growth parameters of water spinach (*Ipomoea aquatica*). Such as plant length, plant length gain, percentage length gain, leaf length, plant growth rate and yield during the experimental period were recorded. All these plant growth parameters during the first crop cycle of the experimental period were found to be higher in T3, followed by T2, T0, and the least in T1. Economic evaluation of the study showed a higher benefit-cost ratio in T3 (2.22), where Amur carp were stocked at 300/m³ with spinach at 40/m², followed by T2 (2.08), T1 (1.36) and T0 (1.35), which may be due to the higher stocking density of fish, which helps in the yield of both fish and plants. Hence, it can be suggested that an aquaponics system with 300 fish/m³ in combination with water spinach at 40/m² is economically viable for farming practices.

Keywords: Amur carp, aquaponics system, water spinach, stocking density, BCR.

Optimisation of stocking density and its effects on climbing perch (*Anabas testudineus*) cum spinach (*Spinacia oleracea*)-based aquaponic systems

Chinmayee Subhasmita, Manoj Kumar Tripathy*, Sushanta Kumar Patra, Santosh Kumar Udgata, Brundaban Sahu, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam, Dharitri Choudhury and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

A small-scale aquaponic system has been studied for 60 days to investigate its efficiency in terms of fish and plant growth as well as economic viability using *Anabas testudineus* as the fish component and spinach as the hydroponic component. Fishes were stocked with three different stocking densities, i.e., 200 nos./m³, 300 nos./m³ and 400 nos./m³ as T1, T2 and T3, respectively, in triplicates with spinach as a plant component in hydroponic beds at 40 plants/m². In control (T0), *Anabas testudineus* (koi fishes) were stocked at 200 nos./m³ with triplicates, where no aquaponics was done. Among various growth parameters of fish, weight gain, weight gain percentage, specific growth rate, daily increment, daily growth index, FER and PER were observed to be higher in T1, followed by T2 and T3, and the least was in T0. The result showed that with an increase in stocking density up to 400 nos./m³, the survival rate also remained the same as that in lower stocking densities. Hence, the yield of the fish was found to be higher in T3. Growth parameters of spinach (*Spinacia oleracea*) such as plant height, height gain, percentage height gain, leaf length, leaf width, plant growth rate and yield during the experimental period were recorded higher in T3, followed by T2 and T1. Throughout the culture period, in the experiment, the highest growth of spinach was recorded in the highest fish density, and this may be due to the availability of more fish waste and nutrients accumulated in the system for plants with higher stocking densities of fish. Economic evaluation of the study showed a higher benefit-cost ratio in T3 (1.53), where koi were stocked at 400/m³ with spinach at 40/m², followed by T2 (1.49) and T1 (1.14), which may be due to the higher stocking density of fish, which helps in the yield of both fish and plants. Hence, it can be suggested that an aquaponic system with 400 nos. of koi/m³ in combination with spinach at 40/m² is economically viable for farming practices.

Keywords: *Anabas testudineus*, aquaponic system, *Spinacia oleracea*, stocking density

Impact of thermal discharge on fish assemblage pattern in tropical river Ganga, India

Aritriya Jana*, Atul Kumar, Basanta Kumar Das, Amiya Kumar Sahoo, Liton Paul, Archisman Ray, Adipta Chakraborty and Naba Kumar Acharjya

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, West Bengal, India.

*jaritriya@gmail.com

Fish communities were evaluated and compared through a field survey in the Ganga River at Farakka, West Bengal, an area impacted by effluent discharge from a thermal power plant (effluent site: T) and at a different unaffected location taken as a control site (C). Monthly assessments of fish and corresponding water quality were conducted from March 2023 to February 2024 to evaluate the influence of thermal pollution on fish assemblage in the River Ganga. The results revealed considerable differences between the impacted and control sites. The effluent site (T) exhibited a significant decrease in fish species richness and diversity compared to the control site (C). Specifically, the site ‘T’ reported only 14 fish species, with a maximum water temperature of $39 \pm 0.5^\circ\text{C}$, while site ‘C’ was documented with 33 species with a temperature of $33 \pm 0.5^\circ\text{C}$. ANOSIM analysis highlighted distinct fish communities at each location. The study underscores that thermal pollution from the power plant effluents significantly alter fish assemblages by modifying their composition and reducing species richness. These findings emphasise the urgent need for continuous monitoring and mitigation of thermal effluent discharge impacts on riverine fish assemblages and the overall aquatic community.

Keywords: Fish assemblage, thermal effluent, Ganga River, SIMPER, ANOSIM

Exploring the role of seaweed culture in the reduction of greenhouse gas emissions in the atmosphere: a nature-based solution for climate change mitigation

Bikram Kumar Sethy*, Nabakishor Sial, Santosh Kumar Udgata, Manoj Kumar Tripathy and Arpit Acharya

College of Fisheries, OUAT, Rangailunda, Berhampur-07

[*bikramkumarsethy78@gmail.com](mailto:bikramkumarsethy78@gmail.com)

To keep the world safe from extreme temperature occurrences, global warming must be kept below 1.50 C. By lowering greenhouse gas (GHG) emissions, seaweed has become a comprehensive natural remedy for global warming. The review assessed seaweed’s contribution to GHG reduction. By absorbing carbon emissions, seaweed can reduce them. Seaweed can also aid in global decarbonisation by reducing ruminant enteric methane (CH₄) emissions and generating bioenergy. Nitrous oxide (N₂O) and other atmospheric trace gases contribute to global warming. A seaweed production of 500 MMT would absorb 10 MMT of nitrogen by 2050. The volatile gas bromoform, which is released by all microalgae, contributes to the atmospheric depletion of ozone (O₃). One element in the chemical makeup of red seaweed is bromoform. Seaweed offsetting is a crucial new tool for creating a more sustainable future, but it is not the sole solution to the climate change issue. This study demonstrates that seaweed cultivation and related sectors are viable solutions for lowering GHG emissions, achieving monetary growth, and creating sustainable means of subsistence.

Keywords: Global warming; greenhouse gases; seaweed.

Comparative evaluation of growth and economic performance of different species in the Biofloc System

S. S. Das*¹, D. Choudhury² and M. K. and Tripathy²

¹Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-761008

²College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-760007

*sidharthasdas@ouat.ac.in

This study looked at how well Vietnam koi, GIFT tilapia, and Singhi fingerlings grew and how much money they made in a biofloc system. The assessment was carried out in individual circular biofloc tanks of 15,000 lt capacity and in triplicate. Each biofloc tank was stocked with 100, 100 and 150 nos/m³ of Vietnam koi, GIFT tilapia and Singhi fingerlings, respectively. A biofloc concentration of 12-15 ml/l was maintained, achieved through the addition of molasses as a carbon supplement and Aqua-Prob as a probiotic source, maintaining a C/N ratio of 15:1. Commercially pelleted feed (crude protein 28%, fat 4%) was provided *ad libitum* during the study period of 140 days. From the growth study it has been found that TO1 (275a±2.45), TO2 (474b±2.62) and FP (215c±2.87) are significantly different in terms of yield. The highest fish yield in TO2 may be recognised due to the higher individual body weight gain (0.394b±1.36) in TO1 in comparison to TO2 (0.118±2.87) and FP (0.232a±2.45). A higher survival rate of 90-95% was obtained in TO1 and TO2, whereas a survivability of 80-84% was observed in FP during harvesting. In contrast, the highest net return of Rs. 48,500 with a B:C ratio of 1.62 was observed in TO2 in comparison to TO1 (Rs. 32,300 and 1.56) and FP (Rs. 24,200 and 1.48). The higher return with the BC ratio is attributed to the higher market price of singhi fish than the others. This provides a better insight into the biofloc system of fish culture and further, the productivity and mortality rate should be checked, and feeding should be according to floc volume.

Keywords: Biofloc, Tilapia, Singhi, Vietnam Koi, growth performance

Embryonic Development and Hatching Success under Varying Water Temperatures

Gargi Sethi*, Santosh Kumar Udgata, Manoj Kumar Tripathy and Arpit Acharya

College of Fisheries Rangeilunda, Berhampur - 07

*sethigargi777@gmail.com

Embryonic development and hatching success in aquatic organisms are significantly influenced by environmental factors, with water temperature being one of the most critical determinants. This study investigates the effects of varying water temperatures on the rate of embryonic development and hatching success across selected fish and amphibian species. Controlled laboratory experiments were conducted at different temperature regimes, ranging from sub-optimal to optimal and supra-optimal conditions. The results revealed that moderate increases in temperature within the species-specific optimal range accelerated embryonic development and reduced the time to hatching. However, exposure to temperatures beyond the optimal threshold led to developmental abnormalities, decreased hatching rates, and increased embryonic mortality. The findings emphasise the importance of maintaining thermal conditions within optimal ranges to ensure successful reproduction and early survival, particularly in the context of global climate change. This research provides insights into temperature-dependent embryogenesis, offering valuable guidance for aquaculture practices and conservation management of temperature-sensitive aquatic species.

Keywords: sub-optimal, optimal, supra-optimal range, optimal threshold, global climate change, temperature-dependent embryogenesis.

Production and economic performance of genetically improved freshwater prawn (CIFA-GI Scampi) under field trial in Ganjam, Odisha

S. S. Das*¹, D. Choudhury² and M. K. Tripathy²

¹Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-761 008

²College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-760007

*sidharthasdas@ouat.ac.in

KVK, Ganjam-II, conducted a Front-Line Demonstration Programme (FLD) on the carp scampi polyculture system in farmers fields from 4 blocks in Ganjam district, *i.e.*, Chikiti, Rangailunda, Chhatrapur and Purusottampur. The demonstration programme was carried out in a 6.0 ha water spread area covering 10 fish farms/farmers. All the farms stocked GI scampi post-larvae obtained from ICAR-CIFA at 15,000 nos./ha, whereas the stocking density of carp was maintained, ranging from 7,500 to 10,000 nos. fingerlings/ha. The stocked GI scampi and carps were fed with floating feed of crude protein 28% and fat 4% at 2-3% of the biomass as a daily ration. The average size at harvest of carp and GI scampi ranged from 740 to 950 g and 75.45 to 96.20 g after 237 to 240 days of culture, with respective average daily growth ranging from 2.7 to 3.2 and 0.27 to 0.32 g/day. However, the survival of GI scampi ranged from 65.3 to 71.6%, while that for carps ranged from 80.4 to 91.8% at harvest. The production of GI scampi ranged from 865 to 1105 kg/ha and that of carps ranged from 3,650 to 4,500 kg/ha after 237-240 days of culture. The cost-benefit ratio was estimated at 1.88 for the carp culture alone to 2.31 for the polyculture of carp-scampi with an increasing net return of 208,000/ha. The promising success of the polyculture of GI scampi not only boosts farmers' income but also contributes to an area expansion of 16.4 ha under carp-scampi culture in the district.

Keywords: Polyculture, CIFA-GI Scampi, growth performance, Ganjam

Stocking density influences economic feasibility & yield in a gift (*Oreochromis niloticus*) and fodder maize (*Zea mays*) based aquaponic system

Bibhuti Bhusan Pradhan, Manoj Kumar Tripathy*, Sushanta Kumar Patra, Santosh Kumar Udgata, Brundaban Sahu, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md Shadab Alam and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

The present study revealed the effective stocking density of fish required for economic feasibility in an aquaponic system. In a 75-day trial, GIFT (*Oreochromis niloticus*) in an aquaponic system was stocked with fodder maize (*Zea mays*) with four different stocking densities, i.e., 100 nos./m³, 200 nos./m³, 300 nos./m³ and 400 nos./m³, with fodder maize as a plant component in hydroponic beds at 400plants/m². In control (T0), fishes were stocked with 100 nos./m³ in triplicates where plants were planted outside with the same density. It was observed that the SGR was highest in T1 and least in T4. The result showed that with an increase in stocking density up to 400 nos./m³, the survival rate decreases due to higher stocking density and high ammonia load in the culture tank. But the total yield of the fish was found to be higher in T3 (1281.93 ± 17.34 g). Growth indices of fodder maize (*Zea mays*) such as plant height, height gain, percentage height gain, plant growth rate and yield were recorded highest in T4 and least in the control (T0), which might be due to the availability of more fish waste and nutrients accumulated in the system for plants with higher stocking densities of fish. Economic evaluation showed the highest benefit-cost ratio (BCR) in T3 (1.77) and the lowest in T4 (1.23), which might be due to the higher stocking density and survivability of fish, which helps in more yield of both fish and plants. Hence, the results clearly indicate that an optimum 300 nos. of GIFT/m³ in combination with fodder maize at 400plants/m² will be economically viable for farming practices in an aquaponic system.

Keywords: GIFT (*Oreochromis niloticus*), aquaponic system, *Zea mays*, stocking density, BCR.

Marine Debris and Its Impact on Physiological Functions in Marine Fishes

Yagnesh B. Motivarash*, Astha Deshmukh and Niranjan Sarang

Department of Fisheries Resource Management, LSPN College of Fisheries, Kawardha

* ya4mos@gmail.com, 8238466742

Marine debris, particularly plastic pollution, is escalating environmental concern with significant implications for marine biodiversity and fisheries sustainability. Fish, being central to marine food webs and human nutrition, are especially susceptible to the physiological disturbances induced by plastic debris. This study examines the effects of marine debris, particularly microplastics and nanoplastics, on various physiological functions in marine fish. Ingestion of plastic particles often leads to gastrointestinal obstruction, reduced nutrient absorption, and gut inflammation. These effects contribute to decreased feeding efficiency, growth retardation, and compromised condition indices. Furthermore, chemical additives leached from plastics and adsorbed pollutants such as PCBs and heavy metals can interfere with endocrine regulation, leading to reproductive dysfunction and developmental anomalies. Respiratory impairment is also reported due to gill damage caused by direct contact or inhalation of suspended microplastic particles. On a cellular level, the presence of microplastics induces oxidative stress, disrupts liver metabolism, and impairs detoxification enzymes. Immune suppression and histopathological alterations in key organs further indicate systemic physiological stress. Behavioural anomalies such as reduced predator response and altered foraging behaviour have also been observed, increasing vulnerability to environmental threats. These physiological impairments not only reduce individual fitness but also pose risks to population stability and ecosystem health. Understanding the mechanisms by which marine debris affects fish physiology is critical for effective marine conservation, pollution control, and public health risk assessment.

Keywords: Marine debris, microplastics, fish physiology, oxidative stress, endocrine disruption

Effect of vermiwash on plankton production and growth performance of *Labeo catla*

Dibakar Gogoi^{1,2*}, Dipak Kumar Sarma², Sangipran Baishya², Kaustubh Bhagawati², Avinash Talukdar² and Sullip Kumar Majhi¹

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati, Assam

²College of Fisheries, AAU, Raha, Nagaon, Assam

[*dibakargogoi45@gmail.com](mailto:dibakargogoi45@gmail.com)

The indiscriminate use of inorganic fertilizers in aquaculture poses serious environmental and health concerns, leading to increased interest in eco-friendly alternatives like vermiwash. This study evaluated the impact of different vermiwash concentrations (5, 10, and 15 ppt) on freshwater plankton productivity over 45 days using 12 FRP tanks, including a control with traditional fertilizer. Plankton sampling at regular intervals revealed 26 genera, with phytoplankton dominated by Bacillariophyceae and Chlorophyceae, and zooplankton by Rotifera, Cladocera, and Copepoda. The highest plankton density was recorded in the 15 ppt treatment (T₃). A follow-up 60-day experiment assessed the effect of this optimal concentration on *Labeo catla* fry growth. Results showed significantly higher specific growth rate (2.12%), weight gain (257.6%), survivability (94.67%), and improved feed conversion ratio (1.04) compared to the control. The study highlights vermiwash as a promising organic input for enhancing plankton productivity and fish growth, promoting sustainable and low-cost aquaculture practices.

Keywords: Vermiwash, Plankton, Organic farming, *Labeo catla*

Evaluation of potential beneficial microorganisms from fish waste compost

Angshuman Saikia*, Inam Akhtar Hussain, Sarifuddin Ahmed, Pranjyoti Sharma, Pradip Chandra Bhuyan, Bipul Kr. Kakati and Anurag Bhuyan

Department of Fish Processing Technology, College of Fisheries, AAU-Raha- 782103

[*angshumansaikia515@gmail.com](mailto:angshumansaikia515@gmail.com)

Research was undertaken to prepare fish waste compost in three distinct methods, with the first treatment consisting of fish waste, sawdust, and sugarcane bagasse in a 2:1:1 ratio, respectively. Similarly, in the second treatment, fish waste, sawdust, and cowdung were used in a 1:1:1 ratio, while the third treatment used fish waste, sugarcane bagasse, and cowdung in a 1:1:2 ratio. The objective of undergoing this study was to eradicate the waste generated every day from fish processing sites into a suitable product that could be used as an organic manure in the future. *Bacillus subtilis* strain FPTCOF: T1, *Priestia megaterium* strain W6, and *Bacillus cereus* strain FPTCOF: T3 were the bacterial isolates discovered from the compost. The IAA activity and phosphorus solubilisation were studied in the identified bacterial isolates from the compost. *P. megaterium* strain W6 demonstrated IAA activity at a concentration of 8.94 µg/ml. The phosphorous solubilisation capability of *B. subtilis* strain FPTCOF: T1, *P. megaterium* strain W6, and *B. cereus* strain FPTCOF: T3 was determined to be 149 ppm, 178 ppm, and 155 ppm, respectively. From the above results, it can be concluded that compost may have a beneficial effect on the growth of plants, which will also help in mitigating the waste generated from the fish processing sectors.

Keywords: Compost, bacterial isolates, mitigation, IAA, phosphorous solubilisation

Sustainable Fingerling Production in Gujarat Reservoirs: A Study on CIFRI HDPE Pen Technology

S. P. Kamble*¹, K. Lohith Kumar¹, J. K. Solanki¹, M. A. Hassan² and B. K. Das²

¹Vadodara Research Station, ICAR-Central Inland Fisheries Research Institute, GERI Campus, Behind Yash Complex, Gotri, Vadodara-390021, Gujarat

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, West Bengal

*suhaskamble149@gmail.com

This study aimed to assess the feasibility of ‘CIFRI HDPE Pen’ technology for fingerling production. The 3-month-long study was conducted by installing two identical CIFRI HDPE pens (0.12 ha), one each in small (Dev dam, Panchmahal) and large (Ukai dam, Tapi) reservoirs of Gujarat. These pens were further divided into two compartments of 0.06 ha, and each compartment was stocked with advanced fry of Catla, *Labeo catla*, and Rohu, *Labeo rohita*, at a combined stocking density of 300,000 advanced fry/ha. The average initial weight of Catla and Rohu was 0.73 and 1.03 g in Dev Dam, whereas it was 1.93 and 2.48 g in Ukai Dam, respectively. Fish fries were fed 8% body weight (BW) with a mixture of rice bran and groundnut oil cake (1:1 ratio). Water quality parameters of both the reservoirs were monitored and found conducive for the growth of carp fingerlings. The growth of Rohu did not differ significantly ($P > 0.05$) between the pens installed at small and large reservoirs; Catla exhibited a significant ($P < 0.05$) difference in growth in terms of final weight in large reservoirs. Survival of catla and rohu was statistically similar ($P > 0.05$) in both reservoirs. The result of the study suggests that the CIFRI HDPE pen can be a promising technology for seed rearing in reservoirs.

Keywords: fingerling production, CIFRI HDPE pen, reservoir, growth, survival

Assessment of nutritional composition and health of fish to anthropogenic stressors in sewage-fed aquaculture systems

Anupam Kumar Sahu^{1*}, Vikash Kumar², Basanta Kumar Das², Santosh Kumar Udgata¹ and Brundaban Sahu¹

¹College of Fisheries Rangeilunda, OUAT, Odisha.

²ICAR-Central Inland Fisheries Research Institute (CIFRI), Barrackpore, 700120, India

*anupamkumarsahu202@gmail.com

Sewage-fed fish aquaculture systems in the East Kolkata Wetlands are a unique example of sustainable resource recovery. However, increasing anthropogenic stressors are still significant hazards to fish productivity and health. The current research aims to assess the nutritional quality and physiological health of one economically important fish species, *Labeo rohita*, reared in sewage-fed fishponds, with reference to environmental stress. The physicochemical characteristics of water and soil were examined to determine the degree of pollution and eutrophication. Analytical results revealed elevated pH, conductivity, and nutrient load, which confirmed higher chemical and organic contamination levels in sewage-fed ponds. Proximate composition analysis showed variation in moisture content, protein, lipid, and ash in fish muscle, reflecting species sensitivity to environmental stress. Quantitative gene expression of the major immunological markers was analysed as a measure of immune status in gill and liver tissues. Expression patterns of innate and adaptive immune-related genes, such as IL-1 β , TNF- α , and IgM, were found to be strongly upregulated in sewage-fed ponds compared to controls, indicating increased immune activation under stress. Histopathological examination of gill, liver, and kidney tissues showed significant tissue changes demonstrating sub-lethal toxicity caused by long-term exposure to pollutants. The nutritional, molecular, and histological analyses provided an overview of fish condition in anthropogenic stress conditions. The information highlights the necessity of monitoring as well as management practices at regular intervals for maintaining fish productivity and food safety in sewage-fed aquaculture systems.

Keywords: Sewage-fed aquaculture, proximate composition, fish immune health, histology

Different methods of hormone delivery for captive maturation and induced breeding of fish

Prem Kumar* and Kedar Nath Mohanta

ICAR-Central Institute of Fisheries Education, Andheri (West), Mumbai,
400 061, India

* prem.cife@gmail.com

Controlled breeding to produce quality seed is a prerequisite for domestication and the development of sustainable aquaculture. Hatchery productions of seed encounter reproductive dysfunction like failure of vitellogenesis, final oocyte maturation, ovulation, and milting in captivity. The common cause of reproductive dysfunction in captivity is captive-induced stress and lack of spawning cues. This reproductive dysfunction can be overcome by domestication, environmental manipulation, and hormonal therapy. The most common medications used to fix reproductive problems are pituitary gland extract (PGE), human chorionic gonadotropin (hCG), GnRH α , and dopamine blockers like domperidone, pimozone, reserpine, or metoclopramide. Aromatase inhibitors (steroidal-exemestane and non-steroidal-fadrozole) are used to improve the milt in male murrel, retaining maleness in protandrous hermaphrodites. Treatment with methyl testosterone (MT) improves milting and milt quality in male mullet and magur. This hormone is also used for mono-sex (male) tilapia production. In addition to injections, other methods for delivering hormones to fish for maturation and induced breeding include cholesterol pellets, cellulose pellets, ethylene vinyl acetate (EVAC), polylactide-glycolide (PLGA), fatty acid dimer sebacic acid (Fad-Sa), microspheres, and osmotic pumps. In conclusion, the hormonal therapy will pave the way to regulate the endocrine disruption in captivity.

Keywords: brain-pituitary axis, final oocyte maturation, neuropeptides, hormone delivery.

Effect of Biofloc Technology on Hatchery Performance of Indian White Shrimp (*Penaeus indicus*) Using Different Carbon Sources

Dinesh Palanisamy, Surya Rengasamy and Akshaya Panigrahi *

ICAR-Central Institute of Brackishwater Aquaculture, Chennai, India – 600 028

*apanigrahi2k@gmail.com

The present study evaluated the hatchery performance of *Penaeus indicus* from the mysis-1 stage to post-larva 10 (PL10) in a zero-water exchange biofloc system. The experiment included three treatments using different carbon sources such as CIBA floc, fructose, lactose, and dextrose at a fixed low C:N ratio, with a stocking density of 100 L⁻¹ with control treatment. Water quality and survival performance were compared among the treatments. The results indicated that the BFT maintained more suitable water quality parameters for *Penaeus indicus* production compared to the control. Analysis of variance showed significant differences among the treatment groups for NO₂⁻-N, NO₃⁻-N, and alkalinity (P<0.05). Survival was significantly higher in the BFT groups compared to the control. Among the treatments, CIBA floc yielded the highest PL1 survival rate at 95.33%, followed by dextrose 91.33%, fructose at 87.67%, and lactose at 82.33%, while the control group exhibited the lowest survival at 75.67% (P>0.05). For PL10 stages, survival rates were CIBA floc (89.67%), dextrose (85.33%), fructose (78%), lactose (73.33%), and control (66.33%) respectively. These findings suggest that CIBA floc and dextrose is the most effective carbon source for enhancing survival and maintaining optimal conditions in a biofloc-based hatchery system for *Penaeus indicus*.

Keywords: *Penaeus indicus*, Biofloc, Carbon source, Survival, Water quality.

Effect of Biofloc Systems on the Growth and Health of Indigenous *Penaeus indicus* and Exotic *Penaeus vannamei* Shrimp Species – Comparative studies

Gopinath Janadevadoss, Akshaya Panigrahi*, Saranya Chakrapani, Modi Kiran Piyushbhai

ICAR_Central Institute of Brackishwater Aquaculture, Chennai, India – 600 028

[*apanigrahi2k@gmail.com](mailto:apanigrahi2k@gmail.com)

The study aimed to evaluate the growth performance and culture efficiency of two shrimp species, *P. indicus* and *P. vannamei*, under different biofloc-based aquaculture systems. The experiment included a Control (without biofloc–C), biofloc with CIBA floc (BFT1), biofloc with mineral mix (BFT2), and biofloc with periphyton and CIBA floc (BFT3). Stocking density was 30/m³ with an initial body weight of 2.9±1.0g in triplicate. The C:N ratio was maintained with respect to feed intake for all treatments. The results revealed comparable growth between the two species, with BFT3 showing the highest weight gain in both *P. indicus* and *P. vannamei*, 18.78 ± 0.25g and 19.63 ± 0.25g respectively, at 90 DOC (n=15). All biofloc treatments, including BFT1, demonstrated significant differences (P<0.05) in growth compared to the control. Similarly, SGR, FCR, and biomass were significantly (P<0.05) higher in biofloc treatments compared to the control. Water quality parameters, such as TAN, nitrite, nitrate, were significantly (P<0.05) lower in biofloc groups compared to the control, revealing the bioremediation of the culture water. Overall, the results indicated that *P. indicus* and *P. vannamei* performed better and comparably, with indigenous shrimp potentially serving as a better alternative to meet cultural demands, thereby boosting the Indian economy and aquaculture.

Keywords: Biofloc system, *P. vannamei*, *P. indicus*, Growth, Water quality

Enhanced Shrimp Culture Performance Using a Customized Biofloc Consortium (CIBAFLOC): A Novel Approach to Sustainable Aquaculture

Saranya Chakrapani*, Akshaya Panigrahi, Naveenkumar Radhakrishnan, J. Syama Dayal, K. Ambasankar, M. Jayanthi

ICAR-Central Institute of Brackishwater Aquaculture, Chennai, India – 600 028

*apanigrahi2k@gmail.com

This study evaluates the effectiveness of a customized biofloc powder (CIBAFLOC), composed of probiotic bacterial strains and carbon sources, in improving water quality, growth, immunity, and gene expression in *Penaeus vannamei* culture. The biofloc starter was formulated using nine probiotic strains (*Bacillus marisflavi* sp., *Bacillus* sp., *Bacillus subtilis* sp., *Virgibacillus* sp., *Bacillus lichiniformis* sp., *Lysinibacillus* sp., *Oceanobacillus* sp., *Bacillus cereus* sp., *Bacillus megaterium* sp., which were scrutinized, cultured, lyophilized, and blended with a carbohydrate mix and vitamin C. CIBAFLOC's ammonia-reducing capacity was first tested without animals by spiking tanks with 2, 5, and 7 ppm ammonia. Following application of fermented CIBAFLOC, TAN levels dropped to zero within six hours at 2 and 5 ppm, while the control showed slower and incomplete reduction. Nitrite and nitrate also declined significantly in treated groups, with T2 achieving the most stable water quality. In subsequent trials, with 2 treatments T1 (1g cibafloc), T2 (1.5g cibafloc), and a control without biofloc. Respected tanks were inoculated with fermented CIBAFLOC and stocked (150/m³; ABW: 0.450±015 g) for 60 days in triplicate. C:N ratio of 15:1 was maintained. CIBAFLOC promoted rapid floc development within five days, increased heterotrophic bacterial counts, and reduced *Vibrio* levels ($p < 0.05$). T2 shrimp showed the best performance: higher average body weight (8.97 ± 1.4 g), survival (84.5%), and reduced FCR ($p < 0.05$). Upon *Vibrio parahaemolyticus* challenge, treated groups had lower cumulative mortality (32.25–40%) than controls (73%) ($p < 0.01$). Gene expression analysis revealed significant upregulation of digestive (trypsin, chymotrypsin) and metabolic (hexokinase, pyruvate kinase) genes, indicating enhanced immune and physiological responses.

Keywords: *P. vannamei*, customized biofloc powder, water quality, challenge study, gene expression

Climate-Driven Reproductive Vulnerability in Freshwater Fishes: A Multi-Approach Assessment

Gunjan Karnatak*, Mishal P., Suman kumari, Lianthuamluaia, U. K. Sarkar, S. Debnath B. D. Ghosh and Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrckpore-700120

*gunjankarnatak87@gmail.com

Freshwater ecosystems faced growing challenges due to human-induced pressures, including unsustainable water extraction, pollutant runoff, and destructive agricultural practices. These threats were further compounded by climate change, which altered key environmental variables critical for aquatic life. Shifts in temperature and precipitation patterns affected the timing and success of fish reproduction, underscoring the need to understand how changing climates influence breeding behaviour and habitat suitability. In this study, ten fish species from riverine and wetland habitats were examined to evaluate their reproductive sensitivity to climatic variations. Novel reproductive indicators were developed to quantify vulnerability. Using Generalized Additive Models (GAM), the study identified species-specific Threshold Gonado-Somatic Index (GSI) values and associated climate preferences such as temperature and rainfall ranges, necessary for initiating successful spawning. The Threshold Condition Factor (Kspawn50) and Pre-spawning Girth (Girthspawn50) were estimated using the Kaplan-Meier method, while climate optima for these metrics were derived using LOESS smoothing techniques. Findings revealed that fluctuations in regional climate conditions had a marked effect on spawning cycles and reproductive output. Some species showed higher resilience by sustaining breeding activity under variable environmental conditions. The newly developed parameters provided a practical approach for monitoring reproductive readiness and could support decision-making, such as setting gear restrictions during peak spawning periods. This integrative framework—linking reproductive biology with climate metrics—enabled the development of a composite Reproductive Vulnerability Index. This index offers a robust tool for identifying both climate-sensitive and climate-resilient species, aiding in the formulation of adaptive conservation and management strategies for inland fisheries in the context of a changing climate.

Keywords: Climate variability, reproductive biology, freshwater fish, vulnerability assessment, inland fisheries, conservation strategies

Effects of fish waste silage and vitamin C supplementation diet on growth and haematological parameters of rohu, *Labeo rohita* (Hamilton, 1822) fingerlings

Harshavarthini M.¹, Dushyant Kumar Damle*¹, Jham Lal¹, Basant Singh¹, Narendra Singh Bhardwaj¹, Gulshan Banjare¹, Jeet Shriwas¹, Kamna Lahre¹, Vivek Kumar Thakur¹ and Ranjana Damle²

¹Late Shri Punaram Nishad College of Fisheries, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh-491 995, India

²Kalinga University, Naya Raipur, Chhattisgarh-492 101, India

*dushyant.damle@dsvckvdurg.ac.in

An experimental trial was conducted for 60 days to evaluate the growth performance and haematological parameters of rohu, *L. rohita*, under different dietary treatments. The study comprised four experimental treatments with three replicates each, along with a control group. We have prepared 4 experimental feeds, such as control (0%), T1 (15%), T2 (30%) and T3 (45%) fish waste silage-containing diets. The nutritional profile of experimental feeds was observed to include crude protein (25-25.75%), lipid (8.46-8.96%), moisture (10.64-11.16%), ash (14.05-14.87%), crude fibre (4.07-4.32), and nitrogen-free extract (35.69-37). The haematological parameters were observed of *L. rohita*, which improved white blood cells, red blood cells, packed cell volume (PCV), haemoglobin (Hb), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) within the healthy physiological range. Growth performance parameters were observed at the end of the experiment. The highest length gain (6.26±0.05), weight gain (9.80±0.10), percentage weight gain (306.25±2.12), specific growth rate (0.67±0.00), protein efficiency ratio (3.59±0.02), hepatosomatic index (0.04±0.00), and intestinal somatic index (0.41±0.00) were observed in the T3 group compared to the other treatment groups. The highest feed conversion ratio (1.41±0.04) was observed in the control group compared to the other treatment groups. Carcass composition of fish such as the highest protein (59.23±0.0057%), lipid (18.13±0.0088%), moisture (8.73±0.011%), and ash (10.95±0.011%) was observed in the treatment T3 group compared to the control group, while the highest Nitrogen Free Extract (6.80±0.011) was observed in the control compared to the other treatment groups. The acceptable levels of water quality parameters were observed during the experiment. The results suggest that 1.5 g fish waste silage enhanced the growth and feed utilization of rohu.

Keywords: Fish, *L. rohita*, fish waste Silage, Haematology, Growth, Carcass composition, Water quality parameters

Studies on growth performance, survival and haematological response of Amrit Catla to varying levels of salinity

Rajashree Jena*¹, Dharitri Choudhury¹, Satyajit Kumar Bhuyan¹, Brundaban Sahu¹, S. S. Das² and Santosh Kumar Udgata¹

¹ College of Fisheries (OUAT), Rangeilunda, Berhampur-7, Odisha, India

² Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-761008

*rajashree25rj@gmail.com

The present study examined the impact of salt on genetically improved *Catla catla*, called as ‘Amrit Catla’, and evaluated its physiological response to resist salinity stress for an experimental period of 45 days. Catla fingerlings were stocked with initial length and weight of 10.52±1.15cm and 10.44±1.34g respectively. Salinity levels of 0, 2, 4, 6, 8, and 10 ppt were tested on genetically improved Catla fingerlings in a laboratory set up to determine its impact on growth and Survival. Zero salinity encouraged higher growth (14.77±0.01g) and specific growth rate (0.77±0.28) and concluded that Catla fingerlings could survive salt levels up to 8 ppt. The survival percentage of fingerlings was 100% upto 8 ppt salinity, whereas 10 ppt salinity showed 75% survivability. The hematological parameters investigation revealed that increase in salt more than 4 ppt influenced blood parameters. Higher Leukocytes count (89.95±0.35) and Glucose (187.12±3.49mg/dl) was found in 10 ppt salinity compared to control whereas Erythrocyte count (25.5±1.9), Haemoglobin (6.9±0.14), MPO (2.59±0.06) and Total protein (3.16±0.07mg/dl) was high in control compared to 10 ppt salinity. Hence culturing selectively bred Catla species in low saline or salt-affected environments with high survivorship presents a promising opportunity for future research and development.

Keywords: Amrit Catla, Salinity, Survival rate, Haematology

Seasonal Dynamics of Phosphorus Fractions in the Sediments of Bhojtal Wetland, Bhopal

Rakesh Kumar¹, Sangeeta Lenka², Simanku Borah¹, Anil Kumar Yadav¹,
Dhruba Jyoti Sarkar³, Sullip Kumar Majhi¹, B. K. Das^{3*}

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre,
Guwahati, Assam, India

²ICAR- Indian Institute of Soil Science, Bhopal, Madhya Pradesh, India

³ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata,
West Bengal, India

*rakeshmund94@gmail.com

Phosphorus (P) fractionation in wetland sediments is critical to understanding nutrient cycling and eutrophication dynamics. This study assesses the seasonal variation of phosphorus fractions in sediment samples collected from nine locations in Bhojtal Wetland, Bhopal during August (monsoon) and October (post-monsoon) 2023. The sediment samples were analyzed for various inorganic and organic phosphorus fractions, including Saloid-P, Al-P, Fe-P, Reductant-soluble P (Red-P), Ca-P, Total Inorganic Phosphorus (Total IP), Total Phosphorus (TP), and Organic Phosphorus (OP). Results showed a marked increase in most phosphorus fractions from August to October, with Al-P rising from an average of 98.18 mg/kg to 116.64 mg/kg, and Fe-P from 384.16 mg/kg to 397.97 mg/kg, indicating potential post-monsoon mineralization and enhanced binding capacity of sediments. Total IP increased from 800.08 mg/kg to 877.51 mg/kg, while TP increased by ~9.3%, suggesting elevated phosphorus retention in the sediment post-monsoon. The Saloid-P and Ca-P pools also showed substantial increases, highlighting the higher availability and precipitation of labile phosphorus under varying hydrological conditions. The OP fraction rose from 178.56 mg/kg to 192.35 mg/kg, reflecting an increase in organic matter deposition and transformation post-monsoon. The highest increases were observed at KB (Karballa) and BF (Betagaon filter) stations, suggesting spatial variability and anthropogenic influence in nutrient loading. The findings emphasize the influence of hydrological seasonality on sediment P dynamics in Bhojtal. Post-monsoon enrichment in phosphorus fractions could enhance internal loading risks, thereby requiring effective management strategies for controlling nutrient input and sustaining wetland health.

Keywords: Bhojtal, sediment phosphorus, monsoon, eutrophication, internal loading, wetland management

Greenhouse gases (GHGs) emission from a highly polluted and a less polluted freshwater wetlands: Understanding the dynamics of GHGs in the era of climate change

Thangjam Nirupada Chanu^{1*}, Basanta Kumar Das¹, Srikanta Samanta¹, Vikas Kumar², Subir Kumar Nag¹, and Bandana Das Ghosh¹

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal – 700 120.

²Prayagraj Centre of ICAR-Central Inland Fisheries Research Institute, 23A, Panna Lal Rd, Prayagraj, Uttar Pradesh – 211 002

*nirupada@gmail.com

Wetlands significantly influence atmospheric greenhouse gas (GHG) concentrations, including methane (CH₄), nitrous oxide (N₂O), and carbon dioxide (CO₂). Although tropical wetlands comprise about 30% of global wetlands, data on their GHG emissions and controlling factors remain limited. The present study measured seasonal fluxes of CH₄, N₂O, and CO₂ using the closed chamber technique in two freshwater wetlands in West Bengal: Bortir (highly polluted) and Kulia Beel (less polluted). Emissions of all three GHGs were substantially higher in the polluted wetland. In Bortir, average fluxes were 6.85 g m⁻² day⁻¹ (CO₂), 537.36 mg m⁻² day⁻¹ (CH₄), and 112.8 μg m⁻² day⁻¹ (N₂O). In Kulia Beel, average fluxes were significantly lower: 0.40 g m⁻² day⁻¹ (CO₂), 60.96 mg m⁻² day⁻¹ (CH₄), and 71.28 μg m⁻² day⁻¹ (N₂O). Additionally, CO₂ and N₂O fluxes from an adjacent upland reference site in the less polluted area were ~6 times higher, indicating complex spatial dynamics. These findings highlight the influence of pollution on GHG emissions and underscore the importance of understanding tropical wetland GHG fluxes for climate change mitigation.

Keywords: Greenhouse Gas Emission, freshwater wetlands, CO₂, CH₄, N₂O

Assessment of trophic Status and Water Quality Index for Fisheries Sustainability in a Tropical Reservoir of India

Sonalika Sahoo*, V. L. Ramya, Jesna P. K., Preetha Panikkar, Sibina Mol S., Vijaykumar M. E. and B.K. Das

ICAR-Central Inland Fishery Research Institute, Regional Station,
Bengaluru, Karnataka-560 089, India

*sonalikaiiss@gmail.com

The Sathanur Reservoir, a key multipurpose water body on the Thenpennai River in Tamil Nadu, India, is facing pollution risks from domestic and industrial discharges. To assess its ecological health and fisheries potential, the trophic state index (TSI) and water quality index (WQI) were evaluated. Sathanur reservoir was found to be eutrophic throughout the study period with the highest TSI (avg) recorded during the monsoon season. The TSI deviation indicated large algal bloom dominance and implies that phosphorus was a limiting nutrient during the study period, except monsoon season. The WQI for freshwater fisheries was calculated based on 15 water quality parameters (pH, Sp. Cond., transparency, DO, TA, TH, TDS, Ca, Mg, nitrate, nitrite, phosphate, chloride, silicate, and temperature) following the Canadian Council for Ministers of Environment guideline. The WQI for monsoon, post-monsoon, summer, and pre-monsoon seasons was found to be in the “Good” category. This favourable WQI indicates that the water quality is within acceptable limits for supporting sustainable fish growth, reproduction, and species diversity. The WQI of Sathanur reservoir highlights its potential for stock enhancement, cage culture, and livelihood-based fisheries, contributing to local economic development. Continued monitoring and catchment management are recommended to preserve the reservoir’s water quality and ecological balance.

Keywords: Water quality index (WQI), Trophic state index (TSI), Tropical reservoir, Fisheries

Characterization of Soil Organic Carbon Pools in a Sewage-fed Wetland of East Kolkata, India

Tanushree Banerjee*, Vikash Kumar, Suvra Roy and B.K. Das

ICAR- Central Inland Fisheries Research Institute, Barrackpore

*bera.tanushree23@gmail.com

Wetlands play a vital role in global carbon cycling, contributing significantly to carbon balance and climate change mitigation. The East Kolkata Wetlands (EKW), among the world’s largest sewage-fed wetland systems, not only support a rich ecosystem but also provide livelihood to thousands of people. This study focused on Sardar Bherry, a polluted section of the EKW, to investigate soil organic carbon (SOC) fractions within the 0–15 cm soil depth. A total of 15 sediment samples were collected from different sites to analyze the distribution of SOC fractions, categorized as very labile, labile, less labile, and non-labile organic carbon. The findings revealed that non-labile carbon constituted the highest proportion (60%), followed by very labile (17%), labile (15%), and less labile (8%) fractions. The lability index (LI) was calculated at 0.87, indicating a predominance of stable organic matter, while the carbon pool index (CPI) stood at 1.59, reflecting enhanced carbon accumulation. These results demonstrate that sewage-fed wetlands such as EKW serve as effective carbon sinks. They play a crucial role in reducing greenhouse gas emissions, enhancing soil structure and fertility, and promoting long-term carbon sequestration. This highlights the ecological and climate-regulating importance of preserving and managing wetland ecosystems.

Keywords: EKW, Sediment, Labile Carbon, Carbon pool index

Effect of selenium on salinity tolerance and disease resistance of *Labeo rohita*

Pujadebi Bera*, Tapas Kumar Ghosh and Surya Kanta Sau
West Bengal University of Animal and Fishery Sciences, Chakgaria, Pancha
sayar, Kolkata-94

*Pujadebi.bera1997@gmail.com

Salinity intrusion in freshwater aquaculture regions, particularly after natural calamities like Aila and Amphan, poses significant challenges to the survival and productivity of freshwater species like *Labeo rohita*. A recent study investigated the role of selenium, individually and in combination with methionine, in enhancing salinity tolerance and disease resistance in *L. rohita* fry. Experimental diets containing selenium (T2), methionine (T1), both (T3), and a control (C) were evaluated in freshwater and saline conditions. The second phase involved salinity exposure and a disease challenge with *Aeromonas hydrophila*, using corresponding diets (T4–T6, Cs). Results revealed that selenium supplementation improved stress tolerance and growth performance under salinity, with the combined diet (T6) showing the least reduction in protein content, enzyme activities, and haematological parameters. Disease resistance was also enhanced, as evidenced by higher haemoglobin and RBC counts in selenium-treated groups. These findings suggest selenium plays a vital role in mitigating salinity-induced stress and enhancing disease resistance in *L. rohita*, offering potential for sustainable brackish water aquaculture.

Keywords: Rohu, Protein, Enzyme, Hematology, Histology

Influence of probiotic on the relative condition factor and relative growth co-efficient of *Carassius auratus*

Manoj Kumar Tripathy*, Santosh Kumar Udgata, Brundaban Sahu, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

The study was designed for a period of 90 days to evaluate the effect of probiotic Aqualact at different levels on relative condition factor and relative growth co-efficient of *Carassius auratus*. The results showed that the relative condition factor (Kn) and relative growth co-efficient (b) in fishes that fed with diets containing probiotic was significantly ($P < 0.05$) higher than control group. Further, the species attained isometric growth and good condition fed with diets containing probiotic @ 0.6% indicating the significant influence of the probiotic.

Keywords: *Carassius auratus*, probiotic, growth co-efficient, relative condition factor

Effect of dietary supplementation of vitamin E on flesh quality parameter of striped catfish, *Pangasianodon hypophthalmus* (Sausage 1878)

Jitender Kumar Jakhar^{ab,*}, A. K. Pal, N. P. Sahu, S. Gupta, G. Venkateswarlu and H. K Vardia

^aFish Nutrition, Biochemistry and Physiology Division, ICAR-Central Institute of Fisheries Education, Versova, Mumbai, 400061, India

^bDepartment of Fish Harvest and Post Harvest Technology, LSPN College of Fisheries, Kawardha 491995,

[*jitender.jakhar@dsvckvdurg.ac.in](mailto:jitender.jakhar@dsvckvdurg.ac.in)

This study was conducted to examine the effect of dietary supplementation of vitamin E on growth performance, body composition and flesh quality parameter of striped catfish, *Pangasianodon hypophthalmus*. Three practical diets were formulated with supplementation of vitamin E (α -tocopherol- T1-100 mg/ Kg diet, T2-200 mg/ Kg diet and T3-300 mg/ Kg diet). In the present study, percentage weight gain, higher SGR and better FCR were found for the treatment T1 and no significant difference ($P>0.05$) was found in FCR among the treatment T2 and T3. The growth performance *P. hypophthalmus* in T2 treatment (200 mg/kg) was not significantly different to treatment T1 but the negative effects by a high dose (300 mg kg⁻¹) of dietary vitamin E have recorded in treatment T3. Dietary level of vitamin E had no significant impact on proximate composition of *Pangasianodon hypophthalmus*. Flesh quality parameters such as fillet colour was significantly ($P<0.05$) influenced by dietary level of vitamin E while fillet texture parameters like firmness, cohesiveness, springiness, and gumminess were not significantly ($P>0.05$) influenced by dietary vitamin E. The present study recommends that 100 mg/ Kg of dietary vitamin E is adequate for better growth and flesh quality of *Pangasianodon hypophthalmus*.

Keywords: *Pangasianodon Hypophthalmus*, Vitamin E, Flesh quality

Optimizing Stocking Density for Nursery Rearing of Amur Carp in a Recirculatory Aquaculture System

M. H. Ramteke¹, B.K. Das¹, H.S. Swain², V. Kumar¹, B.K. Behera³, K.K. Krishnani⁴, S. Samanta¹, A.K. Verma⁵, and A. Upadhyay¹

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700 120

²ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar- 751 002

³National Fisheries Development Board, Hyderabad 500052

⁴ICAR-Indian Institute of Agricultural Biotechnology, Ranchi – 834 010

⁵ICAR-Central Institute of Fisheries Education, Mumbai – 400 061

*mitesh.cife@gmail.com

The study aimed to evaluate the growth performance and survival of Amur carp in different stocking densities in Recirculatory Aquaculture System (RAS) for 90 days of period. Fry of Amur carp (1.26 ± 0.06 g and 3.24 ± 0.24 cm) were stocked in three different densities: 100 fish m^{-3} (SD 100), 200 fish m^{-3} (SD 200), and 300 fish m^{-3} (SD 300), each in triplicate in 5000 L FRP tank. The fish were fed a commercial floating pellet feed (32% CP and 4% CF) twice daily (9:00 and 16:00) at 5 % of their body weight. Water quality parameters were measured at weekly intervals. The results showed that stocking density significantly affected the growth and survival of Amur carp. The lowest density of 100 fish m^{-3} (SD 100) achieved significantly higher ($P < 0.05$) weight gain (21.10 ± 0.79 g), absolute growth rate (0.24 ± 0.01), and specific growth rate (3.20 ± 0.04) compared to the higher densities (SD 200 and SD 300). Better feed utilization and efficiency were observed in the lower density (SD 100), while a poorer survival rate was reported in the highest density (SD 300). The higher biomass reported in SD 200 (2.85 ± 0.17 kg m^{-3}) than the SD 100. Activities of digestive enzymes were reduced, at higher densities. Physiological and biochemical analyses indicated that higher stocking density (SD 300) elevated stress markers and altered the health condition of the fishes. The findings suggest that rearing Amur carp at the density upto 200 fish m^{-3} gives the best balance of growth, survival, feed efficiency, production and health condition in RAS system.

Keywords: Amur carp, RAS, Nursery rearing, stocking density, growth, health

Evaluation of raw and fermented sesame oil cake on growth performance and nutritional composition of Amur carp (*Cyprinus carpio haematopterus*) fingerlings

A. L. Aruna, D. Choudhury*, S. S. Das, B. Sahu, M. K. Tripathy, A. Acharya, S. K. Bhuyan and K. N. Mohanta
College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-760 007

*dharitrichowdhury@ouat.ac.in

A 90-day feeding trial was conducted to evaluate the efficacy of raw and processed sesame oil cake (SOC) on the growth, carcass composition and survivability of Amur carp (*Cyprinus carpio haematopterus*) fingerlings. To reduce the antinutritional factor phytic acid, various processing methods were tested, among which 48-hour solid-state fermentation (SSF) proved most effective, significantly lowering phytic acid content ($0.098 \pm 0.011\%$) and enhancing crude protein ($35.90 \pm 0.06\%$). A total of 210 fingerlings were randomly distributed into seven treatment groups in triplicates and fed isonitrogenous and isocaloric diets: T0 (control), T1–T3 (20%, 40%, 60% replacement of soybean oil cake [SBOC] with raw SOC), and T4–T6 (20%, 40%, 60% replacement with SSF SOC). Significantly higher ($P < 0.05$) crude protein and crude fat content were recorded in the T6 group. Growth performance indicators, including body weight gain ($354.2 \pm 17.8\%$), daily weight gain (0.141 ± 0.002 g/day), and specific growth rate (1.678 ± 0.114), were highest in T6, followed by T5 and T4. Feed utilization parameters such as feed conversion ratio (FCR), protein efficiency ratio (PER), and protein productive value (PPV) were significantly improved in groups fed fermented SOC (T5 and T6) compared to other treatments. The study suggests that replacing 60% of soybean meal with SSF SOC can significantly enhance growth and feed efficiency in Amur carp fingerlings. While fermented SOC showed superior outcomes, inclusion of raw SOC at 20% replacement level also yielded better growth and feed conversion than control and higher raw SOC levels.

Keywords: Amur carp, sesame oil cake, phytic acid, solid state fermentation

Biofloc Technology: A "Green approach" To Boost up Aquaculture Production

Gyanendra Kumar Naik*, Manoj Kumar Tripathy, Santosh Kumar Udgata and Arpit Acharya

College Of Fisheries, OUAT, Rangailunda, Berhampur-07

naikgyanendrakumar60@gmail.com

As the global population steadily increases, there is a growing demand for sustainable food source. Sectors like aquaculture most will need to expand as well to meet the rising need for protein rich food. Biofloc technology (BFT) is an innovative approach in aquaculture that enhance the water quality and productivity by the growth of beneficial microbial organisms. By promoting the growth of beneficial microbial communities through manipulation of the carbon-to-nitrogen (C: N) ratio in the culture water, BFT transforms organic waste and excess nutrients into valuable microbial biomass. Biofloc technology is an eco-friendly technique that could ensure better production with less impact on the environment in the aquaculture practices. Biofloc technology represents a significant advancement that is relatively easy to implement with straight forward setup. It offers a cost-effective solution that would be convenient to fish farmers. BFT can offers and ideal solution for aquaculture by enhancing high survival rate, high biomass yield, and disease resistance. The microbial floc act as natural immunostimulants, strengthening the immune system of Cultures species. It also ensures better security & long-term Sustainability of the system.

Keywords: Biofloc technology, microbial organisms, carbon-to-nitrogen ratio, eco-friendly

Effect of feeding probiotic on the gut health of Rohu (*Labeo rohita*)

Sarita Das

LSPN College of Fisheries, Kawardha, Kabirdham Dist, Chhattisgarh –
491995

*saritadas.kvk@gmail.com

The yearlings of Rohu (*Labeo rohita*) were fed with commercial feed as T₁(Control), feed incorporated with *Lactobacillus sporogenes* @ 4% as T₂, *Saccharomyces cerevisiae* @ 4% as T₃ and both *Lactobacillus sporogenes* @2% and *Saccharomyces cerevisiae* @ 2% as T₄. The experiment was designed for 120 days in the cement tanks. Feeding was done with probiotics and without probiotics at alternate 15 days. The probiotic bacteria were confirmed through biochemical and molecular tests. After 15 days in T₂ the TPC of *Lactobacillus sporogenes* was $2.79 \pm 0.12 \times 10^4$ CFU/g and *Saccharomyces cerevisiae* was 0. In T₃, TPC of *Saccharomyces cerevisiae* was $1.47 \pm 0.02 \times 10^5$ CFU/g and *Lactobacillus sporogenes* was 0. But in T₄ the TPC of *Lactobacillus sporogenes* was $1.22 \pm 0.01 \times 10^4$ CFU/g and *Saccharomyces cerevisiae* was $1.73 \pm 0.01 \times 10^5$ CFU/g. In the next 15 days i.e. in 30 days the colony in the T₂ is 0, as the feed is normal feed, but in T₃ the TPC of *Saccharomyces cerevisiae* was $1.530.03 \times 10^5$, as this species has been colonized in the gut after 15 days. The colony of *Saccharomyces cerevisiae* is more in T₄ as comparable to T₃. The initial body weight in Treatment 1, 2, 3, 4 were 44.37 ± 0.86 , 44.78 ± 0.63 , 45.00 ± 0.91 , 44.40 ± 0.90 g respectively, but the final weight after 120 days was in T₁, T₂, T₃ and T₄ as 102.05 ± 0.99 , 150.78 ± 0.68 , 172.00 ± 0.91 and 183.00 ± 0.9 respectively. It shows that the growth of fish and the no. of microbial colony is more in T₄.

Keywords: Probiotic, *Saccharomyces cerevisiae*, *Lactobacillus sporogenes*, gut, Rohu

Effect of frequency of probiotic application on the fry rearing of Rohu in biofloc system

Silpa Sahu, Saumyendra Nanda, Basanta Kumar Khuntia, Santosh Kumar Udgata and Mrutyunjay Das
College of Fisheries (OUAT), Rangailunda, Odisha
Kausalyaganga, Bhubaneswar
*smrutyan@gmail.com

The experimental study was conducted with addition of probiotic at different time intervals on the fry rearing of Rohu (*Labeo rohita*) to observe the growth rate, immunological parameters, probiotic microflora in biofloc and gut and challenge study against *Aeromonas hydrophila*. Fishes in control and 1st month of treatment tanks were fed with commercial feed @4% body weight and @ 2% body weight of 2nd month of treatment tanks. The experiment was made up of 4 treatments and each having 3 replicates. The Control was without biofloc, T₁ was with probiotic application at the starting time of biofloc formation, T₂ with daily application of probiotic in biofloc system, T₃ with application of probiotic in 7 days interval in biofloc system and T₄ with application of probiotic in 15 days interval in biofloc system. The experiment was conducted for 60 days only. Probiotic was applied as FCO (Fermented carbon organic) method. In each tank stocking density of fry was 30/150 ml with initial weight of each fry was 0.3±0.02 g. C:N ratio was 10:1 maintained with jaggery as carbon source. Various water parameters and growth parameters of fish were recorded during the experiment at 15 days interval. Highest body weight gain was 4.22±0.22 g, daily weight gain was 0.07 g and SGR was 4.30% in T₂. The survival of biofloc tank in T₂ and T₃ was found to be 100%. Lowest FCR (0.77), highest FER (1.30) and PER (3.24) was seen in T₂. The immunological parameters Lysozyme activity, Myeloperoxidase activity (MPO) and Respiratory burst activity was seen highest in biofloc treatments. *Bacillus* species were found predominantly in biofloc and gut of fishes. Fry of Rohu (*Labeo rohita*) were challenged with virulent strain of *A. hydrophila* and highest RPS was noticed in T₂. Hence, it was concluded that a biofloc system with daily probiotic addition as FCO helps in increasing the growth and immunological parameters of Rohu fry.

Keywords: Biofloc, Probiotic, fry of *Labeo rohita*, growth parameters, immunological parameters

Effect of Bottom Substrate on Growth and Survival of Advanced Post Larvae of Giant River Prawn, *Macrobrachium rosenbergii* (De Man, 1879)

*P.V. Kaveri Raman¹, D. Panda², B. R. Pillai², S. K. Udgata¹ and M. K. Tripathy¹

¹College of Fisheries (OUAT), Rangailunda, Odisha

²ICAR-Central Institute of Freshwater Aquaculture
Kausalyaganga, Bhubaneswar

* ramankaveri606@gmail.com

Effect of different bottom substrates on growth and survival of advanced post larvae of giant river prawn, *Macrobrachium rosenbergii* (De Man, 1879) in the indoor culture system were evaluated. The study was conducted in Freshwater Prawn Unit, ICAR-CIFA, Kausalyaganga, Bhubaneswar. The experiment was conducted in 12 indoor cemented tanks with 1500 liter capacity using completely randomised design. There were 3 treatments i.e. sand, mud, pebble and control without any substrate with triplicates. Advanced post larvae with initial average weight 0.4g were stocked at 60 no's/m² and reared for 60 days. They were fed with commercial diet (Crude protein, 35% and Lipid, 6%) at 20 to 10% of their body weight. At harvest, performance of post larvae in terms of growth, length, specific growth rate, average growth rate and FCR was significantly higher in tanks with mud as bottom substrate followed by pebbles, sand and least in the control. All the tanks with bottom substrates showed significantly higher survival ranging from 73-75% and the lowest in the control (65%). The results indicated that bottom substrates play an important role in growth and survival of the advanced post larvae of scampi. The tank culture environment with mud and pebble at the bottom enhances the growth and survival and thereby the production. This finding of this study will help the scampi farmers to choose a suitable substrate to improve the yield.

Keywords: Scampi, bottom substrate, growth, survival, cemented tanks.

Density optimization of pearlspot fry and fingerlings for live transportation

P. A. Patil^{1*}, K.P. Kumaraguru vasagam², M. Kailasam², A. Panigrahi², S. Khara¹, S. Sundi¹, P. Mahalakshmi²

¹Navsari Gujarat Research Centre of ICAR-Central Institute of Brackishwater Aquaculture, Navsari Agricultural University Campus, Navsari, Gujarat-396450

²ICAR-Central Institute of Brackishwater Aquaculture, Chennai, Tamil Nadu 600028

* pankaj.patil@icar.org.in

The present investigation was taken up to find out the optimum densities for pearlspot fry and fingerlings (1–3-inch size) live transportation for varying transit durations of 6, 12, 18 and 24 hrs were studied in 30 L capacity polythene bags filled with oxygenated 5 L of 15 ppt brackishwater. In trial-1, pearlspot fry (2.5-2.8 cm) were packed at density of 100, 200, 300, 400 and 500 nos. in 5 L water, respectively. In trial-2, pearlspot fry (5.0-5.4 cm) were packed at density of 100, 200 and 300 nos. in 5 L water, respectively. In third trial, pearlspot fingerlings (7.4-7.8 cm) were packed at density of 50, 100 and 150 nos. in 5 L water, respectively. Control bag was with only oxygenated 15 ppt brackishwater. All packed polythene bags with pearlspot fry and fingerlings were kept in thermocol boxes for transportation for duration of 6, 12, 18 and 24 hrs periods Results revealed 99.5%-98.5%, 99.2% and 98.5% survival of pearlspot fry (2.5-2.8 cm) at packing density of 400, 300 and 200 nos. in 5 L of 15 ppt oxygenated water for 6-12, 18 and 24 h duration of live transportation, respectively. Whereas 98.4%, 97.5%-97.0% and 96.0% survival of pearlspot fry (5.0-5.4 cm) was observed at packing density of 300, 200 and 100 nos. in 5 L of 15 ppt oxygenated water for 6, 12- 18 and 24 h duration of live transportation respectively. Pearlspot fingerlings (7.4-7.8 cm) packed at density of 50 nos. in 5 L of 15 ppt oxygenated brackishwater water for 6 hrs live transportation exhibited 98.2% survival. Present study suggests optimal packing densities for short and long-distance transportation of pearlspot seed, which is useful for farmers.

Keywords: *Pearlspot fry, live transport, density, transit time, water quality, and survival*

Aquaculture spatial planning for blue transformation in coastal regions and beyond in Odisha, India

M.Jayanthi*, A. Panigrahi and Kuldeep K. Lal

ICAR-Central Institute of Brackishwater Aquaculture, Chennai

*jayanthiciba@gmail.com

Aquaculture offers a chance to transform unused lands that are unsuitable for other productive endeavours into a means for enhancing coastal livelihoods. However, Environmental challenges, regulatory frameworks, restricted resource availability, and the involvement of various stakeholders render the utilization of coastal resources a significant challenge in terms of accountability and responsibility. In India, the utilization of land for coastal aquaculture has remained stagnant at approximately 2 lakh hectares over the past two decades. Though the state of Odisha is housed with largest brackishwater systems in the country, the aquaculture is developed around 19000 ha with a production around 60000 MT in 2023-24. This suggests there is scope for vast expansion from saline lands available, exceeding one lakh hectares. Aquaculture spatial planning model developed at CIBA encompasses the integration of land resources from satellite data analysis, resource characteristics assessment through ground truth validation, water quality and availability, soil characteristics, the other stakeholders demand, and existing rules or regulations to facilitate expansion by pinpointing appropriate zones and the species that are suitable for cultivation. The present study indicates the pathways in which shrimp aquaculture can expand with the alternative resource use from salt affected, unproductive land without altering other important ecosystem characteristics.

Keywords: Blue transformation, coastal regions, Odisha

Blue Transformation in Odisha Fisheries and Aquaculture

Sushree Ratnamanjari Senapati

Fisheries and Animal Resource Development Department, Govt. of Odisha,
Bhubaneswar

*sushree.fishco22@gmail.com

Odisha, a maritime state with 575 km of coastline and rich aquatic ecosystems, holds immense potential in fisheries and aquaculture. Contributing 10.6% to the State’s agricultural economy, Odisha ranks India’s 4th largest fish producer, accounting for 6% of national fish output, and its per capita fish consumption is 17.73 kg. With 6.76 lakh ha of freshwater and 4.18 lakh ha of brackish water resources, it produced 11.24 lakh MT of fish in 2023–24, generating livelihoods and enhancing food and nutritional security for rural communities. The sector employs 10% of agriculture workforce, with an average monthly income of ₹8,500. Government initiatives like Pradhan Mantri Matsya Sampad Yojana (PMMSY), Rastriya Krushi Vigyan Yojana (RKVY), Blue Revolution, and Mukhyamantri Matsyajibi Kalyan Yojana (MMKY) have been instrumental in sectoral development. Initiatives like Matsya Pokhari Yojana (MPY) enabled 18,574 fishers to excavate 11,011.67 ha ponds, while 9,710 Women Self-Help Groups (WSHGs) engaged in pisciculture across 9,197.90 ha Gram Panchayat tanks (2023-24). Efforts to empower women through Biofloc and GP tank-based fish farming have created new livelihood opportunities. With a focus on horizontal and vertical expansion, the government aims to raise productivity beyond 5 tons/ha/year, positioning fisheries as a key driver of Odisha’s rural economy.

Keywords: Odisha, Livelihood generation, Women empowerment, Government schemes

Impact of herb Ashwagandha *Withania somnifera* incorporated diets on growth and reproductive performance of Goldfish *Carassius auratus*

Alaka Tandi, Sushanta Kumar Patra*, Ganesh Chandra Kund, Manoj Kumar Tripathy, Saumyendra Nanda, Brundaban Sahu, Nabakishor Sial and Dharitri Choudhury

College of Fisheries (OUAT), Berhampur-7, Odisha, India

[*skpatra1972@yahoo.com](mailto:skpatra1972@yahoo.com)

A 90 days feeding trial was conducted to study the impact of herb Ashwagandha *Withania somnifera* incorporated diets on growth and reproductive performance of Goldfish *Carassius auratus*. Three experimental diets (with 30% protein level) of the herb *Withania somnifera* with different incorporation levels viz. T₁ (1.5%), T₂ (2.5%), T₃ (3.5%) were tested against the T₀ (control diet-with no herb) to find out the suitable incorporation level of the herb in gold fish production. The experiment was conducted in triplicate in 40 litre glass aquaria. The fishes, measuring length 6.46±0.09cm & weight 10.16±0.03g, were used for the study. The fishes were fed daily @4% of the body weight for the entire period twice in a day. Water quality parameters measured found suitable for goldfish production. All the growth parameters except FCR reflected higher values in 2.5% diets than in 3.5%, 1.5% and in control. Highest survivability (86.67%) was observed in test diets than the control (60%). All the reproductive parameters reflected high value in 2.5% diets than 3.5%, 1.5% and control. In conclusion, all test diets performed well than the control. Among the herbal diets, T₂ (2.5% incorporation level) stood the best with respect to growth, reproduction and survival in goldfish *Carassius auratus*.

Keywords: Ashwagandha, gold fish, growth, reproductive performance, survival

Indigenous Fish culture in wastewater-fed pond of East Kolkata Wetlands

Rumali Sahoo, Gunjan Karnatak, Basanta Kumar Das*, Sayan Mandal, Snehasis Dalal, Angana Majumder, Lianthumluaia, Srikanta Samanta, Vikash Kumar, and Archan Kanti Das

ICAR - Central Inland Fisheries Research Institute, Barrackpore- 700120, West Bengal, India

* basantakumard@gmail.com

The East Kolkata Wetlands are distinctive blend of man-made and natural wetlands known for wastewater-fed aquaculture with reported very high production potential and fish yield. But with passage of time the fish yield has been drastically reduced leading to decrease in profit margin. The cultivation of indigenous fish species, in low-input systems within the EKW region has been planned to overcome the situation and practiced in this study. A 110-days culture trial of two small indigenous fish species—*Systomus sarana* and *Labeo bata* were practiced in a nutrient-rich pond (Chacharia bheri) in the EKW. Monitoring of water quality parameters during the season revealed good culture environment with a mean dissolved oxygen content of $5.42 \pm 1.22 \text{ mg L}^{-1}$, pH of 8.7 ± 0.64 , and a temperature of $25.9 \pm 3.39 \text{ }^\circ\text{C}$. The indigenous fish culture unit showed good primary production (GPP: $0.780 \text{ mgC/m}^3/\text{h}$) and plankton density (mean: 24,301 units/l). *S. sarana* outperformed *L. bata* in growth performance ($R^2 = 0.923$, condition factor = 1.67) ($R^2 = 0.838$, condition factor = 1.00). Using wastewater culture in wetlands can be profitable with proper management, which promote environmentally integrated aquaculture system, sustainability, conserve biodiversity, and food security. This study demonstrates that Small Indigenous Fishes culture in urban wetlands can facilitate scaling up of aquaculture in emerging markets.

Keywords: Wastewater, indigenous fish, plankton, diversity, water quality, wetland

Biodegradable Alternatives to Microplastics in Aquaculture Infrastructure

Aditya Ram*, Santosh Kumar Udgata, Manoj Kumar Tripathy, Nityananda Das and Arpit Acharya

College of Fisheries, OUAT, Rangailunda, Berhampur-07

*adityaram923@gmail.com

The widespread use of plastics in aquaculture equipment, such as nets, ropes, cages, and feed bags, has made a considerable contribution to aquatic microplastic contamination. As these materials decompose, they emit microplastics that endanger aquatic life, contaminate cultured species, and affect food safety and ecosystem health. Interest has grown in the research of biodegradable alternatives that provide similar functions to those of standard plastics. Polylactic acid (PLA), polyhydroxyalkanoates (PHA), and natural fibres such as coir, jute and hemp have all shown outstanding results both in laboratory and field studies. These substances degrade the environment and reduce the harmful effects of long-term pollution. Large-scale implementation faces problems in terms of cost, maritime durability, and performance. Certain advancements in biopolymer engineering and cellulose-based composites are helping the usage of biodegradable materials more in the field of aquaculture. Advancement such as reinforced bioplastics and antifouling coatings also play a vital role in these microplastics. Mitigation strategies such as wastewater treatment facility upgrades, inlet pond water screening, aquafeed staff screening, and regular maintenance and repair of culture facilities are highly beneficial in aquaculture for the eradication of microplastics.

Keywords: Biodegradable, microplastic contamination, bioaccumulation, antifouling coatings

Human Health Risk and Bioaccumulation Pattern of Potentially Toxic Elements in Edible Fish from the Lower Stretch of the Damodar River

Ayan Biswas*, Shreya Roy, Susmita Jana, Lokenath Chakraborty, Arka Mondal, Subhadeep Dasgupta, Dhruba Jyoti Sarkar, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700
120, India

*ayanbiswas794@gmail.com

The present study examines the contamination levels and bioaccumulation pattern of potentially toxic elements (PTEs), specifically Cd, Cr, Pb and arsenic (As) in surface water and economically important fish species along the lower stretch of the Damodar River. A total of 13 fish species representing nine taxonomic orders were analyzed to assess potential human health risks associated with PTEs exposure. Among the species studied, *Ailia coila* exhibited the highest bioconcentration factors (BCFs) for both As and Cd. On an order-wise comparison, mean BCFs were found to be highest in Siluriformes and lowest in Anabantiformes, indicating taxon-specific bioaccumulation pattern. The study estimated human health risk matrices, including estimated daily intake (EDI), total hazard quotient (THQ), hazard index (HI) and carcinogenic risk (CR) for combined PTEs exposure through fish consumption for adult and children. Results indicated that PTEs levels in fish remained within permissible limit. However, risk values both carcinogenic and non-carcinogenic were generally higher in children than in adults, with *Ailia coila* showing the highest cumulative risk across all four metals. Notably, the maximum observed HI value was 0.0377.

Keywords: Potentially Toxic Elements (PTEs), Damodar, Bioconcentration factor, Health Risk Assessment, Fish safety

Assessment of aquaculture impact on land use changes through spatial technologies: A model case study of Ramanathapuram District, Tamil Nadu, India

M. Samynathan*, M. Jayanthi and S. Thirumurthy

ICAR - Central Institute of Brackishwater Aquaculture, Chennai

* msnathan.geo@gmail.com

Understanding land-use dynamics is vital for providing baseline data to support sustainable management practices and protect ecosystems. The mapping of the impact of aquaculture on regional land-use changes helps to identify change scenarios and forecast future modifications. Landsat-7 ETM+ (2002) and Sentinel-2 (2022) were used to analyse and forecast the impact of aquaculture on land-use land cover (LULC) changes in Ramanathapuram District over a 20-year period, using ArcGIS 10.8.2. Fifteen LULC categories, such as agriculture, abandoned aquaculture, aquaculture, abandoned saltpan, buildup, coastal plantation, forest, liable to flood, mangroves, mudflats, saltaffected land, saltpan, sand, scrubland, and waterbodies, were identified, and validated through field verification using Global Navigation Satellite System (GNSS). The aquaculture map of 2022 was carried out and overlaid on LULC of 2002. Aquaculture has increased by 66.02% accounting for 624 ha in 2002 and 1036 ha in 2022, reflecting the region’s focus on blue growth. The aquaculture expansion utilized scrubland, mudflats, and agricultural land. This analysis of LULC dynamics highlights the extent of other land use converted aquaculture development, and the changes in natural landscapes. The major aquaculture development occurred from the land classes that were not used for any other activities.

Keywords: land-use change, spatial model, satellite data, aquaculture

Possible effects of fingermillet-based biofloc technology at various C:N ratios on butter catfish (*Ompok bimaculatus*) water quality, growth performance, and haematological and serum biochemical profiles

Swapna Behera^{2*}, Pratap Chandra Das¹, Nathan Felix² and Shajahan Ferosekhan¹,
Himansu Sekhar Swain¹, Saminathan Athithan², Pandurengan Padmavathy²

¹ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha, India

²Fisheries College & Research Institute, Tamil Nadu Dr. J. Jayalalithaa Fisheries University,

Thoothukudi, Tamil Nadu, India.

*swapnasmart222@gmail.com

A 90-day study evaluated the effects of varying carbon-to-nitrogen (C/N) ratios on butter catfish (*Ompok bimaculatus*) in zero-water-exchange tanks, focusing on water quality, growth, body composition, digestive enzymes, serum biochemistry, and haematological parameters. Three finger millet-based C/N treatments—10:1 (CN10), 15:1 (CN15), and 20:1 (CN20)—were tested in triplicate, with a freshwater control group receiving no carbohydrate supplementation. Fish (initial weight: 5.45 g) were stocked in 150-L experimental tanks and fed a 40% protein diet. Water parameters were monitored throughout. As C/N ratios increased, total ammonia and nitrite levels decreased, while phosphate levels rose. CN15 led to superior performance, with 37.79% greater weight gain and a 28.81% higher specific growth rate than the control. Feed conversion ratio (3.13 ± 0.4) improved by 39.2%, and protein efficiency ratio (0.83 ± 0.11) rose by 66% in CN15. Higher C/N ratios also increased body protein and ash while reducing moisture and lipid content. Hematological indices like hemoglobin, RBCs, WBCs, and hematocrit improved with higher C/N ratios. Among all treatments, a C/N ratio of 15:1 proved optimal for enhancing growth, feed utilization, and immune response in *O. bimaculatus*, suggesting its suitability for biofloc-based aquaculture systems.

Keywords: *Ompok bimaculatus*, biofloc, C/N ratio, finger-millet, growth, survival

Effect of Dietary n-3/n-6 Fatty Acid on Reproduction and Egg Quality of Climbing Perch, *Anabas testudineus*

Nitish Kumar Chandan*¹, Kedar Nath Mohanta⁴, Rajesh Kumar², Rakhi Kumari¹, Uday Kumar Udit³, Siddaiah GM¹, Jackson Debbarma² and Narottam Prasad Sahu⁴

¹FNPD, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar;

²APED, ICAR- Central Institute of Freshwater Aquaculture, Bhubaneswar;

³FGBD, ICAR- ICAR- Central Institute of Freshwater Aquaculture, Bhubaneswar, India

⁴FNBP Division, ICAR-Central Institute of Fisheries Education, Mumbai

*nitishcifa@gmail.com

The impact of dietary n3/n6 ratio of fatty acids (FA) on growth, gonadal maturation, reproductive performance and egg quality was studied in brood fish of *Anabas testudineus*. The brood fish were randomly distributed into 15 tanks (1000L capacity) with six males (23±3g) and six females (33±5g) in each tank. Six iso-nitrogenous (CP 40%) and iso-lipidic (CL 8%) experimental diets were formulated to contain 0.25 (T1), 0.5 (T2), 0.75 (T3), 1.25 (T4) and 0.1(C) n3/n6 fatty acid ratio and fed for 90 days at 3% of body weight in triplicate. The results revealed that the growth performance of the broodstock *A. testudineus* was significantly higher in T2, T3, and T4, whereas gonadosomatic index (GSI) and relative fecundity were significantly higher in T3 than other dietary treatment groups (P<0.05). The dietary treatments did not influence the egg fertilization rate (P>0.05). The hatching % was significantly higher in the group fed with T2, T3, T4 and T5. Similarly, the highest survival and egg size were observed in the groups fed with diet T3, T4 and T5. In male fish, reproductive hormones such as progesterone were significantly higher in dietary groups T3, T4 and T5, whereas testosterone and 11-Keto testosterone (11-KT) were observed significantly higher in T3 and T4 fed groups. In females, progesterone levels were significantly higher in dietary groups T2, T3, and T4, while estradiol levels were significantly elevated in groups T3 and T4. In female testosterone level was significantly higher in T2, T3, T4 and T5 fed groups. The vitellogenin induction in female anabas was significantly enhanced in T3 fed group in comparison to the control and other groups. In conclusion, the dietary n3/n6 ratio of 0.75-1.00 could be the best inclusion level in the diet of *Anabas tesudineus* brood stock diet to achieve maximum reproductive performance and superior egg quality.

Keywords: Anabas, climbing perch, Fatty Acid, n3/n6 ratio, Maturation, Reproduction, Larval Survival, Hormone

Aquatic Carbon Cycling: Implications for Climate Change

Pooja Priyadarshini*, Sushanta Kumar Patra, Santosh Kumar Udgata,
Manoj Kumar Tripathy, Dharitri Choudhury, Arpit Acharya and Chandan
Roul

College of Fisheries, OUAT, Rangailunda, Berhampur-07

*poojapriyadarshini2525@gmail.com

Aquatic ecosystems play a critical role in the global carbon cycle, acting as both carbon sinks and sources. Oceans, rivers, lakes, and wetlands regulate atmospheric carbon dioxide (CO₂) levels by absorbing, storing, and releasing carbon through biological, chemical, and physical processes. Phytoplankton and aquatic plants sequester CO₂ through photosynthesis, while microbial decomposition and sedimentation influence long-term carbon storage. Aquatic carbon cycling within aquaculture systems represents a dynamic nexus of biogeochemical transformations, profoundly modulated by anthropogenic activity. The intricate interplay between autotrophic primary producers, heterotrophic decomposers, and aquacultural inputs orchestrates a multifaceted continuum of carbon fluxes, including sequestration, respiration, and organic matter remineralization. However, human activities such as deforestation, pollution, and climate change disrupt these natural processes, leading to increased carbon emissions from aquatic environments. Rising temperatures and ocean acidification further alter carbon dynamics, reducing the efficiency of carbon sequestration and exacerbating climate change. Understanding aquatic carbon cycling is essential for developing strategies to mitigate global warming, highlighting the need for conservation efforts and sustainable management of water bodies. This review elucidates the imperative of incorporating carbon-centric paradigms in the evolution of ecologically harmonious aquaculture systems by exploring the mechanisms of aquatic carbon cycling, its role in climate regulation, and potential solutions to preserve these critical ecosystems in the face of environmental change.

Keywords: Aquatic ecosystem, Carbon cycle, Global warming, Climate regulation

Effects of fish waste silage and vitamin C supplemented diet on growth and haematological parameters of common carp, *Cyprinus carpio* (Linnaeus, 1758) fingerlings

Basant Singh¹, Dushyant Kumar Damle*¹, Jham Lal¹, Harshavarthini M.¹, Komal Prasad Sahu¹, Sujata Singh¹, Mandakini Verma¹ and Ranjana Damle²

¹Late Shri Punaram Nishad College of Fisheries, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh-491 995.

²Kalinga University, Naya Raipur, Chhattisgarh-492 101, India

*dushyant.damle@dsvckvdurg.ac.in

An experiment was conducted for 60 days to evaluate the growth performance, feed utilization and haematological parameters of common carp, *Cyprinus carpio*, under different dietary treatments. The study comprised four experimental treatments with three replicates each, along with a control group. We have prepared 4 experimental feeds, such as Control (0%), T1 (15%), T2 (30%) and T3 (45%) fish waste silage-containing diets. The nutritional profile of experimental feeds was carried out to determine levels of crude protein (25-25.75%), lipid (8.46-8.96%), moisture (10.64-11.16%), ash (14.05-14.87%), crude fibre (4.07-4.32), and nitrogen-free extract (35.69-37). The haematological parameters were observed of *Labeo rohita*, which improved white blood cells, red blood cells, haemoglobin (Hb) and haematocrit (HCT) within the healthy physiological range. The highest length gain (5.96±0.05), weight gain (8.43±0.15), percentage weight gain (161.44±10.14), specific growth rate (0.46±0.01), protein efficiency ratio (3.03±0.18), hepatosomatic index (0.05±0.00), and intestinal somatic index (0.33±0.00) were observed compared to the control groups. The highest feed conversion ratio (1.91±0.47) was observed in the control group compared to the treatment group. Carcass composition of the fish at the end of the trial was similarly analysed for protein (58.87-60.29%), lipid (13.10-13.78%), moisture (10.25-10.96%), ash (9.21-9.32%), and NFE (6.45-7.73%) content. Water quality parameters remained within acceptable limits throughout the study period. The results suggest that specific dietary treatments significantly enhanced growth and feed utilization in common carp, indicating potential benefits for aquaculture nutrition strategies.

Keywords: *C. carpio*, Fish waste silage, Growth performance, Carcass composition, Water quality, Waste utilization

Vulnerability assessment in ecologically important coastal regions: A model case study in Chengalpattu District, Tamil Nadu

S. Thirumurthy*, M. Jayanthi, M. Samynathan

ICAR - Central Institute of Brackishwater Aquaculture, 75, Santhome high road, Chennai, Tamil Nadu, India - 600 028.

*geogmu@gmail.com

Coastal resources face significant stress due to developmental activities and climate change, that alters the environment and increases the vulnerability. Changing shoreline due to climate change impacts including sea level rise is major challenge faced by coastal population. The present study evaluated the changes in ecologically important coastal region in terms of changing shorelines and its impact on land use. The coastline variations were delineated from Landsat and Sentinel-2 data satellite images using Digital Shoreline Analysis System. High-water lines from satellite images of 1973, 1988, 2003, and 2018 were digitized to demarcate the coastline positions. The shorelines change analysis indicated the erosion in 94% transects and accretion in the rest of 6 % transects. There is no stable coast in the study region. The maximum and mean rate erosion has occurred at a rate of - 4.70 m/yr and -1.95 + 3.39 m/yr respectively. The total loss of coastline shift was 56.34 m in 45 years at few locations, which are considered to be hotspots. The changing shoreline is expected to increase due to global climate change impacts. The results indicated that geospatial techniques provided informative maps to determine the critical coastal regions to plan for the conservation and adaptation measures.

Keywords: Coastal shoreline change, Climate change; DSAS, Geospatial techniques

Scampi Seed Production in Brackishwater Ponds in India: A Case Study

D. Panda*, B. R. Pillai, B. Mishra, S. Sahu and N. Naik

ICAR-Central Institute of Freshwater Aquaculture

Kausalyaganga, Bhubaneswar-751 002

*debapnd@yahoo.co.in

A new innovative and low-cost technique of seed production of freshwater prawn in small brackish water ponds is in practice in coastal districts of Odisha and West Bengal for the last few years. This is practiced mostly in East Midnapur district in West Bengal and Balasore district in Odisha during February to June when the salinity is high in the brackish water canals. Initially, small brackish water ponds (0.04 ha to 0.20 ha) are dewatered, disinfected with bleaching powder @30ppm, and filled with 10-15 ppt salinity water up to a depth of 80-100 cm. Organic manures and fertilizers are applied after 3 days of heavily aeration to achieve plankton production. Berried females weighing 50-100 g bearing grey eggs are stocked @ of 50-100 kg/ ha. The pond water is aerated 1-2 hours for 4-5 times daily. The eggs generally hatch out within 2-3 days after stocking of berried female. The scampi larvae generally metamorphose to post larvae in 18-24 days. Then, the post larvae are harvested using scoop nets at night and kept in hapas. Most of the seed producers do not have facilities for acclimatizing post larvae to freshwater so the PLs are sold without acclimatization which often leads to poor survival when they are stocked in freshwater ponds. The production of post larvae in this system varies between 1.0 to 5.0 lakh/ ha depending on the quality of berried females and experience of the farmer.

Keywords: Scampi, Seed, Odisha, West Bengal, Brackishwater, Ponds

Brackishwater Finfish Farming in India: Emerging Practices, Opportunities and Future Strategies

M. Kailasam* and Kuldeep Kumar Lal

ICAR-Central Institute of Brackishwater Aquaculture, Chennai – 600 028

* kailasamam@gmail.com

Brackishwater aquaculture sector has witnessed a continuous growth and projected to experience stronger and sustain in the future. The sector is considered as key contributor to the overall earning of foreign exchange through export. To maintain the sustainable growth, it is important to diversify the species and farming systems instead of depending fewer species. Species diversification can increase farm productivity, improved water and soil quality and reduce the risk by choosing the appropriate crop portfolio. Finfish species such as seabass, milkfish, grey mullet, pearlspot, long whiskers catfish and mangrove red snapper have great potential. Finfish farming can play a pivotal role by offering nutritional, economic, and environmental advantages as farming can be done in diversified systems such as ponds, cages, pens, RAS, IMTA and biofloc tanks. In the recent years, farming of seabass, pearlspot and milkfish have experienced steady growth due to availability of hatchery seed, functional feeds and ready markets. Seabass fingerlings production is emerging as rural economic activity to meet the increasing seed demand for large scale grow-out culture. Hand hold approach by the departments, institutions with the stakeholders and technology backup support by the R&D institutions would help expansion of brackishwater finfish farming in India.

Keywords: Brackishwater, aquaculture, finfish, diversification, seabass

Studies on seasonal phytoplankton indicative communities in Tampara Lake, Odisha

Biswajit Mishra^{1*}, Sushanta Kumar Patra², Ganesh Chandra Kund²,
Manoj Kumar Tripathy², Santosh Kumar Udgata² and Nabakishor Sial²

¹Young Professional-I, PMSSY Project, ICAR-CIFA, Bhubaneswar, Odisha

²College of Fisheries (OUAT), Berhampur-7, Odisha, India

* bm3940761@gmail.com

A study on seasonal variations of plankton communities was conducted in Tampara Lake, Odisha for the period from December 2023 to July 2024. Three experimental stations were identified for sampling: Station 1 (no activity zone), Station 2 (moderate activity zone), and Station 3 (high activity zone). Water samples were collected from all the stations at an interval of 10 days. Water quality parameters and phytoplankton identification and density were recorded using standard methods. The water quality data measured from all three stations over the study showed no significant variations among the stations ($p > 0.05$). Among the phytoplankton, the class Chlorophyceae (17 genera) exhibited the highest richness followed by Bacillariophyceae (10 genera), Cyanophyceae (5 genera), Dinophyceae (2 genera) and Chrysophyceae (1 genus). In terms of abundance, Bacillariophyceae ranked highest across all stations and seasons, followed by Chlorophyceae, Chrysophyceae, Cyanophyceae, and Dinophyceae. Regarding indicative phytoplankton species, *Asterionella* and *Cyclotella* are indicators of clean water, whereas *Nitzschia*, *Microcystis*, and *Oscillatoria* are indicators of pollution. The density of *Asterionella* and *Cyclotella* in Tampara Lake was much higher than that of pollution indicators such as *Nitzschia*, *Microcystis*, and *Oscillatoria*, clearly suggesting a mesotrophic state of the lake.

Keywords: Tampara lake, phytoplankton, richness, abundance, seasonal bioindicators

Integrated Farming of Catfish and Carps: A Paradigm for Enhanced Productivity and Income Generation

Md Shadab Alam*, Soumi Laha, Priyanka Acharya, Arpit Acharya, Brundaban Sahu, Manoj kumar Tripathy, Dharitri Choudhury, Satyajit Kumar Bhuyan, Sushanta Kumar Patra, Nabakishor Sial, Santosh Kumar Udgata and Nityananda Das

College of Fisheries (OUAT), Berhampur-7, Odisha, India

Improving profitability *via* productivity is a paramount global issue and considerable initiatives are underway to increase farmers' income through aquaculture. The primary aim of these initiatives is to foster economical aquaculture using a sustainable methodology, hence preserving environmental integrity. These initiatives are being executed consistently across multiple levels. Including the accessibility of high-quality seed, the implementation of alternative species in aquaculture, the formulation of species-specific and economical fish feed, the establishment of disease-free and pristine water quality culture techniques, the utilization of additives and nutraceuticals to enhance productivity and growth in aquaculture, and the advancement of integrated methodologies in fish farming, among others. The integrated and coordinated approaches of the culture system persist in captivating fish growers throughout Asian nations. The primary rationale for this is its cost efficiency. Likewise, linking various food trophic levels inside the culture systems demonstrates an effective approach. We achieve this by linking the food trophic levels and transforming the waste of one fish species into sustenance for another. The integrated cultivation of catfish and carp is founded on this fundamental idea. In this scenario, only catfish ingest artificial feed, whereas carp predominantly flourish on naturally occurring food in the pond. Catfish require more feed, whereas carps consume and grow using the natural food generated from it. Consequently, the food chain is entirely and effectively exploited. Consequently, we can get pond output of 8-20 tons per acre without the necessity of constant aeration.

Keywords: Aquaculture, Mix fish farming, Productivity, Trophic integration

The aquatic environmental stress modulates quinolone and nitrofurantoin resistance of *Salmonella Montevideo* to the climatic variations: A new perspective on evolution

Karuppannan Iswarya^a, Robinson Jeya Shakila^{b*}, Shanmugam Sundhar^{a*}, Rajendran Shalini^a, Muralidharan Nagarajan^c, Balasubramanian Sivaraman^a, and Ulaganathan Arisekar^a

^aTamil Nadu Dr. J. Jayalalithaa Fisheries University, Department of Fish Quality Assurance and Management, Fisheries College and Research Institute, Thoothukudi 620 008, Tamil Nadu, India ^bParaprofessional Institute of Fishing Technology, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Pirappanvalasai, Ramanathapuram 623 516, Tamil Nadu, India

^cTamil Nadu Dr. J. Jayalalithaa Fisheries University, Department of Fish Processing Technology, Fisheries College and Research Institute, Ponneri 601 204, Tamil Nadu, India sundhar.fqm16@gmail.com

Climatic variation became a global threat and significantly wavered on the aquatic environmental factors. Despite that, indirectly impacts and rises the antibiotic resistance pathogens including the *Salmonella enterica serovar Montevideo*. A total of 26 dual stress conditions were identified out of 55 combinations, and the growth response was observed. Further, *Salmonella Montevideo* strains exposed on dually combined stressor up to 1000 generations of population, then analysed the resistance profile of quinolone and nitrofurantoin class antibiotics which have been prescribed to treat the salmonellosis and enteric fever. When exposed to all multiple stress conditions, both strains of *S. Montevideo* exhibited the sensitive profile to ciprofloxacin. While only two synergistic stress effects (20 °C - 50‰S and 5 ppm NH₃ -37°C) have increased resistance as often attain over 750 population. The experiment showed that on combined effect with the salinity stressor highly induced the resistance to nalidixic acid, norfloxacin and nitrofurantoin in resistance strain of *S. montevideo*, with on respective few combinatory stressors such as 50% S with pH 9.0, 45 °C and 5000 ppm H; 5 ppm NH₃ - 10‰S. In spite of all antibiotics, both strains has gained the ability and become more resistant to norfloxacin and nitrofurantoin on multiple environmental stress. The study could be beneficial to establish forceful control measures for future mitigation of *Salmonella* infection, it would clearly notify the relation between climate instability, aquatic environments and antimicrobial resistance bacteria.

Keyword: *Salmonella Montevideo*, Environmental stressors, Quinolone, Nitrofurans, Dual stress condition

Stock enhancement in inland open waters through transparent stocking program

A. K. Das* and B. K. Das
ICAR-Central Inland Fisheries Research Institute
Barrackpore, Kolkata
*archandas50@gmail.com

India’s fisheries and aquaculture sector is progressing rapidly towards achieving the goals of the second Blue Revolution, targeting a production of 22 million tonnes (mt) by 2025-26, having already achieved 18.40 mt in 2023-24, a remarkable rise from 0.70 mt in 1950-51. This growth is significantly supported by India’s vast inland open water resources, particularly floodplain wetlands (1.2 million ha) and reservoirs (3.47 million ha). In 2022-23, India emerged as the global leader in inland fisheries production, contributing 1.24 mt, thus supporting rural livelihoods and food security. Stock enhancement remains the cornerstone of inland open water fisheries development, especially in reservoirs and wetlands, through strategic restocking and river ranching (notably under NMCG in the Ganga since 2017). With aquaculture area expansion reaching saturation, enhancing productivity per unit area in open waters has become essential to achieving Sustainable Development Goals (SDGs). Demonstrated success of ICAR-CIFRI technologies has significantly boosted yields: Reservoir stocking has improved productivity to 34, 98, and 190 kg/ha/year in large, medium, and small reservoirs respectively. Case studies include Karapuzha (Kerala): 18 to 150 kg/ha, 58 Odisha reservoirs: 158% increase, and Chhattisgarh: 80.43 to 374.46 kg/ha. Major reservoirs like Indirasagar, Gandhisagar, and Govindsagar also showed notable gains. Under PMMSY, strategic targets of 50, 147, and 343 kg/ha/year for large, medium, and small reservoirs have been set. Efforts like scampi enhancement in Jharkhand have also yielded socio-economic benefits for tribal communities. A unified national inland open water fisheries policy is crucial for integrating ecological, economic, and social goals, ensuring long-term sustainability and upliftment of India’s inland fisherfolk.

Keywords: Inland open waters, stock enhancement, transparency, production

Balancing Productivity and Ecology: Integrated multi-trophic aquaculture (IMTA) system of Indian pompano, *Trachinotus mookalee*, Pacific white-leg shrimp, *Penaeus vannamei*, and red seaweed, *Kappaphycus alvarezii*

Maibam Malemngamba Meitei^{1*}, Karthireddy Syamala², Gouranga Biswas³, Sukham Munilkumar¹, Sekar Megarajan⁴, Muralidhar P Ande²

¹ICAR- CIFE, Mumbai, Maharashtra

²ICAR- CIFE, Kakinada Centre, Kakinada, Andhra Pradesh

³ICAR- CIFE, Kolkata Centre, Kolkata, West Bengal

⁴ICAR-CIFE, Visakhapatnam, Andhra Pradesh

*maibam.aqcpb104@cife.edu.in

Integrated Multi-Trophic Aquaculture (IMTA) has gained recognition for its integration of extractive species alongside fed species, facilitating the assimilation of particulate organic matter (POM) and dissolved inorganic matter (DIM), and thereby promoting ecological sustainability. The current study aimed to assess the growth performance and water quality outcomes of co-culturing Indian pompano (*Trachinotus mookalee*) and Pacific white-leg shrimp (*Penaeus vannamei*) with red seaweed (*Kappaphycus alvarezii*) in an IMTA system over a 45-day period. Four treatments were established, including a control (C) without seaweed and three treatments with varying seaweed biomasses: 0.5 kg m⁻³ (T1), 1.0 kg m⁻³ (T2), and 1.5 kg m⁻³ (T3), each in triplicate. Both *T. mookalee* and *P. vannamei* were stocked at 30 individuals m⁻³ and were fed species-specific diets containing 45% and 35% protein, respectively, at 5% of their body weight three times daily. The results indicated no significant difference (p>0.05) in the growth performance of *T. mookalee* but the final mean weight and specific growth rate of *P. vannamei* were significantly (p<0.05) higher in T3 although not significantly different with T2. However, phosphate and nitrate levels were significantly (p<0.05) reduced in all the treatments, with lowest in T3 compared to the control. These findings suggest that the inclusion of *K. alvarezii* in the IMTA system supports fish and shrimp growth while enhancing environmental sustainability through nutrient remediation.

Keywords: *Trachinotus mookalee*, *Penaeus vannamei*, *Kappaphycus alvarezii*, Dissolve inorganic matter (DIM), Particulate organic matter (POM)

From Vulnerability to Resilience: Climate Adaptation in Aquaculture

Soumya Priyadarshini*, Santosh Kumar Udgata, Manoj Kumar Tripathy,
Nityananda Das and Arpit Acharya

College of Fisheries, OUAT, Rangailunda, Berhampur-07

*priyadarshinisoumya51@gmail.com

Climate adaptive aquaculture refers to development and implementation of strategies, technologies and practicing aquaculture that enable the sector to withstand and thrive amidst impact of climate change. Aquaculture productions significantly contribute to food security and exports, specially for the developing countries. Sustainability of aquaculture influenced majorly by climate change. The risk factors of climate change such as increase in temperature, sea-level rise, cyclone, storm, ocean acidification all the associated ecological changes are causing a wide range of problems in fisheries sector. Improved disease monitoring ,avoidance of unprocessed animal by -products ,use of beneficial mineral oils, Improved climate resilient aquaculture systems like Biofloc and RAS, use of microalgae and algal based feeds, reduction of feed wastage ,reducing carbon loss , efficiently use carbon by reference of carbon footprints, Reduce the use of plastics in aquaculture ,supplementation of herbal probiotics to reduce the use of antibiotics are some of precautionary measure for climate adaptive smart aquaculture practices .Climate adaptive aquaculture will enhance the food security ,improve the livelihoods by protecting income and job of millions of fish farmers, minimizes the damage of infrastructure and stocks from extreme weather conditions, better growth rated and effective resource utilization ,reduce energy consumption. This review mainly focuses in reduction of wastes in aquaculture practices, income diversification through aquageoponics system and examining plastics use from fish health by poikilocytosis. This will mainly focus on some smart idea practices will sustain the adverse impacts of climate. For a country like India Aquaculture is not just an option but necessity for the long-term sustainability of the sector and well being of its people.

Keywords: Aquaculture, climate adaptative, Sustainability

Observation on growth and survival of silver barb, *Barbonymus gonionotus* (Bleeker, 1849) under varied stocking densities reared in small concrete tank culture system

Amanjit Nayak, Manoj Kumar Tripathy*, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam, Bikash Kumar Pati and Santosh Kumar Udgata

College of Fisheries, Odisha University of Agriculture and Technology,
Berhampur-760007

*mtripathy.ouat@gmail.com

A 90 days study was conducted to assess the effect of different stocking densities on growth, survival and production of silver barb, *Barbonymus gonionotus* (Bleeker, 1849) reared in small concrete tanks. The experiment was conducted in triplicates following a completely randomized design in concrete tanks. The advanced fry of size range 7.2 to 7.8 cm length and 7.9 to 9.3 g weight were reared at three treatment stocking densities *i.e.*, 15,000 fish/ha (T1), 20,000 fish/ha (T2) and 25,000 fish/ha (T3), and 10,000 fish/ha (T0) served as control. All the experimental units pertained to the same feeding regime and fertilization schedule. At the end of the 90-days experiment, the results showed significantly higher zootechnical performance such as survival, growth response, and feed utilization of silver barb in control followed by T1 and T2, which were statistically similar ($p > 0.05$). The lower zootechnical performance was observed in T3. However, the highest production of fish was obtained from the T3 experimental units. Considering both growth response and production parameter in primacy, it can be concluded that the stocking density in the range of 20,000 to 25,000 fish/ha is suitable for the rearing of silver barb fry in a concrete tank culture system for economic viability.

Keywords: *Barbonymus gonionotus*, zootechnical performance, growth, survival, stocking density

Culture and fattening of mudcrab, *Scylla serrata* in shallow water cages in Gopalpur creek, East Coast of India

Nabakishor Sial*, Ganesh Chandra Kund and Sushanta Kumar Patra

College of Fisheries (OUAT), Berhampur-7, Odisha, India

*nabakishor12@yahoo.com

Mud crab, *Scylla serrata* is an economically important cultivable species. In the present study, an attempt was made to culture and fatten the crabs in shallow water bamboo cages (1.0 m x 0.25 m x 0.30 m) in Gopalpur creek during the period from January to March, 2024 (90days). A total of 24 nos of crabs of carapace width (6.4 to 7.7cm) and body weight (50g to 75g) were stocked at the rate of 1, 1, 2 and 4 nos in T₀ (control), T₁, T₂ and T₃ respectively in triplicate. To avoid cannibalism, in treatments T₂ and T₃, the cages were partitioned into different compartments of size 0.25m x 0.25m x 0.30m and the crabs were stocked @ 1 crab/compartment. Artificial feeding @ 15% body weight/day was given to all treatments (T₁, T₂ and T₃) except the control (T₀). At the end of the experiment, the survival recorded was 100% in T₁ followed 83% (T₂), 75% (T₃) and 67% (T₀). The average individual weight gain was highest in T₁ (253g) followed by T₂ (223 g), T₃ (153g) and T₀ (123g). Similarly, the biomass yield measured was highest in T₃ (1380g) followed by T₂ (1117 g), T₁ (760 g) and T₀ (245 g). The biomass of each treatment is significantly higher than the control (P<0.05).

Keywords: *Scylla serrata*, fattening, cage, stocking density, weight gain

Impact of synthetic hormone on sex and stress steroid levels, breeding performance, spawning success, and embryonic development in *Labeo gonius* (Hamilton, 1822)

Himanshu Sekhar Swain, Pratap Chandra Das, Velmani Vignesh*, Husne Banu

ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha, India, 751002

*vigneshfishco@gmail.com

The present study investigated the dynamic changes in the sex and stress steroids levels following induction of *Labeo gonius* with a synthetic hormone Ovatide® for breeding and also focuses on the reproductive performance and embryonic development. Blood samples were collected to quantify sex steroid concentrations in both males and females during the breeding cycle. The results indicated a positive correlation between elevated testosterone levels in males and higher estradiol level in females following synthetic hormone induction. The level of dopamine decreased post-injection in both female and male, while GnRH level elevated irrespective of sex. The Cortisol levels increased significantly at 6- and 12-hours post-injection, before decreasing by 24 hours after the injection. While no changes were observed in lactate and glucose levels after 6 hours, both were significantly elevated in the hormone-injected treatments compared to the control group at 12 hours post-injection. The induced breeding programme of *Labeo gonius* was carried out in the eco hatchery with male and female size of 558.3±11.9 g and 774.3±13.1g respectively, kept at 1:1 sex ratio. Optimum dose of synthetic hormone, Ovatide® (sGnRHa+ Domperidone) 0.3 ml/kg and 0.15 ml/kg for female and male administered. Spawning took place after 7 hrs of injection. The gonadosomatic index (GSI) for male and female fish were 1.95±0.02 and 20.09±0.32 respectively, just before the spawning. The absolute fecundity of the fish was observed at 1324±34 nos of eggs/g of the ovary. Hatching was noticed after 15 hr of egg incubation and the hatching percentage was 82.3± 3.3%. Embryonic development was monitored under controlled conditions, revealing critical stages of development, including cleavage, gastrulation, and organogenesis.

Keywords: Hormonal profile, Breeding performance, Induced breeding, Embryonic development

Sub-Theme-II
**Innovations in Aquatic Animal Health & Disease
Management (IAHM)**

Prevalence of Antimicrobial Resistance in Freshwater Aquaculture Systems of Odisha, India

S. N. Sahoo, A. K. Pradhan, P. Priyadarshani, S. S. Mishra and **P. Swain***

Fish Health Management Division, ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar-751 002, Odisha, India

*pswainy2k@yahoo.co.in,

Antimicrobials, including antibiotics, are commonly used in aquaculture to manage bacterial diseases. However, their indiscriminate use can hasten the development of antimicrobial resistance (AMR), posing a major risk to global health as well as food security. The study focused on finding out the prevalence of antimicrobial resistance in three indicator bacteria—*Escherichia coli*, *Aeromonas* sp., and *Staphylococcus* sp. isolated from fish and pond water samples across 499 freshwater aquaculture farms in eight districts of Odisha during the period 2018–2025. A total of 2,393 bacterial isolates were obtained, comprising 784 *E. coli*, 793 *Staphylococcus* sp., and 816 *Aeromonas* sp. antimicrobial susceptibility testing was conducted following CLSI guidelines and data analysis was performed using WHONET software. The *E. coli* isolates are resistant to ampicillin (17.4%), tetracycline (10.2%), ciprofloxacin (9.5%), ceftiofur (9.5%), nalidixic acid (9.1%) etc. *Aeromonas* sp. are found resistant to ceftiofur (48.6%), trimethoprim-sulfamethoxazole (22.7%), cefotaxime (21.3%), amoxicillin/clavulanic acid (12.9%), and ciprofloxacin (10.1%) etc. *Staphylococcus* sp. showed resistance to penicillin (75%), ceftiofur (25.9%), tetracycline (11.9%), ciprofloxacin (11.5%), trimethoprim-sulfamethoxazole (11%) etc. Importantly, resistance to antibiotics not typically used in aquaculture was also observed, suggesting possible environmental contamination from external sources. These findings highlight the urgent need for AMR monitoring in aquaculture systems and for framing integrated mitigation strategies to curb the spread of resistance.

Keywords: Antimicrobial resistance, *E. coli*, *Aeromonas* sp., *Staphylococcus* sp., Antibiotics

Physicochemical parameters and disease occurrence in some fish farms of Ganjam and Kalahandi districts of Odisha, India

Santosh Kumar Udgata, Manoj Kumar Tripathy* and Brundaban Sahu, Nursingha Charan Pashupalaka, Dharitri Choudhury and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur, Odisha, India

*mtripathy.ouat@gmail.com

A study was done from November 2015 to March 2020 at 22 fish farms in Ganjam district and 21 fish farms in Kalahandi district of Odisha, India, to check for diseases in fish and to measure water quality as part of the National Surveillance Programme on Aquatic Animal Disease (NSPAAD) at College of Fisheries (OUAT), Odisha. During the survey, 86 water samples were collected and evaluated, 50 of which were from the Ganjam district and 36 from the Kalahandi district. The water quality parameters selected for assessment were pH, temperature, dissolved oxygen, ammonia, nitrite, phosphate, alkalinity and hardness. Except for the ammonia level in some farms of Kalahandi district, the values were found to be within desirable ranges. In finfish, argulosis and aeromoniasis were found to be predominant parasitic and bacterial infections. To investigate the association and influence of physico-chemical parameters on disease occurrence in two districts, appropriate statistical tools were used to establish the correlation. It was observed that water quality parameters except ammonia have a minimal effect on the occurrence of disease. The occurrence of argulosis and aeromoniasis in some fishponds of both districts might be due to excess organic load at the bottom and poor pond environment.

Keywords: physico-chemical water parameter; disease incidence; argulosis; aeromoniasis

Evaluation of effective antimicrobial therapy for aeromoniasis in carps

Santosh Kumar Udgata, Puspa Chandravanshi, Brundaban Sahu, Nrusingha Charan Pasupalaka, Manoj Kumar Tripathy*, Dharitri Choudhury and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur, Odisha

*udgatask2002@gmail.com

Aeromoniasis was found to be the most predominant bacterial disease in a surveillance program from April 2014 to March 2020 in southern Odisha, varying from 6.7 to 29.4%. The present study tested three antibiotics: ciprofloxacin, ofloxacin, and norfloxacin. Doses were finalised according to 2.0 g/ml as the MIC value and 3.0 µg/ml as the MBC value for Ciprofloxacin; 5.0 µg/ml as the MIC value and 25.0µg/ml as the MBC value for Ofloxacin; and 5.0 µg/ml as the MIC value for Norfloxacin. The MBC/MIC ratio was determined for ciprofloxacin as 1.5 and for ofloxacin as 5. Since the value of the MBC/MIC ratio was below 4 for ciprofloxacin, this was bactericidal. Whereas Ofloxacin was bacteriostatic, as the value of the MBC/MIC ratio was above 4. Based on this result, ciprofloxacin and ofloxacin were tried for *in vivo* applications. The LD50 value of *A. hydrophila* (*Ah2*) was calculated to be 2.19 x 10⁷ cfu/fish. The causative agent was re-isolated from the kidneys and livers of the moribund fishes and subjected to 16S rRNA gene sequencing and deduced gene sequences of 1484 bp. The pairwise sequence alignment was performed with the reference strain, *Ah2* (GenBank Accession No. MT974689.1), showing 100% identity, confirming the causative agent to be the same strain, *A. hydrophila*. Experimentally infected fish were treated with ciprofloxacin and ofloxacin at three different doses (2.5 µg, 3.0 µg, 3.5 µg and 5.0 µg, 25 µg, 50 µg, respectively) per gram of body weight for ten consecutive days. Doses were selected based on MIC and MBC values. The percentage recovery was found to be better for Ciprofloxacin than Ofloxacin. A farm trial was also conducted with the same antibiotics with the same doses. ANOVA with LSD analysis was carried out and the effect of doses of 3.0 µg/ml and 3.5 µg/ml was found significantly superior to 2.5 µg/ml of ciprofloxacin. Finally, ciprofloxacin at 3.5 µg/ml was incorporated into feed found suitable for application at the farmer’s pond.

Keywords: *A. hydrophila*, Aeromoniasis, Antibiotics

Prevalence and Dissemination of Carbapenem-Resistant *Klebsiella* spp. in the Lower Ganga River Basin

Abhijit Das*, Debasmita Mohanty, Mala Kumari, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata
700120, West Bengal

*abhi.fishery@gmail.com

The emergence of carbapenem-resistant *Klebsiella* spp. represents a growing public health concern, particularly in aquatic environments impacted by urban pollution. This study assessed the prevalence and resistance profiles of *Klebsiella* spp. isolated from various sites along the lower stretch of the Ganga River, influenced by urban wastewater discharge. High contamination levels were observed, as indicated by elevated contamination factors and degrees, reflecting the deteriorated water quality in the region. Among 92 *Klebsiella* isolates, 60.87% were confirmed as carbapenemase producers. Resistance to key carbapenems imipenem (58.70%) and meropenem (54.35%) was notably high. Molecular characterisation revealed extensive multidrug resistance, with widespread distribution of β -lactamase genes: blaCTX-M (80.43%), blaTEM (75%), and blaSHV (57.61%), along with carbapenemase genes blaKPC (57.61%) and blaIMP (42.39%). These findings suggest that urban wastewater is a major driver in both environmental contamination and the dissemination of drug-resistant *Klebsiella* spp. in the Ganga River system. The study underscores the urgent need for continuous monitoring, effective wastewater treatment, and public health strategies to restrict the environmental spread of carbapenemase-producing bacteria and mitigate associated health risks.

Keywords: *Klebsiella* spp., carbapenem resistance, Ganga River, urban wastewater, antimicrobial resistance (AMR), β -lactamase genes

Toxic effect of organophosphate (chlorpyrifos) on haematological, biochemical, enzymatic and histological parameters in striped catfish (*Pangasianodon hypophthalmus*, Sauvage, 1878)

Bhagchand Chhaba*^{1a}, H. B. Dhamagaye¹, E. Arun Goud¹, A.S. Pawase¹, P. H. Sapkale¹, B. R. Chavan¹, S. J. Meshram¹ and Priyanka Acharya²

¹College of Fisheries, Shirgaon, Ratnagiri (Dr B.S.K.K.V. Dapoli)

²Department of Aquaculture, College of Fisheries, Rangeilunda, Berhampur (O.U.A.T. Odisha)

*Teaching Associate, College of Fisheries, Kawardha, (D.S.V.C.K.V. Chhattisgarh)

* bhagchandchhaba123@gmail.com

The objective of this study was to determine the effects of the organophosphate (chlorpyrifos) on haematology, enzymatic activity, biochemistry, and histology in striped catfish. The fish in the experiment were exposed to two lower amounts of chlorpyrifos, 20 EC (T1 - 0.0106 and T2 - 0.0212 mg L⁻¹), along with a control group that had no chlorpyrifos (0.0 mg L⁻¹), for a period of 45 days. It was calculated that the 96-hour LC50 for chlorpyrifos 20 EC is about 0.106 mg L⁻¹. Documentation of water parameters was done regularly. Tissue (liver, kidney, and gill) and blood samples were collected on the 15th, 30th and 45th days of the experimental duration and were analysed to examine the haematological profile, biochemical and enzymatic activity and oxidant/antioxidant status of the fish. A significant reduction in red blood cell count, haemoglobin concentration, haematocrit level and mean corpuscular haemoglobin concentration and an increased white blood cell count, mean corpuscular volume and mean corpuscular haemoglobin of CPF-treated fish were observed. Biochemical profiles such as total protein, albumin, and globulin levels significantly declined while serum glucose and triglycerides enhanced with consequent increasing doses of chlorpyrifos exposure. Enzymes ACP, ALP, ALT, AST and AChE activity showed significant (p<0.05) differences in blood serum during exposure to chlorpyrifos. SOD and catalase activity reduced significantly in CPF-exposed fishes. More significant histological changes were documented in the gills, liver and kidney of the T2 group in comparison to the T1 group. In conclusion, this study demonstrated that CPF had adversely affected the haematological values, biochemical parameters, enzymatic activity, histological features and oxidant/antioxidant status of the fish.

Keywords: Biochemical, Chlorpyrifos, Haematology, Histology, Toxicity.

Genetic Footprints of Invasion: eDNA-Driven High-Resolution Surveillance of Nile Tilapia (*Oreochromis niloticus*) Across Eastern India’s Freshwater Landscapes

Biswajit Mandal, Basanta Kumar Das*, Vikash Kumar, Suvra Roy, Snehasis Dalal and Srikanta Samanta

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, West Bengal

* basantakumard@gmail.com

This study employed environmental DNA (eDNA) analysis to assess the distribution of *O. niloticus* across multiple aquatic habitats, leveraging species-specific primers to enable high-resolution detection. eDNA signatures were successfully amplified from sediment and direct tissue samples collected from wetland ecosystems across West Bengal, India, including eight ecologically significant sites: Sardar Bheri Wetland, Kolaghat, Moyna, Kakdwip, Akaiapur, Beri Bour, Khalsi and Culture Pond, with sequences submitted to NCBI (PQ810007, PQ810734, PQ814753, PQ814801, PQ821106), confirming the widespread presence of species. Spatial heterogeneity in physicochemical parameters influenced eDNA persistence and detection efficiency. Temperature ranged from 24°C to 32.5°C, pH from 7.49 to 8.91, and sediment composition played crucial roles. Sand-dominated substrates facilitated rapid DNA percolation and loss, whereas finer sediments enhanced retention. PCR validation demonstrated high specificity, with no cross-reactivity with non-target species, confirming the robustness of the primer design. Despite successful amplification in lentic environments, the absence of *O. niloticus* eDNA in Kolaghat, Akaiapur, and Ganga River sediments suggest either low species abundance or rapid degradation in high-flow systems. These findings underscore the influence of hydrodynamic conditions on eDNA stability and emphasise the need for habitat-specific sampling strategies. This study establishes eDNA as a powerful, non-invasive tool for invasive species monitoring, bridging molecular ecology and fisheries ecosystems. The study highlights the potential eDNA approaches to monitor *O. niloticus* populations and provides critical insight towards developing global invasive species management frameworks.

Keywords: Environmental DNA, Species Surveillance, *Oreochromis niloticus*, Fisheries Management

**Weight-Specific Serum Proteomics of Male Hilsa (*Tenualosa ilisha*):
Unveiling Developmental and Immune Adaptations**

Hena Chakraborty¹, Hirak Jyoti Chakraborty¹, Basanta Kumar Das^{1*} and
Joydev Maity²

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore – 700120,
West Bengal

²Vidysagar University, Midnapore, West Bengal – 721102

[*basantakumard@gmail.com](mailto:basantakumard@gmail.com)

This study investigates serum proteome dynamics in male Hilsa (*Tenualosa ilisha*), a species of significant ecological and economic importance, to support its conservation and aquaculture potential. Using LC-MS/MS-based proteomic profiling, serum samples from six body weight groups were analyzed. The highest number of proteins (817) was identified in the 201–300 g group, while the 401–500 g group exhibited the lowest (84), indicating non-linear proteomic shifts during development. All proteomic data were submitted to the ProteomeXchange Consortium via PRIDE. Bioinformatic analysis revealed enrichment in immune-related Gene Ontology (GO) categories and KEGG pathways, including neuroactive ligand–receptor interaction, phagosome formation, FoxO signaling, Apelin signaling, and herpes simplex virus interaction. Several immune-regulatory proteins, such as Alpha-2-Macroglobulin, Fibulin, MEF2C, and complement factors, were consistently expressed, whereas others—including MADS-box proteins, anaphylatoxins, and cytosolic non-specific dipeptidase—showed weight-dependent variation. The observed expression patterns suggest that serum proteomic composition is closely linked to physiological and immunological transitions during ontogeny and freshwater migration. These findings offer novel insights into the developmental immunobiology of Hilsa and provide a valuable foundation for future research on domestication, stock enhancement, and aquaculture under changing environmental conditions.

Keywords: Proteomics, Hilsa, Immune gene, KEGG, Gene Ontology, LC-MS/MS

Integrated methods of controlling Argulosis in carp culture ponds

S. S. Das^{1*}, D. Choudhury² and M. K. Tripathy²

¹Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-761008

²College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-760007

*sidharthasdas@ouat.ac.in

The study was aimed at controlling argulosis in carp culture effectively, along with checking the use of unregulated chemicals, synthetic drugs, and plant extracts. Krishi Vigyan Kendra, Ganjam-II, under OUAT, Bhubaneswar, conducted a demonstration programme in 20 pisciculture ponds with a water spread area (WSA) of 14.20 ha, involving 20 farmers from 10 villages of 5 blocks, *i.e.*, Chikiti, Rangailunda, Chhatrapur, Kukudakhandi and Purusottampur. The demonstration programme involved capacity building of the farmers and technology showcasing the pond application of CIFRI-Argucure (Tandav) 40ml/Acre-m WSA 3 times in 7 days' interval along with feeding the fish mixed with Ivermectin 2% w/w powder 200 g/tonne feed for 5-7 days. Besides this provision for location-specific substrates such as bamboo poles, coconut/palm tree branches were provided in the dyke-adjacent water area for physical removal of the parasite. The basic water quality parameters, including the plankton, were measured at 3-day 'intervals during the application of the chemicals and at 7-day 'intervals post-application of the chemicals. The demonstration result was promising in effectively controlling the *Argulus* infestation by 96.58% without any negative effect on the zooplankton population and water quality parameters. Further, an average yield of 24.48% higher at 38.69 q/ha was observed than the local check (Farmers practice FP) at 31.08 q/ha. As apparent, the net return per ha-m also showed a significant increase from Rs. 1.16 lakh to Rs. 1.71 lakh with the corresponding BC ratio of 1.87 to 2.10. Hence, integrated management practice of application of antiparasitic drug TANDAV along with feeding Ivermectin 2% w/w powder as per the recommended dose may be followed in *Argulus*-infested ponds.

Keywords: *Argulus*, Integrated management, CIFRI-Argucure, Ganjam

Prodigiosin from Bivalve-Associated *Serratia marcescens*: A Natural Antimicrobial and β -Lactamase Inhibitor Against Fish Pathogens

Debasmita Mohanty^{1,2*}, Asit Kumar Bera¹, Hemanta Chowdhury¹, Punam Kumari², Mala Kumari¹ and Basanta Kumar Das¹

¹ ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata 700120, West Bengal

² Department of Bioscience and Biotechnology, Fakir Mohan University, Vyasa Vihar, Balasore, 756020, Odisha

*simidebasmita05@gmail.com

The rapid rise of antimicrobial resistance (AMR) and limited effective treatments in aquaculture demand novel, eco-friendly alternatives. In this study, a red pigment-producing *Serratia marcescens* strain (IFSMLMEK1) was isolated from the freshwater bivalve *Lamellidens marginalis*. The extracted pigment, prodigiosin, was characterized using UV-Vis and FTIR spectroscopy. Functional bioassays demonstrated significant antibacterial activity against major fish pathogens, including *Aeromonas hydrophila*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Staphylococcus aureus*. Strong antibiofilm activity was observed, particularly against high biofilm-producing *Pseudomonas aeruginosa*, with dose-dependent inhibition. Importantly, this is the first report of prodigiosin's antifungal activity against aquatic oomycete pathogens *Saprolegnia parasitica* and *Aphanomyces invadans*, known for causing high mortality in freshwater fish species. Antioxidant assays further indicated the potential of prodigiosin to mitigate oxidative stress in aquaculture settings. Whole-genome analysis confirmed the presence of a complete prodigiosin biosynthetic gene cluster with 100% similarity to known references. In silico molecular docking revealed stable binding of prodigiosin with key extended-spectrum β -lactamase (ESBL) enzymes TEM, SHV, and CTX-M highlighting its potential as a β -lactamase inhibitor. Moreover, this study identifies prodigiosin as a promising natural compound for controlling fish pathogens and combating AMR in aquaculture.

Keywords: Prodigiosin, *Serratia marcescens*, Aquaculture pathogens, Antibiofilm activity, β -lactamase inhibition

Prevalence of Snakehead Rhabdovirus - Indian Strain (SHRV-In) in Tamil Nadu, India, and Susceptibility of Nile Tilapia to the Virus

Priyadharshini Michael*, Sivasankar Panchavarnam, Chrisolite Bagthasingh, Subash Palaniappan, Rani Velu, Vijay Amirtharaj Kandasamy Sekaran, Mohamed Mansoor Mohaideenpitchai, Mageshkumar Palraj and Selvamagheswaran Muthumariyapan

Fisheries College and Research Institute (FC&RI), Thoothukudi -628 008, Tamil Nadu, India.

*michaelpriyadharshini@gmail.com

Snakehead rhabdovirus (SHRV-In) is one of the most potentially harmful pathogens of snakehead, capable of causing 100% mortality within five days. This study aimed to screen freshwater fishes in Tamil Nadu for the occurrence of rhabdovirus, detect genomic variations among strains, and assess the susceptibility of tilapia to SHRV-In. Surveillance conducted across six districts (Tirunelveli, Thoothukudi, Madurai, Erode, Trichy, and Thanjavur) confirmed the presence of the virus, with an overall prevalence of 6.6%. Eight virus strains were isolated from snakehead and tilapia exhibiting clinical signs such as scale loss, discolouration, pale patches, dermal ulceration, and haemorrhages. PCR amplification targeting the N, P, M, G, NV, and L genes revealed that all genes were present in strains from Tirunelveli and Tenkasi. However, the P gene was not detected in strains from Madurai and Thanjavur, the M gene was not detected in the Trichy strain, and the N gene was not detected in the Thoothukudi strain. Infecting tilapia with SHRV-In-TL strains caused important changes in their tissues, blood, immune system, and biochemistry, but there were no visible symptoms or deaths. These findings suggest that failure of SHRV-In-TL replication in Tilapia may result from host resistance mechanisms and viral genomic diversity.

Keywords: Genomic variation, infectivity, RT-PCR, SHRV-In, tilapia

Anthropogenic Modulation of Microbial Abundance and Community Dynamics in the East Kolkata Wetlands (EKW)

Angana Majumder, Vikash Kumar, Srikanta Samanta, Snehasis Dalal,
Rumali Sahoo, Asim Kumar Jana and Basanta Kumar Das*

ICAR-Central Inland Fisheries Research Institute, Barrackpore 700120,
West Bengal, India

*basantakumard@gmail.com

The bacterial community structure plays a fundamental role in aquaculture dynamics and is integral to the maintenance of aquatic ecosystem health. In the East Kolkata Wetlands (EKWs) the world’s largest functioning sewage-fed aquaculture system—continuous inputs of organic matter and pollutants from sewage discharge have created anoxic and nutrient-rich conditions. These environmental pressures foster the proliferation of opportunistic and pollutant-tolerant bacterial taxa, including faecal coliforms, antibiotic-resistant strains, and sulphate-reducing bacteria. This study investigates the bacterial community structure within the EKWs by sampling nine berries, categorised based on pollution levels into three groups: highly polluted (subject to daily or weekly sewage input), moderately polluted (monthly sewage input), and minimally polluted (primarily feed-based with occasional sewage inflow). Water, sediment, and fish samples were collected in triplicate during three distinct seasonal phases: pre-monsoon, monsoon, and post-monsoon. Phylogenetic analysis revealed distinct microbial assemblages: *Pseudomonas*, *Aeromonas*, *Bacillus*, and *Escherichia coli* were prevalent in water samples; *Enterobacter*, *Serratia*, and *Citrobacter* dominated sediment samples; while *Proteus*, *Providencia*, *Lysinibacillus*, and *Bacillus* was abundant in fish tissue. Pathogenicity and virulence potential of selected isolates were further evaluated through fish challenge assays, contributing valuable insights into disease causation and aiding in the development of targeted disease management strategies. This study provides a comprehensive assessment of microbial diversity in EKWs under varying anthropogenic stress, highlighting its implications for aquaculture sustainability and ecosystem resilience.

Keywords: Bacterial community, sewage, East Kolkata Wetland, aquaculture

Prevalence of Multidrug-Resistant and ESBL-Producing *Aeromonas* spp. in the Adi Ganga River, West Bengal, India

Mala Kumari*, Debasmita Mohanty, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata
700120, West Bengal

*mala12041994@gmail.com

The detection of multidrug-resistant (MDR) *Aeromonas* spp. in aquatic environments presents a growing public health concern. This study focused on the Adi Ganga River, a heavily urbanized and polluted tributary of the Ganga River in West Bengal, India. Surface water samples were collected from multiple locations along the Adi Ganga, and 33 distinct *Aeromonas* spp. were isolated. The study aimed to investigate the prevalence of MDR, extended-spectrum β -lactamase (ESBL), and plasmid-mediated AmpC-producing *Aeromonas* spp. The isolates demonstrated high levels of resistance to β -lactam/ β -lactamase inhibitor combinations (ampicillin/sulbactam: 94%, amoxicillin/clavulanic acid: 67%), carbapenems (imipenem: 91%), and cephalosporins (cephalexin: 61%, cefepime: 55%, ceftazidime: 47%, ceftriaxone: 39%). Resistance to tetracycline (18%) and chloramphenicol (15%) was comparatively lower. ESBL production was confirmed in 56% of isolates, with blaTEM (94%), blaSHV (39%), and blaCTX-M group (27%) genes detected. Additionally, plasmid-mediated AmpC β -lactamase genes were found in 15% of isolates. The presence of MDR and ESBL-producing *Aeromonas* spp. in the Adi Ganga River underscores the environmental risk of antimicrobial resistance dissemination, posing serious implications for human, animal, and aquatic health.

Keywords: *Aeromonas* spp., Adi Ganga River, Multidrug resistance (MDR), Extended-spectrum β -lactamase (ESBL), Antimicrobial resistance (AMR)

Evaluation of effective antimicrobial therapy for aeromoniasis in carps

Santosh Kumar Udgata, Puspa Chandravanshi, Brundaban Sahu, Nrusingha Charan Pasupalaka, Manoj Kumar Tripathy*, Dharitri Choudhury and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur, Odisha
*udgatask2002@gmail.com

Aeromoniasis was found to be the most predominant bacterial disease in a surveillance programme from April 2014 to March 2020 in Southern Odisha, varying from 6.7 to 29.4%. In the present study, three antibiotics, namely ciprofloxacin, ofloxacin, and norfloxacin, were tried. Doses were finalised according to 2.0 g/ml as the MIC value and 3.0 µg/ml as the MBC value for Ciprofloxacin; 5.0 µg/ml as the MIC value and 25.0 µg/ml as the MBC value for Ofloxacin; and 5.0 µg/ml as the MIC value for Norfloxacin. The MBC/MIC ratio was determined for ciprofloxacin as 1.5 and for ofloxacin as 5. Since the value of the MBC/MIC ratio was below 4 for ciprofloxacin, this was bactericidal. Whereas Ofloxacin was bacteriostatic, as the value of the MBC/MIC ratio was above 4. Based on this result, ciprofloxacin and ofloxacin were tried for *vivo* application. The LD₅₀ value of *A. hydrophila* (*Ah2*) was calculated to be 2.19 x 10⁷ cfu/fish. The causative agent was re-isolated from the kidneys and liver of the moribund fishes and subjected to 16S rRNA gene sequencing and deduced gene sequence of 1484 bp. The pairwise sequence alignment was performed with the reference strain, *Ah2* (GenBank Accession No. MT974689.1), showing 100% identity, confirming the causative agent to be the same strain, *A. hydrophila*. Experimentally infected fishes were treated with ciprofloxacin and ofloxacin at three different doses (2.5 µg, 3.0 µg, 3.5 µg and 5.0 µg, 25 µg, 50 µg, respectively) per gram of body weight for ten consecutive days. Doses were selected based on MIC and MBC values. The percentage recovery was found to be better for Ciprofloxacin than Ofloxacin. A farm trial was also conducted with the same antibiotics with the same doses. ANOVA with LSD analysis was carried out and the effect of doses of 3.0 µg/ml and 3.5 µg/ml was found significantly superior to 2.5 µg/ml of ciprofloxacin. Finally, ciprofloxacin at 3.5 µg/ml was incorporated into feed found suitable for application at the farmer's pond.

Keywords: *A. hydrophila*, Aeromoniasis, Antibiotics

The Use of Some Alternative Therapies in the Healing of Diseases of Fish in West Bengal

Debapriyo Mukherjee, Nabanita Chakraborty, T.J. Abraham, Prasenjit Mali and Gadadhar Dash*

Dept. of Aquatic Animal Health, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, Panchasayar, Kolkata-700094

*dashgadadhar@gmail.com

The growing problem of bacteria becoming resistant to antibiotics and worries about antibiotic leftovers in fish farming have led to a big move towards using treatments that don't involve antibiotics for managing fish diseases. Bacteria and parasites are the most common pathogens of cultured warm-water fish and cause major losses to the freshwater aquaculture industry worldwide. Alternative therapies such as probiotics, herbal extracts, immunostimulants, common disinfectants, bacteriophage therapy and improved husbandry practices would also be effective for reducing bacterial infection in freshwater fishes. This study explores the assessment of efficacy in three (03) herbal extracts (namely *Ayapana triplinervis*, *Nyctanthes arbortristis*, and *Allium sativum*) and two (02) common disinfectants (namely hydrogen peroxide and benzalkonium chloride), which were extensively studied, and the challenges associated with the rise of these non-antibiotic interventions were investigated. Based on laboratory trials and challenge tests in a controlled environment, the research highlights the benefits of sustainable disease control measures. The studies showed ulcer disease in *L. rohita* caused by *Aeromonas hydrophila* could be treated with *Ayapana triplinervis* at 10 gm/kg feed. *Nyctanthes arbortristis* at 1 gm/kg feed was an effective remedy for the reduction of endoparasitic infections in *H. fossilis*. Extract from *Allium sativum* was able to reduce 98.51% growth of *E. tarda* with only 2.5% of extract and boosted the survivability of *C. batrachus* to up to 93.1%. Hydrogen peroxide at a concentration of 5 ppm proved to be effective in treating *Labeo rohita* infected with *Aeromonas veronii*, and benzalkonium chloride (BKC) was similarly effective at 1 ppm. The findings elicit the potential of herbal extracts and common disinfectants as effective, sustainable alternatives to antibiotics in freshwater aquaculture.

Keywords: Antimicrobial resistance, herbal extracts, common disinfectants, benzalkonium chloride

Dietary oxolinic acid administration induces behavioural, haematological and biochemical alterations in catfish *Pangasianodon hypophthalmus*

Sohini Chatterjee^{1*} Sanjib Kumar Manna¹ Tapti Sengupta², Nilemesh Das¹, Asit Kumar Bera¹ and Prasanna Kumar Patil³

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal-700 120

²West Bengal State University, North 24 Parganas, Malikapur, Berunanpukuria, Barasat, Kolkata, West Bengal-700 126

³ICAR – Central Institute of Brackishwater Aquaculture, Santhome High Road, RA Puram, MRC Nagar, Chennai, Tamil Nadu – 600028

*sohinisc14@gmail.com

Oxolinic acid (OA) is a 4-quinolone, approved as an aqua medication in several European Union countries. The main goal of this study was to investigate the safety of the antibiotic for *Pangasianodon hypophthalmus*, a catfish with huge aquaculture importance. Fish with an average body weight of 30±2.8 g were in-feed administered oxolinic acid at doses ranging between 12 (1× dose) and 120 (10× dose) mg kg⁻¹ body weight daily for a consecutive 21 days. This was followed by a further 14 days of withdrawal observation. Fish behaviour, feed intake, blood biochemistry, and blood cell counts were regularly monitored on days 5, 10, 15, 18, and 21 of the experiment to assess the fish health. The results showed increased levels of SGOT and SGPT up to 296.14±1.23 IU/L and 129.95±0.98 IU/L, respectively, in fish administered with 3× and 5× dosages of the antibiotic. There was also a rise in blood urea nitrogen and creatinine levels, especially in the 5x dosage group, indicative of impaired kidney function. An increase in the blood globulin level after the drug withdrawal might suggest a potential immunostimulation property of the antibiotic. There was no fish death, and most of the changes were reversible after drug withdrawal, suggesting moderate hepatotoxic and nephrotoxic activities of oxolinic acid in the catfish.

Keywords: Pangasius, oxolinic acid, blood biochemistry, haematology

Spatio-Temporal Patterns and Correlates of Aquatic Animal Diseases in West Bengal: Insights from Disease Surveillance under NSPAAD by Faculty of Fisheries, WBUAFS (2022–2025)

Nabanita Chakraborty, Debapriyo Mukherjee, T.J. Abraham, Prasenjit Mali & Gadadhar Dash*

Dept. of Aquatic Animal Health, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, Panchasayar, Kolkata-700094

*dashgadadhar@gmail.com

An extensive analysis of fish and shrimp disease surveillance data from West Bengal (2022–2025) revealed interesting spatio-temporal patterns and key factors influencing aquatic disease outbreaks. Over 60 disease events were documented, with South 24 Parganas, Purba Medinipur, and Howrah identified as critical hotspots. Bacterial diseases were frequently observed in *Labeo rohita*, *Catla catla*, *Clarias batrachus*, and *Penaeus vannamei*. Parasitic infections were common in fish farming systems with a lot of fish crowded together and weak safety measures. Seasonal peaks were consistently reported during pre-monsoon (March–May) and post-monsoon (November–January), coinciding with climate stress and water quality fluctuations. Several shrimp farms reported abiotic-triggered syndromes such as Bright Red Syndrome, White Faecal Syndrome, and Cramp Muscle Syndrome. The analysis highlighted a strong pathogen–host–environment triad: bacterial infection under immunosuppression and poor feeding practices, parasitic infections in overstocked stagnant ponds, and *Vibrio* infection in shrimps under salinity and pH fluctuations. Disease emergence and spread further accelerated with traditional feeding, delayed diagnosis, and absence of prophylaxis. The findings emphasise the need for continuous surveillance, better farm management, and widespread outreach tools like the Report Fish Disease (RFD) mobile app. The National Surveillance Programme on Aquatic Animal Diseases (NSPAAD) enables early detection, region-specific interventions, and farmer-level capacity building.

Keywords: Disease surveillance, bacterial diseases, parasitic infestations, pathogen–host–environment triad & NSPAAD

Temporal dynamics of oxytetracycline residue in the muscle tissue of *Anabas testudineus* following oral administration and assessment of its withdrawal period

Rahul Thaware¹, Gijo Ittoop¹, Sanis Juliet² and Suresh N. Nair^{3*}

¹Department of Aquatic Animal Health Management, Kerala University of Fisheries and Ocean Studies, Panangad, Kochi-682 506.

²Department of Veterinary Pharmacology and Toxicology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala- 673 576

³Department of Veterinary Pharmacology and Toxicology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala- 680 651

*suresh@kvasu.ac.in

This study investigated the muscle residue of oxytetracycline (OTC) after its oral administration at a dose of 80 mg/kg to climbing perch, *Anabas testudineus*. The first group, consisting of five fish fed a standard commercial diet, was compared to the second group, consisting of a total of 60 fish which received a single oral dose of OTC through medicated feed at 80 mg/kg for 5 days, with muscle residue determination conducted at a water temperature of 26±1°C. A total of 60 (15x4) fish were sacrificed for muscle tissue. Samples were collected at intervals of 0, 1, 2, 3, 5, 7, 10, 12, 14, 16-, 20-, 24-, and 30-days post-medication after euthanasia. At each time point, five fishes (one from each replicate) were sacrificed for sample collection, and muscle tissues were preserved in McIlvain buffer, later extracted using equal volumes of methanol and acetonitrile. The concentration of oxytetracycline in the muscle was quantified by RP-HPLC (C-18 column) using a mobile phase of oxalic acid, methanol and acetonitrile (77:18:5). Oxytetracycline residue levels exhibited a gradual increase from day 1 to day 5, reaching peak concentration on day 5, followed by a subsequent decrease. Analysis of the muscle concentration data using a four-point logistic regression equation revealed that the oxytetracycline concentration fell below the established Maximum Residue Level (MRL) of 1.5 µg/g by the 20.66th day. In conclusion, a withdrawal period of 21 days was deemed necessary in *Anabas testudineus* after the oral administration of oxytetracycline at the rate of 80 mg/kg for 5 days.

Keywords: Oxytetracycline, muscle tissue, *Anabas testudineus*, oral administration

Beyond Immediate Defence: Decoding the Mechanisms of Trained Immunity in Tilapia

Astha Deshmukh^{*1}, Dr. Yagnesh B. Motivarash², Dr. Pabitra Barik¹

¹Department of Aquatic Environment and Health Management, LSPNCOF, Kawardha, CG.

²Department of Fisheries Resource Management, LSPNCOF, Kawardha, CG.

*asthadeshmukh15@gmail.com

Trained immunity is a groundbreaking concept in the field of immunology, where the innate immune system experiences long-lasting epigenetic reprogramming and metabolic changes after being exposed to pathogens or immunomodulatory agents. This reprogramming leads to a heightened immune response during subsequent interactions with both homologous and heterologous pathogens. The current research seeks to develop an in vitro model of trained immunity to examine its fundamental mechanisms and investigate its potential as a novel therapeutic approach. In this study, head kidney macrophages were extracted from *Oreochromis niloticus* and cultured in Leibovitz's L-15 medium. To evaluate trained immunity, the cells were categorized into six experimental groups: β -glucan stimulation, β -glucan and metformin co-stimulation, restimulation with lipopolysaccharide (LPS), LPS restimulation combined with metformin, LPS-only stimulation, and a control group. Trained immunity was assessed by measuring levels of inflammatory cytokines, evaluating epigenetic chromatin modifications, quantifying the expression of trained immunity markers, and determining lactate dehydrogenase (LDH) activity. Analysis of proinflammatory cytokines TNF- α , IFN- γ , and IL-1, along with trained immunity marker HIF-1 α and mTOR, indicated the highest cytokine levels in the LPS-restimulated group, followed by the β -glucan-stimulated group. Furthermore, nitric oxide production, phagocytic activity, and LDH levels were significantly increased in the LPS-restimulated groups compared to the control. These findings highlight the enhanced immune responses that are typical of trained immunity.

Keywords: Trained immunity, innate immune memory, β -glucan, Epigenetic reprogramming

Surveillance and detection of asymptomatic infection of WSSV and ehp in wild *Penaeus indicus* broodstock from Indian coastal zones

Nagarajan Arun *, Shanmugakarthik J, Ravichandran Sathasivam, Sathish Kumar T, Deepakrajasekar Padmanaban, Saravanan K, Ananda Raja R, Subhendu Kumar Ota, and Akshaya Panigrahi

ICAR-Central Institute of Brackishwater Aquaculture, Chennai, - 600 028, Tamil Nadu, India

* arunvtg01@gmail.com

White Spot Syndrome Virus (WSSV) and *Ecytonucleospora hepatopenaei* (EHP) are major pathogens in shrimp aquaculture, posing serious threats to both farm-reared and wild shrimp populations due to their high virulence and potential for widespread transmission. In the present study, wild *Penaeus indicus* shrimp were collected from various coastal regions across India and screened for WSSV and EHP using a TaqMan probe-based multiplex qPCR assay. Genomic DNA was extracted from pleopod tissue using a column-based method to ensure high purity and consistency. Specific primers and probes targeting the VP28 gene of WSSV and the SWP gene of EHP were employed to enable the simultaneous detection of both pathogens in a single multiplex qPCR reaction. To validate WSSV-positive samples, a Loop-Mediated Isothermal Amplification (LAMP) assay was subsequently performed. Several shrimps tested positive for one or both pathogens, including individuals without visible signs of infection, indicating the presence of asymptomatic carriers. The use of TaqMan probes enhanced the specificity and sensitivity of the multiplex qPCR assay, demonstrating its potential as a reliable tool for field-level diagnostics. These findings suggest the silent circulation and environmental persistence of these pathogens in wild stocks and underline the need for continuous pathogen detection and disease surveillance in natural shrimp populations.

Keywords: White Spot Syndrome Virus, *Ecytonucleospora hepatopenaei*, *Penaeus indicus*, TaqMan probe PCR

In Silico Screening of Neem Phytocompounds Against *Vibrio parahaemolyticus* Virulence Proteins

Kulothungan Balasundaram*, R. Naveenkumar, N. Arun, R. Surya and A. Panigrahi

Crustacean Culture Division, ICAR-Central Institute of Brackishwater Aquaculture, Chennai, India-600 028.

* kulathunganbala99@gmail.com

Vibrio parahaemolyticus is a major pathogen in shrimp aquaculture, causing acute hepatopancreatic necrosis disease (AHPND) and vibriosis, both of which contribute to significant economic losses. Its ability to form biofilms enhances its virulence, persistence, and resistance to conventional treatments. In this study, eighteen phytocompounds derived from Neem, *Azadirachta indica* were evaluated for their antivirulence potential using molecular docking approaches. The docking was performed using PyRx version 0.9.8, targeting five key virulence-related proteins of *V. parahaemolyticus*. Pharmacokinetic profiling was carried out using SwissADME and ADMETlab 2.0, while toxicity was assessed via ProTox-II. Among the tested compounds, Cianidanol, Epicatechin, Isomargolonone, Margolonone, and Quercetin showed favorable drug-likeness, high gastrointestinal absorption, good solubility, and no major predicted toxicity. These compounds also demonstrated consistent binding affinities: Cianidanol (−7.1 to −6.3 kcal/mol), Epicatechin (−8.1 to −6.5 kcal/mol), Isomargolonone (−7.4 to −6.2 kcal/mol), Margolonone (−8.1 to −5.7 kcal/mol), and Quercetin (−8.1 to −6.8 kcal/mol). Among them, Epicatechin and Cianidanol were particularly notable for their strong binding, safe pharmacological profiles, and predicted antivirulence potential. As a next step, MD simulations will assess complex stability, followed by in vitro and in vivo validation to confirm efficacy for sustainable shrimp health management.

Keywords: *Vibrio parahaemolyticus*, *Azadirachta indica*, Molecular docking, Pharmacokinetics, Aquaculture

Evaluation of reference gene stability in *Labeo catla* under bacterial and hypoxic stress conditions

Arpit Acharya¹, *, Gayatri Tripathi², ** and Raja Aadil Hussain Bhat³

¹College of Fisheries, OUAT, Rangeilunda, Berhampur, Odisha

²ICAR- Central Institute of Fisheries Education, Mumbai, Maharashtra

³ICAR- Directorate of Coldwater Fisheries and Research

*acharya.arpit18@gmail.com

The selection of an appropriate reference gene is critical for accurate normalization in gene expression studies. Traditionally, housekeeping genes are chosen arbitrarily, despite growing evidence that their expression can vary across tissues and experimental conditions. This study aimed to evaluate the stability of three commonly used reference genes β -actin, glyceraldehyde-3-phosphate dehydrogenase (*GAPDH*) and elongation factor-1 alpha (*EF-1 α*)—in *Labeo catla* under four experimental conditions: bacterial challenge (B), hypoxia (H), combined bacterial challenge and hypoxia (B+H), and control (C). Five tissues (blood, gill, liver, kidney, and spleen) were collected at defined intervals and analysed using RT-qPCR. The cycle threshold (Ct) values were assessed for expression stability using the RefFinder tool, incorporating multiple statistical algorithms. Results revealed tissue and treatment-specific variation in gene stability. *GAPDH* exhibited the highest variability and was consistently ranked as the least stable across all conditions. In contrast, β -actin and *EF-1 α* showed stable expression in kidney and liver tissues, making them more reliable reference genes under the tested conditions. These findings emphasize the importance of validating reference genes prior to their use in gene expression studies and caution against the routine use of *GAPDH* in *L. catla* without prior validation.

Keywords: Housekeeping gene stability, *Labeo catla*, Hypoxia, Bacterial challenge, RefFinder

Harnessing the potential of probiotic microbial proteins for bacterial disease management in aquaculture

R. Bharathi Rathinam*¹, Tanvi Sawant², Ratnesh Jain², Amulya, S.G.¹ and Gayatri Tripathi¹

¹ICAR-Central Institute of Fisheries Education, Mumbai

²Institute of Chemical Technology, Mumbai

*rbharathi@cife.edu.in

The present study investigated the antimicrobial potential of probiotic bacterial strains isolated from freshwater farmed Asian seabass i.e., PS29, PS36 isolates and commercially available *Lactobacillus plantarum* and *L. rhamnosus* for bacterial disease management in aquaculture. Two protein extraction methods, acetone precipitation and methanol-chloroform precipitation, were employed to isolate proteins from concentrated and non-concentrated cell-free supernatant fractions (CFS). The results showed variable protein yields depending on the strain and extraction method. The methanol-chloroform method resulted in higher protein yields from concentrated CFS invariable of strains, while the acetone precipitation method was more effective for strains PS29, PS36 and *L. rhamnosus*. Antimicrobial assays demonstrated that the protein fractions exhibited inhibitory activity against fish bacterial pathogens i.e., *Aeromonas veronii*, *Lactococcus lactis* and *Photobacterium damsela* isolated from Asian seabass cultured in freshwater as well as brackishwater. Notably, the probiotic isolates derived from the gut of Asian seabass exhibited stronger anti-microbial activity than the commercially available probiotics. The findings emphasize the potential of probiotic-derived proteins as natural alternatives for bacterial disease management in aquaculture.

Keywords: Asian seabass, Protein extraction, Probiotic protein and Anti-microbial activity

Next generation therapeutics from the marine organism: biomedical roles of natural and synthetic aquatic biomolecules

Deepakrajasekar Padmanaban* and Akshaya Panigrahi

ICAR-Central Institute of Brackishwater Aquaculture, Chennai, Pin – 600 028, Tamil Nadu, India.

* deepurajasekar@gmail.com

Natural biomolecules synthesized by aquatic and terrestrial organisms play essential roles in diverse physiological and biochemical processes. These include primary metabolites such as proteins, nucleic acids, lipids, and carbohydrates and a wide range of secondary metabolites, including alkaloids, flavonoids, polyphenols, and peptides. Due to their structural complexity and functional specificity, these compounds are integral to drug discovery, exhibiting antimicrobial, antioxidant, anti-inflammatory, and anticancer activities. Among them, antimicrobial peptides (AMPs), from both natural and synthetic sources, have gained considerable interest for their broad-spectrum antimicrobial properties and additional therapeutic functions such as immunomodulation, wound healing, and anticancer effects. Marine organisms, constantly exposed to microbe-rich environments, are a prolific source of AMPs that serve as key components of innate immunity. These peptides exhibit diverse structures and mechanisms of action, enabling activity against bacterial, fungal, protozoan, and viral pathogens, as well as tumor cells. Unlike conventional chemotherapeutics, many AMPs demonstrate selective cytotoxicity toward cancer cells via membrane disruption, apoptosis, autophagy, cell cycle arrest, and metastasis inhibition, with lower resistance potential. Recent advancements in peptide design, chemical modification, and delivery technologies have improved their stability, specificity, and therapeutic efficacy. This review consolidates recent advances in the structural characteristics, functional mechanisms, and biomedical applications of marine-derived AMPs, highlighting their potential as next-generation therapeutics for infectious diseases and cancer.

Keywords: Bioactive molecules, marine organisms, antimicrobial peptides (AMPs), Infectious disease, anticancer agents

In silico approach to inhibit *Vibrio alginolyticus* infection via targeting the porin proteins using isoflavonoids compounds.

Modi Kiran Piyushbhai^{1*}, Deepika², Rahul Thakur¹, Manu Jena¹, Nida Qureshi¹, J Gopinath¹, C. Saranaya¹, Srikarnashekar Elango¹, Kumarguru Vasagam¹, Akshaya Panigrahi¹.

¹ICAR-Central Institute of Brackishwater Aquaculture, Chennai-600 028, TN, India.

²LSPN College of Fisheries, Kawardha, CG, 491 995, India.

* modikiran007@gmail.com

Shrimp aquaculture, a vital sector for global food security and economic growth, is increasingly threatened by bacterial pathogens such as *Vibrio alginolyticus*, which cause high morbidity, mortality, and economic loss. The excessive reliance on antibiotics has led to escalating antimicrobial resistance, necessitating sustainable alternatives. This study explores the antimicrobial potential of plant-derived isoflavonoids against *V. alginolyticus* using an *in-silico* drug discovery framework targeting key outer membrane porins (OmpN, OmpA, OmpC, OmpK, and ToxR). 3D structures of porins were modelled via Swiss-Model and validated using SAVES v6.1. A library of 122 isoflavonoids from PubChem was screened using PyRx molecular docking. Binding affinities ranged from -7.2 to -11.4 kcal/mol, with Maackiain (CID-442810) demonstrating the strongest binding and favourable interaction profiles, confirmed through Discovery Studio visualization. Importantly, Maackiain also showed low predicted toxicity, making it a promising candidate for further development. This study underscores the power of computational screening in aquaculture therapeutics and identifies Maackiain as a novel, plant-based lead compound against *V. alginolyticus*. Future directions include *in vivo* validation in fish models, pharmacokinetic profiling, and mechanism elucidation-advancing toward antibiotic-free, sustainable disease management in aquaculture.

Keywords: *Vibrio alginolyticus*, *in silico* drug, Porin proteins, Swiss-Model, Maackiain

Mass Mortality in *Labeo bata* Linked to Co-infection by *Aeromonas veronii* and *Megasporoporia* sp.: Pathological and Immunological Insights

Pranaya Kumar Parida[#], Vikash Kumar, Basanta Kumar Das
Aquatic Environmental Biotechnology (AEB) Division,
ICAR-Central Inland Fisheries Research Institute (CIFRI), Barrackpore,
700120, India
basantakumard@gmail.com

Co-infections have a considerable influence on fish production, altering the progression and severity of various fish diseases. Despite this, the impact of co-infection on aquatic animals, including fish, has received minimal attention, leaving a significant gap in research. The research examines the cause behind significant mortality in *Labeo bata*. Microbial pathogens were isolated from infected tissue samples of *bata*, with preliminary identification of the strains as *Aeromonas veronii* and *Megasporoporia* sp. This identification was based on morphology, 16S rRNA and ITS PCR sequencing, along with phylogenetic analysis. A co-infection fish model was developed to explore the cellular and molecular responses of fish amidst bacterial and fungal co-infection scenarios. Additional analysis suggested that the co-infection condition may be linked to the outbreak of the disease and the resulting mortality of *L. bata*, as confirmed by survival assays, histological examinations, and qPCR analysis. The findings indicated that co-infection with *A. veronii* and *Megasporoporia* sp. resulted in different degrees of cellular alterations within the muscle tissues of infected *L. bata* samples. Transcription analysis further reveals that co-infection influences the expression of genes associated with inflammation (*TNF- α* , *IL-1 β* , *iNOS*), immune activation (*TLR 4*, *C3*, *MYD88*, *NOD 1*), and both innate and adaptive immune responses (*IFN- γ* , *Hsp70*, *Mx*, *IgM*) in liver, kidney, and gill tissues from infected *L. bata*. The insights gained from this study are invaluable for understanding co-infection dynamics and pathobiology, which are essential for risk assessment and the development of management strategies to mitigate virulence.

Keywords: *Labeo bata*, co-infections, *Aeromonas veronii*, *Megasporoporia* sp., pathogenesis

Effect of repeated bacterial culture on virulence and antibiotic resistance characteristics: a study of gram-positive and gram-negative fish pathogens

Vikash Kumar*, Angana Bag, Pranaya Kumar Parida, Anupam Adhikari, Souvik Dhar, Asim Kumar Jana and Basanta Kumar Das[#]

Biotechnology laboratory, ICAR-Central Inland Fisheries Research Institute, Barrackpore-700120, West Bengal, India

* kumar.vika.vikash2@gmail.com

In this study, we examined the effects of repeated in vitro subculturing on the virulence and antimicrobial resistance (AMR) profiles of Gram-negative and Gram-positive fish pathogens. The fish pathogenic bacterial isolates, namely *Lactococcus lactis*, *Enterococcus gallinarum*, *Proteus penneri*, and *Escherichia coli*, underwent 56 consecutive subcultures in tryptic soy broth and were evaluated for virulence, antimicrobial susceptibility, and AMR gene expression. The results revealed a significant decrease in the virulence of Gram-positive pathogens. Both *L. lactis* and *E. gallinarum* exhibited a marked reduction in the mortality rates of *Labeo rohita* after repeated subculturing, ultimately achieving 0% mortality by day 56. This suggests losing key virulence factors, such as toxins and adhesins, under non-selective conditions. In contrast, Gram-negative bacteria, particularly *P. penneri* and *E. coli*, exhibited higher levels of virulence throughout the study, even though mortality rates gradually declined. The antimicrobial resistance profiles of *L. lactis* remained steady, demonstrating consistent resistance to a wide range of antibiotics, including rifampicin and polymyxin B. Meanwhile, *E. gallinarum* showed slight variations in resistance, especially to colistin, while *P. penneri* and *E. coli* experienced changes in resistance to multiple antibiotics, including polymyxin B and tetracycline, after 42 days of subculturing. Importantly, no genetic alterations were detected in AMR-related genes through quantitative PCR analysis, indicating that the observed changes in resistance were likely phenotypic rather than genetic. This study underscores the critical need for ongoing surveillance in aquaculture pathogen management, emphasizing the dynamic nature of bacterial virulence and resistance profiles that can develop from prolonged subculturing.

Keywords: *In-vitro* subculturing, virulence, antimicrobial resistance, fish pathogens, aquaculture

Dietary Supplementation of *Bacillus amyloliquefaciens*, *B. subtilis* and *B. cereus* Individually or in Consortium Effected Growth Performance, Skin Mucosal Immunity, mRNA Expression, and Disease Resistance Against *Aeromonas hydrophila* and *Edwardseilla tarda* in Asian Stinging Catfish, *Heteropneustes fossilis* (Bloch 1793)

Chinmayee Muduli*, Mamatarani Mahapatra and Pushpa Choudhary

Fish Health Management Division, ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar, Odisha-751002, India

*[mailto:chinmayi@gmail.com](mailto:mailtochinmayi@gmail.com)

Probiotics represent a promising avenue for improving the sustainability and profitability of aquaculture. A 45-days of feeding trial was conducted to understand the effect of dietary supplementation of *Bacillus amyloliquefaciens*, *B. subtilis* and *B. cereus* individually or in consortium on the growth performance, skin mucosal immunity, expression of immune and anti-oxidant gene, and disease resistance against *Aeromonas hydrophila* and *Edwardseilla tarda* in Asian stinging catfish, *Heteropneustes fossilis*. Probiotic supplemented diet was prepared by adding the probiotic strain to the basal diet (control) @ 10^9 CFU g^{-1} . The analysis shows that, growth indices viz. specific growth rate, weight gain, condition factor, and viscerosomatic index were significantly high and feed conversion ratio was significantly low in the probiotic consortium fed group. Survival rates remained unchanged. Significant increase in immune-related factors like lysozyme and immunoglobulin in serum and mucus was recorded. Furthermore, this probiotic consortium supplementation uplifted the antioxidant activity in serum and reduced stress by decreasing cortisol. Molecular study indicates that the antioxidant gene, growth related genes, effector cytokines gene expression were significantly induced by feeding probiotic consortium consisting up of *Bacillus amyloliquefaciens*, *B. subtilis* and *B. cereus*. The survival percentage of 73.33% achieved in the probiotic consortium fed singhi.

Keywords: *Bacillus amyloliquefaciens*, *B. subtilis* and *B. cereus*, probiotic consortium, Asian stinging catfish

Characterization of *Aeromonas veronii* in Cage-Cultured Pangasius: A Case Study from Hirakud Reservoir, India

Ramesh Chandra Malick, Basanta Kumar Das, Satish Koushlesh, Pranab Gogoi, Canciyal Johnson, Ratul Chakraborty and Sobhagya Nayak

ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata, India

*malick.ramesh5@gmail.com

A disease outbreak affecting *Pangasius* (*Pangasianodon hypophthalmus*) cultured in cage systems at the Hirakud Reservoir, Odisha, was investigated following reports of abnormal mortality during the post-monsoon season. Clinical symptoms included haemorrhagic lesions on the body surface, ulceration at the fin base, and abdominal distension. Bacteriological analysis of infected tissues revealed the presence of *Aeromonas veronii*, a known opportunistic pathogen in freshwater aquaculture. Isolates were grown on Ampicillin Dextrin agar and displayed characteristic yellow colonies. Gram staining and biochemical profiling using API test kits confirmed the genus *Aeromonas*. For accurate identification and confirmation, molecular characterization was conducted by amplifying the 16S rRNA gene using universal primers. The resulting amplicons (~1.4 kb) were sequenced and submitted to NCBI GenBank. BLAST analysis revealed 99.8% similarity with reference *A. veronii* strains. Phylogenetic analysis further confirmed clustering with known pathogenic strains of *A. veronii*. The antibiotic resistance patterns of the isolated agent revealed that it was resistant to 45% of the tested antibiotics. The experimental challenge proved the pathogenicity of the bacteria with an LD₅₀ of 1.6×10^6 CFU/fish. The findings highlight the emerging threat of *A. veronii* in open-cage culture systems and the need for regular health surveillance, molecular diagnostics, and improved biosecurity practices. This study provides the first molecular evidence of *Aeromonas veronii* infection in *Pangasius* cultured in Hirakud cages and contributes to the growing concern over bacterial pathogens in reservoir-based aquaculture.

Keywords: *Aeromonas veronii*, *Pangasius hypophthalmus*, Hirakud Reservoir, 16S rRNA Cage culture, disease outbreak

Status of antimicrobial resistance (AMR) of *Pseudomonas aeruginosa* bacteria in rohu (*Labeo rohita*) in the Ganjam district of Odisha

Nityananda Das, Shaktiman Dash, Saumyendra Nanda, Santosh Kumar Udgata, Basant Kumar Khuntia and Parmesh Prasad Lenka

*pplenka077@gmail.com

The swab samples from fish gill were collected in TSB from live rohu (*Labeo rohita*) obtained from different aquaculture farms and reservoir of Ganjam district of Odisha and analyzed for the incidence of *Pseudomonas aeruginosa* species. The isolates which had shown growth on Cetrimide agar were furthered studied by doing different biochemical tests and observation of their morphology under compound microscope. Isolated bacteria showing positive result towards oxidase test and negative result towards indole, MR, VP and not producing H₂S were presumed as *P. aeruginosa* species. The disk-diffusion test was carried out against the *P. aeruginosa* for AMR test using different antibiotics like Pencillin (P), Ampicillin (AMP), Amoxyclav (AMC), Tetracycline (TE), Ciprofloxacin (CIP), Ceftazidime (CAZ), Amikacin (AK), Ofloxacin (OF), Gentamicin (GEN) and Cefotaxime (CTX). The zone of inhibition was then measured, and the sensitivity/ resistance of the isolates were assessed. The *P. aeruginosa* isolates from different part of Ganjam district showed 100% resistance to Pencillin (P), Ampicillin (AMP) and Amoxyclav (AMC) while it showed 100% susceptibility towards antibiotics like Tetracycline (TE), Ceftazidime (CAZ), Ciprofloxacin (CIP), Amikacin (AK), Gentamicin (GEN), Ofloxacin (OF) and Cefotaxime (CTX).

Keywords: *P. aeruginosa*, Biochemical test, Antibiotics, AMR, Rohu

Enhancement of antibody production by herbal dietary intake in *Labeo rohita*

Swagatika Sahu^{1*}, Jyotirmayee Pradhan², Basanta Kumar Das³

¹KrishiVigyan Kendra, Balasore (OUAT), ²KKS Women’s College, Balasore

³ ICAR-CIFRI, Barrackpore, West Bengal- 700 120

* swagatikasahu@ouat.ac.in

Herbal immune stimulants are widely used in aquaculture as a natural way to enhance fish and shrimp immunity and improve disease resistance. In this context, a 58-day study was conducted to evaluate the efficacy of ethanolic extract of *Curcuma longa* and *Allium sativum* on the immune response of *Labeo rohita* (avg wt. 180±30 g). In experimental diet, 0.5% of ethanolic extracts of *Curcuma longa* and *Allium sativum* was incorporated separately, in addition to the normal diet. All the groups of fish were injected intraperitoneally with 500 µl of 20% suspension of goat-RBC in phosphate buffered saline. After immunization blood and serum were collected on 7th, 14th, 21st and 28th to determine serum biochemical parameters such as total protein, albumin, globulin and albumin/globulin ratio, non-specific immunological parameters, like total serum antiprotease, alpha-1 antiprotease activity, myeloperoxidase (MPO) activity and RNA/DNA ratio. The results demonstrate enhanced total protein, albumin and globulin in 0.5% ethanolic extract treated groups. Significantly higher ($p \leq 0.05$) total serum antiprotease and MPO content was found in the treatment groups compared to control. The RNA/DNA ratio of kidney and spleen was observed significantly higher in all groups as compared to the control in entire exposure period. Results support the potential use of dietary herbal immuno-stimulant in culturing this fish.

Keywords: *Curcuma longa*, *Allium sativum*, *Labeo rohita*, yeloperoxidase, RNA/DNA ratio

Bioaccumulation and Human Health Risk Assessment of Heavy Metals in Different Edible Fish Species from Mangaluru Coast

Narendra Kumar Maurya*, A.T. Ramachandra Naik and Lakshmi pathi M. T.

College of Fisheries, Karnataka Veterinary, Animal and Fisheries Sciences University, Mangaluru 575 002, Karnataka

*mauryanarendra678@gmail.com

This century, heavy metal pollution has become a major problem, particularly in fish organs. because of the radioactive substances found in sewage, industrial and agricultural wastewater, which endanger human livelihoods by destroying aquatic habitats. In the pre monsoon, monsoon and post monsoon of 2024, five commercial fish species were taken from Mangaluru Wharf, and the health risks associated with low and high intake were evaluated. Heavy meals in various organs are determined using the atomic absorption spectrophotometer method, which is given as $\mu\text{g/g}$ dry weight. Result: In comparison to the gills, liver and kidney, muscle had lower quantities of Cd, Pb, Hg, As, Zn, Cu, Fe, and Ni (0.0001-0.0036, 0.006-0.143, 0.0001-0.0006, 0.0001-0.0016, 0.064-0.897, 0.895-1.898, 0.381-0.970, and 0.332-0.583) of heavy metals per gram. These levels fell between WHO, FAO/WHO, and EU limits. Edible species consumption fell short of the TDIs, Although THQ and TTHQ levels were less than 1, they were more than 1 in youngsters who were heavy consumers. Conclusion: According to the study's findings, eating Mangaluru coast fishes is safe for human health. It is imperative that consumers understand the potential health hazards associated with excessive fish intake, especially for youngsters who consume large amounts of it.

Keywords: Bioaccumulation, Heavy Metals, Human Health Risk Assessment, pollution

Occurrence of environmental bisphenol A in surface waters from the Ganga River Basin, India: Seasonal Changes and Risk Assessment

Sourav Kundu*, Lianthuamluaia, Basanta Kumar Das, Nirupada Chanu
ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata -
700120

*kingsourav@gmail.com

Over the past two decades, there has been a heightened focus on the impacts of bisphenol owing to its established endocrine-disrupting properties. This study assessed the prevalence of environmental bisphenol A (eBPA) in surface waters of the Ganga River Basin (GRB) in West Bengal. The analytical method was validated and utilized on over 90 surface water samples collected during three sampling expeditions from eight tributaries of the GRB in West Bengal. The determination of eBPA was carried out using solid-phase extraction (SPE) followed by derivatization before analysis via sandwich-ELISA. All tributaries exhibited elevated concentrations of eBPA in surface water during all seasons, with the peak level recorded in Adiganga (678.76 ± 13.59 ng/L) and the minimum found in the Rupnarayan River (118.06 ± 8.43 ng/L). The Damodar, Ichamati, and Jalangi rivers exhibited a moderate eBPA levels (358.15 - 474.58 ng/L) whereas the Matla and Churni rivers showed lower levels (230.91 - 266.22 ng/L). Data indicated that eBPA was extensively detected in surface riverine water across the whole GRB, with its prevalence in the lower sections of the tributaries attributed to industrial discharges. Human activities, including industrial, commercial, and residential waste discharge into tributaries, significantly affect the prevalence of eBPA in the GRB. The ecological risk assessed of eBPA in the GRB revealed risk quotient > 1 indicating considerable ecological concerns and may adversely affect aquatic life. This study highlights the urgent requirement for foundational data on eBPA prevalence and ecological risks to inform regulatory actions and implement effective mitigation strategies aimed at safeguarding the GRB tributaries.

Keywords: Bisphenol A, River Ganga, Tributaries, surface water, ecological risk

Physio-metabolic responses of *Catla catla* (Hamilton,1822) fry against ammonia toxicity

Subhasrita Nayak¹, Pratap Chandra Das¹, Himanshu Sekhar Swain¹ and Nabakishor Sial²

¹ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha, India, 751002

² College of Fisheries, OUAT, Rangailunda, Berhampur, Odisha, 760007
*nayaksrt999@gmail.com

Aquatic ecosystems are increasingly impacted by anthropogenic stressors, among which ammonia pollution poses a significant threat to freshwater fish populations, reflecting the same in the aquaculture systems. This study investigates the toxicological effects of ammonia on *Catla catla* fry by determining the 96-hour lethal concentration (LC₅₀) and analyzing physio-metabolic responses to sub-lethal ammonia exposure. The 96-hour LC₅₀ was calculated as 25.02 ppm, resulting in 100% mortality at concentrations of 75 ppm and above, and no mortality at up to 5 ppm. Fry were then exposed to sub-lethal concentrations of 12.51 ppm (1/2 LC₅₀), 6.25 ppm (1/4th of LC₅₀), and 2.50 ppm (1/10th of LC₅₀) for 30 days. Behavioural observations revealed erratic swimming, abnormal gill movements, and loss of equilibrium, intensifying with higher ammonia levels. Biochemical analysis indicated significant increase in blood glucose, SGOT, and SGPT, suggesting hepatic stress with respect to increase in the ammonia levels. Also, total protein, albumin, and globulin levels decreased, while the albumin-globulin (A/G) ratio increased at higher concentrations, indicating impaired protein synthesis. Elevated oxidative stress markers (SOD and catalase) highlighted adaptive responses of the fry to oxidative stress. Growth metrics including specific growth rate (SGR), daily growth index (DGI) and thermal growth coefficient (TGC) declined in a dose-dependent manner while the feed conversion ratio (FCR) and protein conversion ratio (PCR) increased under elevated ammonia concentrations reflecting poor feed and protein utilization. Water quality analysis indicated a decline in dissolved oxygen and increased pH and nitrogenous compounds, with higher ammonia levels. These findings provide valuable insights into the physiological and biochemical responses of freshwater fish to ammonia toxicity.

Keywords: *Catla catla*, ammonia, fry, lethal concentration, stress

One Health Approach to Reduce AMR Load from Poultry Waste through Circular Economy Model.

Aditya Pratap Acharya,¹ Sagarika Acharya², Hemanta Maity¹, Sanjay Kumar Dutta¹, Uttam Sarkar¹ & Indrajit Kar¹.

¹F/o-VAS, West Bengal university of Animal & Fishery Sciences.

²College of Fisheries, Bihar Animal Science University

* adityapratapacharya@gmail.com

India's poultry sector, with ~3430 million birds, produces 3.3 million tons of waste annually (Kokilan Divya Priya, 2022). On average, 1000 kg of live broilers generate 43 kg of fresh manure/day, and producing 1 kg of chicken requires 148 mg of antibiotics (Mutua et al., 2020). Due to poor antibiotic absorption in poultry (70–90% excreted; Liu et al., 2024), waste becomes a major source of antimicrobial resistance (AMR), harboring diverse ARGs and ARBs. High-density farming and improper waste disposal further aggravate ARG propagation. Heavy metals in manure may enhance ARG spread by promoting ARBs. Direct use of poultry manure in agriculture and aquaculture poses serious environmental and public health risks. A One Health, circular economy model is proposed to mitigate AMR through integrated waste valorization. Due to high nitrogen levels, poultry manure cannot be directly used for vermicomposting. Aquatic plants like *Azolla* and *Eichhornia* (Water Hyacinth), capable of heavy metal uptake, will be co-cultured with poultry manure (1:1 w/w) to balance the C:N ratio. *Azolla* will be harvested every 7–20 days and *Eichhornia* cultured in tubs with varying manure levels. Post-culture, sediments and chopped plant biomass will be mixed with poultry manure (1:1 w/w) for vermicomposting using *Eisenia fetida*. This combined bio-remediation process degrades organic matter and reduces antibiotic and ARG load. Antibiotic levels will be evaluated at 15, 30, 45, and 60 days; ARGs will be assessed via high-throughput sequencing at the end. This integrated approach not only recycles waste but also reduces environmental AMR risk, aligning with One Health principles.

Herbal Medicines in Aquaculture: A Natural Way to Healthier Fish Farming

Paidi Srivaishnavi*, Nityananda Das, Santosh Kumar Udgata, Manoj Kumar Tripathy and Arpit Acharya

College of Fisheries, OUAT, Rangailunda, Berhampur-07

*srivaishnavipaidi@gmail.com

Herbal medicines in fisheries refer to the integration of plant-based compounds and traditional medicinal knowledge into aquaculture practices, aimed at promoting fish health which is the major factor, disease resistance, and environmental sustainability. With the increasing challenges posed by antibiotic resistance, environmental stressors, and rising costs of conventional medicines, herbal remedies are emerging as a viable alternative source for disease control and growth promotion in aquaculture systems. The use of medicinal plants and herbal extracts such as neem, tulsi, garlic, aloe vera, and turmeric has shown promising results in boosting fish immunity, enhancing survival rates, and improving water quality through natural bioactive compounds. Incorporating herbal medicines reduces dependency on synthetic antibiotics, thus minimizing drug residues in fish products and preventing the emergence of resistant pathogens. Formulations using herbal feed additives, bath treatments, and immune stimulants offer cost-effective and eco-friendly solutions, particularly beneficial for small-scale and rural aquaculture sectors. These herbal approaches also align with organic and sustainable aquaculture practices. The review highlights recent innovations in herbal aqua-therapy, the effectiveness of plant-based immunostimulants, and their role in enhancing the resilience of fish species to environmental and pathogenic stresses. This concept review primarily focuses on the role of herbal bio-actives in promoting fish health, reducing production losses, and maintaining ecosystem balance. For a country like India, with deep-rooted traditions in herbal medicine, integrating these practices into modern fisheries is not just an alternative but a sustainable and culturally inclusive strategy for long-term sectoral development and the welfare of aquaculture communities.

Keywords: Herbal medicines, aquaculture, medicinal plants

Biochemical and molecular insights into *Argulus bengalensis* induced stress in *Labeo rohita*

Souvik Dhar*, Vikash Kumar, Pranaya Kumar Parida, Anupam Adhikari, Asim Kumar Jana and Basanta Kumar Das

Biotechnology laboratory, ICAR-Central Inland Fisheries Research Institute, Barrackpore-700120, West Bengal, India

*dharsouik2014@gmail.com

Several cases of high parasitic loads and pathogenicity have been reported which modulate the growth, hematological, and immunological factors in host fishes. The present study was undertaken to characterize the ectoparasite *Argulus* and investigate the host (*Labeo rohita*) response through serum and gene expression profiles. The gene expression was analyzed from two major immunocompetent organs, viz., the kidney and liver. Results showed that the isolated parasite was *Argulus bengalensis* through partial 18S rRNA (NCBI Accession number- PP107952). In the infected group, the serum parameters including IgM, C3, HSP70 and cortisol were significantly ($p < 0.05$) increased but CAT and SOD were significantly ($p < 0.05$) decreased as compared to the control group. The mRNA expression study highlights that catalase (CAT), heat shock protein 70 (HSP70), and *Nucleotide-binding oligomerization domain-1 (NOD1)* were significantly ($p < 0.05$) upregulated. In contrast, *Myeloid differentiation factor 88 (MyD88)*, *complement component (C3a)*, *Glutathione peroxidase (GPx)*, and *Toll-like receptor-4 (TLR4)* levels were statistically ($p < 0.05$) down-regulated in the *Argulus*-infected group as compared to the control group. It is observed that the alterations in serum biochemistry and immune gene expression induced by this parasitic infection contribute to the severe mortality of the economically important fish species, *L. rohita*. This study will serve as a reference for understanding the susceptibility of *L. rohita* to *Argulus bengalensis* and the defence mechanisms against ectoparasitic diseases that are treatable.

Keywords: *Ectoparasite; parasitic load; pathogenicity; molecular; serum; gene expression*

**Tissue-Level Analysis of Immune Modulation by Endocrine Disruptors
in *Labeo catla***

Anupam Adhikari^{*}, Vikash Kumar, Pranaya Kumar Parida, Souvik Dhar,
Asim Kumar Jana and Basanta Kumar Das

Biotechnology laboratory, ICAR-Central Inland Fisheries Research
Institute, Barrackpore-700120, West Bengal, India

[*anupamadhikari006@gmail.com](mailto:anupamadhikari006@gmail.com)

The persistent and widespread prevalence of endocrine-disrupting chemicals (EDCs) in the aquatic environments pose significant environmental concern. EDCs, which are prevalent in industrial wastes and personal-care products, pose a threat to human and aquatic health. Fish, especially *Labeo catla*, serve as sentinel organisms to measure water contamination. This study evaluated the immunotoxic effects of three common EDCs using *Labeo catla* as a model: triclosan (TCS), bisphenol A (BPA) and diethyl phthalate (DEP). EDCs affect several physiological functions, including the immune system, according to an expanding body of research. We assessed alterations in immune gene expression in the liver and brain tissues following exposure to the aforementioned EDCs. Immune-related genes were significantly upregulated in the results, suggesting that defense pathways were activated in response to stress being exerted by these EDCs. This study highlights TCS, BPA, and DEP's immunotoxic potential by showing that they can trigger immunological compensatory mechanisms meant to preserve homeostasis. Additionally, the results lend credence to the idea that immune gene expression could be used as a biomarker for aquatic organisms' exposure to EDCs. In order to evaluate long-term ecological risks and comprehend the immunomodulatory effects of environmentally relevant EDC concentrations, more research is necessary. For the purpose of monitoring the environment and creating regulatory plans to reduce EDC pollution in aquatic environments, these insights are essential.

Keywords: *Labeo catla*; Triclosan; Bisphenol A; Diethyl phthalate; Immunotoxic

Disease outbreak caused by *Aeromonas veronii* in *Labeo bata* in a freshwater wetland of Eastern India

M. Shaya Devi*, A.K. Bera, Shreya Ghoshal, R. K. Manna, A.K. Gupta and B.K. Das

ICAR- Central Inland Fisheries Research Institute, Kolkata-700120

*shayamanohar21@gmail.com

A comprehensive investigation was conducted into a large-scale fish mortality event in the freshwater wetland, Khalsi, located in North 24 Parganas, west Bengal, India. This wetland is typically used for stocking Indian major carps such as *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*, and the minor carp *Labeo bata*. During December–January 2024–25, a notable increase in mortality was observed specifically in *L. bata*. The affected fish exhibited signs of septicemic disease, including hemorrhagic spots, ulcerative lesions, and rotten, pale gill patches. Water and sediment samples were analyzed, and bacterial pathogens were isolated using microbiological and molecular techniques. *Aeromonas veronii* was identified from blood samples and appeared to be the causative agent of the disease. The isolate obtained from blood of moribund *L. bata* was subjected to biochemical test, 16S rRNA gene amplification, sequencing and phylogenetic analysis for identification and confirmation. Antibiotic susceptibility tests showed the bacterium was resistant to Cefoxitin, Amoxicillin, Imipenem and Ampicillin. The isolate was also tested through infectivity experiment in healthy *L. bata* for validation of Pathogenicity. The infectivity experiment showed that *A. veronii* could reproduce the disease and mortality. This study provides the first documented evidence of *A. veronii* infection in *Labeo bata*, offering valuable data to support improved disease management strategies in aquaculture.

Keywords: *Labeo bata*, *Aeromonas veronii*, Septicemic, mortality, resistant

Integrated Assessment of Pharmacokinetics, Residue Depletion, and Histopathological Effects of Emamectin Benzoate in Rainbow Trout

Richa Pathak^{1*}, Krishna Kala¹, Prasanna Kumar Patil², Neetu Shahi¹, Niladri Sekhar Chatterjee³, Ranjit Kumar Nadella³, Sumanta Kumar Mallik^{1#}

¹ICAR-Central Institute of Coldwater Fisheries Research (ICAR-CICFR), Anusandhan Bhavan, Bhimtal-263 136, Nainital, Uttarakhand

²ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA), Annamalai Puram, Chennai - 600028, Tamil Nadu, India

³ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), CIFT Junction, Willingdon Island, Matsyapuri, Kochi-682 029, India

[*richap1989@gmail.com](mailto:richap1989@gmail.com)

The study examined the pharmacokinetics, withdrawal period, biosafety, and histopathological effects of Emamectin Benzoate (EB) in rainbow trout (*Oncorhynchus mykiss*) following a 21-day oral exposure at therapeutic (1X; 50 µg kg⁻¹) and supra-therapeutic (5X; 250 µg kg⁻¹ and 10X; 500 µg kg⁻¹) doses. Pharmacokinetic profiling at 50 µg kg⁻¹ showed rapid absorption and wide tissue distribution, with the highest C_{max} and AUC values in the kidney (C_{max}: 346.29 µg kg⁻¹, AUC_{0-∞}: 71136.84 µg·h kg⁻¹), and the longest mean residence time (MRT) in the intestine (916.75 h), indicating delayed clearance. The muscle showed low accumulation (C_{max}: 13.07 µg kg⁻¹) and rapid elimination. Histopathological evaluations revealed no significant tissue alterations at the therapeutic dose. However, the 5X and 10X groups showed dose- and time-dependent lesions: myocyte loss and necrosis in muscle; cytoplasmic vacuolation, nuclear degeneration, and hypertrophy in liver; Bowman's space dilation, glomerular damage, and tubular alterations in kidney; epithelial lifting and hyperplasia in gills; and brush border disruption, enterocyte hyperplasia, and inflammatory infiltration in intestine. Behavioural observations indicated reduced feeding, hyperpigmentation, and minor mortality at the highest dose. Therefore, 50 µg kg⁻¹ body weight is recommended as the optimal and effective dose, ensuring therapeutic efficacy, biosafety, and compliance with withdrawal regulations in aquaculture.

Keywords: Emamectin benzoate, Rainbow trout, Pharmacokinetics, Histopathology, Withdrawal period

Winter stress leads infection by multiple pathogens of bacteria and parasite in *Pangasianodon hypophthalmus*

Bera A.K, Devi M.S, Rathod S.K, Das B.K, Gupta A.K, and Manna S.K
ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata-
700120

[*asitmed2000@yahoo.com](mailto:asitmed2000@yahoo.com)

A disease outbreak occurred in *Pangasianodon hypophthalmus*, maintained in experimental wet lab facility. The affected fish exhibited lethargic movement, and white granule like spots on body surface. Thorough pathological investigation, including microscopy, molecular analysis, and clinical examinations, were conducted. The bacterial pathogen *Aeromonas hydrophila* was isolated from blood samples, indicating a systemic infection. The pathogenicity of the isolated bacteria was confirmed through challenge experiments. Light microscopy of skin scrapings from affected fish revealed the presence of the protozoan parasite *Ichthyophthirius multifiliis*. Further, histopathological examination of the gills showed trophonts of the same parasite. Genomic DNA isolation from skin scrapings, followed by amplification of the universal 18S rRNA gene and sequencing, confirmed the presence of *Ichthyophthirius multifiliis*. On microscopic observation *Dactylogyrus* sp. was noticed in gill of some of the fishes. This study reports, for the first time, the co-infection of *Aeromonas hydrophila*, *Dactylogyrus* sp. and *Ichthyophthirius multifiliis* in *Pangasianodon hypophthalmus*. These findings provide foundational information for the diagnosis of fish diseases caused by distantly related pathogens

Keywords: *Pangasianodon hypophthalmus*, disease, stress, *Aeromonas hydrophila*, *Ichthyophthirius multifiliis*, and *Dactylogyrus* sp.

Assessment of Emamectin Benzoate Efficacy and Withdrawal Period for Controlling *Argulus* Infestation in Rainbow Trout, *Oncorhynchus mykiss* (Walbaum, 1792)

Krishna Kala^{1*}, Richa Pathak¹, Neetu Shahi¹, Prasanna Kumar Patil², Niladri Sekhar Chatterjee³, Ranjit Kumar Nadella³, Veena Pande⁴, Sumanta Kumar Mallik^{1#}

¹ICAR-Central Institute of Coldwater Fisheries Research (ICAR-CICFR), Anusandhan Bhavan, Bhimtal-263 136, Nainital, Uttarakhand

²ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA), Annamalai Puram, Chennai - 600028, Tamil Nadu, India

³ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), CIFT Junction, Willingdon Island, Matsyapuri, Kochi-682 029, India

⁴Department of Biotechnology, J. C. Bose Campus, Bhimtal 263 136, Kumaun University, Uttarakhand

[*krishnakala777@gmail.com](mailto:krishnakala777@gmail.com)

Rainbow trout (*Oncorhynchus mykiss*) is a key coldwater aquaculture species in India, particularly in the Himalayan region. However, ectoparasitic infections, especially from *Argulus* species, present a significant challenge, leading to economic losses and compromising fish health. This study assessed the effectiveness and withdrawal period of emamectin benzoate (EB), an anti-parasitic agent approved by both the FDA and EMA, against natural *Argulus* infestations in juvenile rainbow trout. Fish were treated with EB at doses of 25, 50, and 150 µg/kg body weight for seven consecutive days. Following treatment, the 50 µg/kg group showed improved feeding behavior and reduced stress associated with parasitic infection. Histopathological analysis revealed telangiectasia in the secondary lamellae of the gill filaments, with no observable changes in the liver, kidney, intestine, or muscle tissues. Tissue depletion studies indicated that the liver exhibited the highest accumulation and elimination rate of the drug. LC-MS/MS analysis confirmed that EB residues in edible tissues remained below the Maximum Residue Limit (MRL) of 100 µg/kg throughout the trial, eliminating the need for a withdrawal period. Overall, the findings demonstrate that EB is both effective and safe for controlling *Argulus* infestations in rainbow trout under Indian coldwater conditions, while also meeting international food safety standards.

Keywords: Emamectin benzoate, FDA, EMA, Coldwater, Efficacy, Maximum residue limit, Withdrawal period

Prevalence and Antibiotic Resistance of *Enterococcus* Species Isolated from Farmed Fish

Mohan Singh*, Krishna Kala, Richa Pathak, Bhupendra Singh, Neetu Shahi, Sumanta Kumar Mallik

ICAR-Central Institute of Coldwater Fisheries Research (ICAR-CICFR), Anusandhan Bhavan, Bhimtal-263 136, Nainital, Uttarakhand

*mohanbisht715@gmail.com

Aquaculture is the food industry with the quickest rate of growth because of the substantial rise in production brought about by the growing demand for animal protein worldwide. *Enterococcus* species, which are frequently found in the intestines of humans, animals, and aquatic organisms, are among the antibiotic-resistant bacteria that are posing a threat to this expansion. The purpose of this study was to identify and isolate *Enterococcus* species from the intestines of carp and trout that were collected from aquaculture farms in Himachal Pradesh and Uttarakhand, India. A total of 64 enterococci isolates were obtained from 110 fish samples using Slanetz-Bartley Agar, followed by morphological and biochemical identification. The prevalence of enterococci spp. in fish samples was 58%. The biochemical profiling showed typical *enterococcal* characteristics, including negative results for catalase and DNase, and positive aesculin hydrolysis and methyl red tests. Molecular characterization was performed using partial 16S rRNA gene sequencing and phylogenetic analysis. The identified isolates mainly belonged to *Enterococcus faecalis*, *E. faecium*, *E. hirae*, and *E. durans*. Antibiotic susceptibility of the isolates was tested against 29 antibiotics following CLSI (2016) guidelines using the disk diffusion method. The majority of isolates exhibited resistance to widely used antibiotics like Clindamycin, Kanamycin, Penicillin-G, Imipenem/Cilastin, and Lincomycin, according to the results, which showed concerning resistance patterns. The findings highlight the presence of antibiotic-resistant *Enterococcus* species in farmed fish in Uttarakhand and Himachal Pradesh, posing a potential risk for transmission of resistant strains through the food chain.

Keywords: *Enterococcus* spp., Antibiotic resistance, Biochemical characterization, Aquaculture.

Peroxidase mimic ferroxhyte (FeOOH) nanoparticles enabled highly specific colorimetric detection of arsenate in water and fish

Dhruba Jyoti Sarkar^{1*}, Ramij Raja¹, Basanta Kumar Das¹, Soumyadeb Bhattacharyya², Souvik Pal², Subhankar Mukherjee²,

¹Aquatic Environmental Biotechnology Division, ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, 700120, West Bengal, India

²Centre for Development of Advanced Computing-Kolkata, Kolkata-700091, West Bengal, India

*dhruba1813@gmail.com

Arsenic poses a serious health risk to humans. Hence, a simple and robust analytical approach for monitoring arsenic levels in water and food matrixes is required. We present a simple and rapid approach for quantifying arsenate in water and fish using ferroxhyte (FeOOH) nanoparticles as a sensor probe. The FeOOH nanoparticles showed peroxidase mimetic activity oxidizing 3,5,3',5'-tetramethylbenzidine (TMB) to a blue product (oxTMB, λ_{max} 650 nm) in the presence of H₂O₂. However, arsenate's presence inhibits the peroxidase activity of FeOOH nanoparticles through binding on the catalytic active sites. Based on this principle, the presently developed method obtained a good linear response (R^2 , 0.99) over the range of 0.005 to 5.000 mg L⁻¹ arsenate with 0.006 mg L⁻¹ as the detection limit which is less than the prescribed limit (0.010 mg L⁻¹) by WHO for drinking water. The average recoveries at different fortification levels ranged from 89.51 to 115.61 % in water and 101.11 to 106.99% in fish muscle. The present analytical technique showed good selectivity due to pronounced peroxidase inhibition alibility (60.53-103.78%) by arsenate than other non-target ions like PO₄³⁻, NO₃⁻, Cr₂O₇²⁻, etc. The FeOOH nanoparticles showed a promising application prospect for colorimetric detection of arsenate with a wide detection range in water and fish samples.

Keywords: Nanozyme, FeOOH, Arsenate, Water, Fish

A Smart and Accessible Solution for Aquatic Animal Health Management

Mrutyunjaya Das*, Dharitri Choudhury, Santosh Kumar Udgata, Manoj Kumar Tripathy Durga Charan Sethy and Soumya Priyadarshini

College of Fisheries, OUAT, Rangailunda, Berhampur-07

*smrutyun@gmail.com

Aquaculture plays a crucial role in global food security, yet it faces persistent challenges such as disease outbreaks, suboptimal health monitoring, and inefficient resource use. These health-related setbacks often lead to significant economic losses for farmers. A technology-driven solution is essential to empower farmers with tools that enhance aquatic animal health, ensure biosecurity, and improve overall farm sustainability. Addressing this need, AquaClue emerges as a transformative platform that simplifies aquaculture management while prioritizing animal health and disease control through accessible, intelligent solutions. AquaClue integrates innovations in aquatic health management with user-friendly digital tools. It offers a disease diagnosis assistant to support early detection and minimize stock losses, smart calculators for feed and water quality management to reduce health risks, and a daily task manager to maintain farm hygiene protocols. Educational modules promote best health practices, while planned AI-powered analytics and IoT integration will allow real-time monitoring of health parameters, automated alerts, and predictive disease modeling. By uniting innovation, accessibility, and sustainability, AquaClue empowers aquaculture communities to improve animal health, reduce mortality, and build a resilient aquaculture future.

Keywords: Aquaculture, Aquatic Animal Health Management, AquaClue, Sustainability, Innovation, Productivity

Pharmacokinetics and Tissue Distribution of Lufenuron in Juvenile Rainbow Trout (*Oncorhynchus mykiss*) Following Single Dose Oral Administration

Richa Pathak^{1*}, Krishna Kala¹, Prasanna Kumar Patil², Neetu Shahi¹, Niladri Sekhar Chatterjee³, Ranjit Kumar Nadella³, Sumanta Kumar Mallik¹

¹ICAR-Central Institute of Coldwater Fisheries Research (ICAR-CICFR), Anusandhan Bhavan, Bhimtal-263 136, Nainital, Uttarakhand

²ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA), Annamalai Puram, Chennai - 600028, Tamil Nadu, India

³ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), CIFT Junction, Willingdon Island, Matsyapuri, Kochi-682 029, India

*richap1989@gmail.com

Lufenuron, a benzoylurea insecticide, is used in aquaculture to control ectoparasites by inhibiting chitin synthesis in their exoskeletons. The study evaluated the pharmacokinetics of Lufenuron in juvenile rainbow trout (*Oncorhynchus mykiss*) following a single oral dose of 5 mg kg⁻¹ body weight, with tissue samples liver, kidney, gill, intestine, muscle and plasma collected up to 128 hours post-treatment at 21 °C. LC-MS/MS analysis revealed that Lufenuron was rapidly absorbed ($T_{max} = 16$ h in most tissues), with maximum concentrations observed in the liver ($C_{max}: 1840$ mg kg⁻¹) and intestine ($C_{max}: 1630$ mg kg⁻¹). The liver exhibited the greatest drug exposure ($AUC_{0-t}: 89660.50$ mg·h kg⁻¹) and accumulation ($AUMC_{0-\infty}: 5.6 \times 10^6$ mg·h² kg⁻¹), whereas the gill had the longest mean residence time ($MRT_{0-\infty}: 73.79$ h), indicating prolonged retention. The fastest elimination occurred in the intestine ($\lambda_z: 0.05$ h⁻¹, $t_{1/2}: 14.2$ h). Plasma concentrations were consistently lower ($C_{max}: 610$ mg kg⁻¹; $AUC_{0-t}: 28072.33$ mg·h kg⁻¹), confirming limited systemic distribution. Lufenuron is primarily distributed and retained in hepatic and gastrointestinal tissues, supporting its efficacy as an antiparasitic with manageable withdrawal profiles. Based on the pharmacokinetic behavior and tissue retention, a single oral dose of 5 mg kg⁻¹ body weight is recommended as effective and safe for parasite control in rainbow trout aquaculture.

Keywords: Lufenuron, Rainbow trout, Pharmacokinetics, C_{max} , mean residence time

Absorption, distribution and excretion of an anthelmintic drug praziquantel in rainbow trout, *Oncorhynchus mykiss* (Walbaum 1792) following a single dose oral administration

Richa Pathak^{1*}, Sumanta Kumar Mallik^{1#}, Krishna Kala¹, Prasanna Kumar Patil², Neetu Shahi¹, Ritesh Shantilal Tandel², Niladri Sekhar Chatterjee³,
Ranjit Kumar Nadella³, Kishor Kunal¹

¹ICAR-Central Institute of Coldwater Fisheries Research (ICAR-CICFR), Anusandhan Bhavan, Bhimtal-263 136, Nainital, Uttarakhand

²ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA), Annamalai Puram, Chennai - 600028, Tamil Nadu, India

³ICAR-Central Institute of Fisheries Technology (ICAR-CIFT), CIFT Junction, Willingdon Island, Matsyapuri, Kochi-682 029, India

*richap1989@gmail.com

This study investigated the absorption, distribution and excretion of an anthelmintic veterinary drug praziquantel (PZQ) in rainbow trout (*Oncorhynchus mykiss*) following a single oral administration at a dose of 50 mg/kg body weight. Fish with an average weight of 107.65 ± 34.56 g and length of 21.5 ± 2.30 cm were sampled at various time points ranging from 0 to 128 hours post-dosing. Among the tissues, the liver exhibited the fastest PZQ absorption, reaching a peak concentration of 205 $\mu\text{g}/\text{kg}$ within 2 hours and demonstrating the highest absorption rate constant ($k_a = 1.03 \text{ h}^{-1}$), followed by the intestine ($k_a = 0.958 \text{ h}^{-1}$). In contrast, muscle tissue showed the slowest absorption ($k_a = 0.134 \text{ h}^{-1}$) and the longest absorption half-life ($t_{1/2a} = 5.17 \text{ h}$), indicating delayed uptake and prolonged retention. The gill and plasma recorded the highest area under the curve (AUC_{0-128}) values—10,233.25 $\mu\text{g}\cdot\text{h}/\text{kg}$ and 9,309.29 $\mu\text{g}\cdot\text{h}/\text{kg}$, respectively reflecting substantial drug exposure. Elimination kinetics varied across tissues: muscle exhibited the fastest elimination ($k_e = 0.052 \text{ h}^{-1}$; $t_{1/2} = 13.38 \text{ h}$), while the intestine showed the slowest elimination, with the longest elimination half-life (70.18 h) and mean residence time ($\text{MRT} = 102.29 \text{ h}$), suggesting extended drug persistence. Overall, the study highlights the prolonged retention of PZQ in the intestine and plasma, underlining the importance of optimizing dosing strategies in aquaculture to enhance therapeutic efficacy, reduce residual drug levels, and mitigate the risk of antimicrobial resistance.

Keywords: Praziquantel, Rainbow trout, LC-MS/MS, Pharmacokinetic, Mean Residence Time

Identification of a Novel Potential Vaccine Candidates Against *Aeromonas hydrophila* using Immunoinformatic Approach
Amrita Mohanty^{1*}, Gulshan Kumar², Gowhar Iqbal¹, Prabhat Kumar Behera³

¹ICAR-Central Institute of Fisheries Education, Mumbai, India

²Rajendra Prasad Central Agricultural University, Bihar, India

³Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab, India
[*mamaamrita95@gmail.com](mailto:mamaamrita95@gmail.com)

Aeromonas hydrophila is a common gram-negative bacterium causing regual infection in freshwater fish. Among Gram-negative bacteria, efflux pumps of the RND (Resistance-Nodulation-Division) transporter permease family are prevalent and catalyse the active efflux of numerous antibiotics and chemotherapeutic drugs. Bacterial efflux pumps belonging to the RND superfamily mediate resistance to several biocides, such as; Cu(I) and Ag(I) ions. A RND efflux pump typically coordinates with an outer membrane channel and a periplasmic membrane fusion protein to form a functioning tripartite protein complex. This protein is a well-known antigenic protein and reported from mammalian pathogens. In this study, we have used several bioinformatics online servers for determining immunogenic property of efflux pump RND protein. The study includes several bioinformatics approaches to analyse various aspects of RND protein, such as; physico-chemical properties, transmembrane domains, secondary and tertiary structure, B and T-cell potential epitopes, and other important immunological characteristics of this protein. Also, 12 transmembrane domains were recognized for this protein. The secondary structure of RND protein comprised of 48.27% alpha-helix, 16.51% extended strand, and 27.64% random coil. Additionally, several potential B and T-cell epitopes were also identified for RND efflux pump protein. In addition, prediction of this protein's antigenicity and allergenicity revealed that it is immunogenic and non-allergenic. Based on the outcomes of the Ramachandran plot analysis of predicted tertiary structure; 95.7%, 3.2%, and 1.1% of the amino acid residues, respectively, were included in the favoured, allowed, and outlier regions. Hence, this work identified efflux RND transporter as a potential vaccine candidate to mitigate the infection of *Aeromonas hydrophila*, a common freshwater fish pathogen.

Keywords: *Aeromonas hydrophila*, RND, Immunogenic, antigenicity, Vaccine

Smart Diagnostics in Aquaculture: Lab-on-Chip Systems for Rapid Onsite Pathogen Detection

*¹Manish Kumar¹, Suraj Kumar¹ and Nayan Chouhan¹

¹Department of Aquatic Health and Environment, College of Fisheries,
Central Agriculture University (Imphal), Lembucherra, 799210,

*manishsinghichthyology@gmail.com

Disease outbreaks remain a major constraint in modern aquaculture, causing significant economic losses and threatening stock health. Conventional diagnostic methods, such as culture-based assays or centralized PCR testing, are time-consuming, require skilled personnel, and often lead to delays in treatment due to sample transport and result turnaround time. These limitations underscore the need for innovative, rapid, and field-deployable diagnostic solutions. Lab-on-Chip (LoC) technology represents a transformative approach, integrating multiple laboratory functions onto a single microfluidic chip. These compact devices enable onsite detection of aquatic pathogens through miniaturized systems combining nucleic acid amplification (such as LAMP or PCR), biosensing, and real-time readouts often compatible with smartphones or cloud platforms. LoC systems contribute significantly to sustainable aquaculture by enabling early detection and real-time disease surveillance, thus minimizing antibiotic misuse, reducing mortality, and supporting environmentally responsible practices. Their portability, speed (typically <1 hour), and cost-effectiveness make them ideal for hatchery and farm-level applications. Working on principles of microfluidics, biosensing, and often isothermal amplification, LoC devices provide accurate results with minimal sample volumes. The future perspective includes integration with IoT for predictive analytics and expansion toward multiplex detection platforms. In conclusion, smart diagnostics through Lab-on-Chip systems offer a promising path for resilient, technology-driven, and sustainable aquaculture management.

Keywords: Lab-on-a-Chip (LOC), disease diagnostics, microfluidics, biosensing, sustainable aquaculture

Immunological responses of Nile tilapia (*Oreochromis niloticus*) to tilapia parvovirus (TiPV) infection

Swati Surabhi* , P. Sivasankar, B. Chrisolite, Anix Vivek Santhiya

Fisheries College and Research Institute, Tamil Nadu Dr. J. Jayalalithaa
Fisheries University, Thoothukudi-628008, Tamil Nadu, India

[*swati19surabhi@gmail.com](mailto:swati19surabhi@gmail.com)

Tilapia parvovirus (TiPV) is a novel viral agent isolated from Nile tilapia (*Oreochromis niloticus*) with haemorrhages, scale loss, ascetic fluid accumulation and discolouration in south India. It can be lethal to tilapia and cause massive mortalities up to 90% and induced a typical cytopathic effect (CPE) after 3days of post infection (dpi) during propagation in tilapia brain cell line. The goal of the current investigation was to evaluate the host immune response in tilapia after challenge with TiPV by intraperitoneal injection. Tilapia fish challenged with TiPV showed significant ($P<0.05$) changes in haematological parameters such as haematocrit (HCT), red blood cell (RBC), white blood cell (WBC) and platelet (PLT) counts, haemoglobin (HGB), mean corpuscular haemoglobin (MCH), mean platelet volume (MPV); immune parameters such as catalase activity, respiratory burst, superoxide dismutase (SOD) and myeloperoxidase (MPO); and serum biochemical parameters such as glucose, albumin, globulin, creatinine, urea, cholesterol, total protein, alkaline phosphatase, aspartate aminotransferase (SGOT), and alanine aminotransferase (SGPT) activity at 24, 48, 72, 96 hours post infection (hpi). Changes in hemorrhagic and immune parameters reveal the induction and response of the host defense mechanism to TiPV infection. This would support the development of new immunotherapeutics, such as immunostimulants and vaccines, to prevent or control TiPV disease.

Keywords: Tilapia, TiPV, Haematology, Immune response

Therapeutic Evaluation and Residual Kinetics of Oxytetracycline dihydrate in Rainbow Trout, *Oncorhynchus mykiss* (Walbaum, 1792)

Krishna Kala^{1*}, Richa Pathak¹, Neetu Shahi¹, Niladri Sekhar Chatterjee², Ranjit Kumar Nadella², Rabindar Singh Patiyal¹, Sumanta Kumar Mallik¹

¹ICAR-Central Institute of Coldwater Fisheries Research (ICAR-CICFR), Anusandhan Bhavan, Bhimtal 263 136, Nainital, Uttarakhand

²ICAR- Central Institute of Fisheries Technology (ICAR-CIFT), CIFT Junction, Willingdon Island, Matsyapuri, Kochi-682 029, India

*krishnakala777@gmail.com

This study evaluates the effectiveness, antibiotic residue reduction, and withdrawal time of oxytetracycline dihydrate, an approved broad-spectrum antibiotic, in the exotic fish species rainbow trout, *Oncorhynchus mykiss* for use in aquaculture. Effective doses of oxytetracycline dihydrate at 44.1, 88.2, 132.3, and 176.4 mg per kg of fish body weight per day were tested over a 10-day period in *O. mykiss* (Walbaum, 1792) experimentally infected with *Aeromonas hydrophila* RTS 02. LC-MS/MS was employed to measure the oxytetracycline residues in muscle, liver, kidney, intestine, and plasma tissues. Withdrawal times for oxytetracycline in muscle and all sampled tissues were calculated using the WT 1.4 software. The oral dose ranging from 88.2 mg to 176.4 mg Kg⁻¹ of fish body weight per day for 10 days resulted into higher rainbow trout survivability of 64-74% and significant histopathological improvements in liver, kidney, and muscle tissues. The maximum concentration (C_{max}) of oxytetracycline detected in plasma (2120 µg Kg⁻¹) and intestine (6740 µg Kg⁻¹) after day one of post dosing. Antibiotic residue depleted below the maximum residual limit (MRL) set for oxytetracycline (100 µg Kg⁻¹) in plasma (80.1 µg Kg⁻¹), kidney (46.6 µg Kg⁻¹) and intestine (78 µg Kg⁻¹) on 12th, 20th and 8th day, respectively, 10-day post oxytetracycline consumption at 80 mg Kg⁻¹ day⁻¹. The effective doses identified were 88.2, 132.3, and 176.4 mg Kg⁻¹ day⁻¹ of oxytetracycline administered over a period of 10 days. The withdrawal study showed that the therapeutic dose of Oxytetracycline at 80 mg Kg⁻¹ day⁻¹ in the fish muscle decreased below the maximum residue limit (100 µg Kg⁻¹) after 35.89 days, ensuring the safety of fish products for consumption.

Keywords: Oxytetracycline dihydrate, Efficacy, Withdrawal, Maximum residue limit and Liquid chromatography-tandem mass spectrometry

Sub-Theme-III
Socio-Economic Dimensions for Sustainable Fisheries & Aquaculture (SSFA)

Technical Efficiency Analysis of Asian Seabass Farming in Andhra Pradesh: A Stochastic Production Frontier Approach

Karthik Kumar Goud Palsam^{1*}, Kalidoss Radhakrishnan² and Ankush L. Kamble¹

¹ ICAR-Central Institute of Fisheries Education, Mumbai, Maharashtra

² Fisheries College and Research Institute, Ponneri, India

*karthikpalsam@gmail.com

Asian seabass (*Lates calcarifer*) is an emerging high-value aquaculture species in India, gaining popularity due to its export potential and adaptability to brackish water pond environments. Efficient resource use is crucial for enhancing profitability and sustainability, especially amid fluctuating input and output prices. This study estimates the technical efficiency of pond-based seabass farming using a Stochastic Production Frontier (SPF) model. Primary data were collected from 60 seabass farmers purposively selected from Krishna and Eluru districts of Andhra Pradesh using a structured interview schedule. The model incorporated key input variables such as quantities of seed and feed, cost of chemicals and fertilizers, and cost of energy consumption. The estimated technical efficiency scores revealed a considerable scope for improving productivity with the existing technology and input structure. The findings suggest that enhancing farming experience, technological adoption, and institutional participation could further improve seabass production through better input use efficiency.

Keywords: Input use efficiency, Brackish water aquaculture, *Lates calcarifer*, Andhra Pradesh

Leveraging Recreational Fisheries for Aqua-Tourism and Resilience Building in the Wetlands of the Lower Gangetic Plains

P. K. Parida,¹ P. R. Swain^{1,2}, K. Mondal¹, S. Chakraborty¹, B. K. Behera^{1,3} and B. K. Das¹

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata

²National Fisheries Development Board (NFDB), Eastern Regional Centre, Bhubaneswar

³National Fisheries Development Board (NFDB), Hyderabad

*pranayaparida@gmail.com

Wetlands, often termed “biological supermarkets,” are rich in biodiversity and provide critical ecological services and livelihood support. In regions like West Bengal, where millions depend on these ecosystems, fishing, particularly culture-based practices in inland open waters remain essential for sustenance. However, income from fish sales alone often falls short, underscoring the need for alternative livelihoods to strengthen socio-economic resilience. A promising solution is aquatourism, which harnesses the scenic and ecological value of wetlands to create sustainable income opportunities. The Duma wetland in North 24 Parganas, a major floodplain wetland in the lower Gangetic delta, exemplifies this potential. Managed by a Primary Fisheries Cooperative Society (PFCS) with over 1,000 members, Duma's fish yield rose from 48 to 82 tons annually after the implementation of an ICAR-CIFRI integrated management plan. Still, heavy dependence on fisheries strains the ecosystem. Emerging activities like sport fishing, boating, fish festivals, and kiosks offer viable supplementary income, engaging women and youth while reducing rural-urban migration. With supportive policies and investment, these ventures can spur local entrepreneurship, ensure ecological conservation, and promote inclusive rural development. The Duma wetland stands as a model for sustainable, community-based wetland governance, balancing livelihoods and environmental health.

Keywords: Aqua tourism, wetland management, alternative livelihood, financial resilience, sport fishing

Assessing Climate-Induced Livelihood Vulnerability in Fishing Communities of the Lower Gangetic Estuarine Region

Anurag Singh*, Basanta Kumar Das, Shreya bhattacharya, Liton Paul, Piyashi Debroy, Yateesh DC, Gitashree Thengal
ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal, India

*1619anu@gmail.com

This study assesses the climate-induced vulnerability of fishing communities in two estuarine villages Fraserganj and Ganga Sagar located in the South 24 Parganas district of West Bengal, within the ecologically fragile Sundarbans mangrove region. Primary data were collected from 90 fishers between February and November 2024 using semi-structured interviews and focus group discussions. The Livelihood Vulnerability Index (LVI) framework was applied to evaluate multiple dimensions of vulnerability. Findings reveal considerable environmental and socio-economic stress. A high Cyclone Exposure Index (0.81) and Water Salinity Impact Score (0.68) indicate strong exposure to extreme weather and salinity intrusion, which threaten fishery productivity. The low-Income Diversification Score (0.30) suggests a dependence on fishing, reducing resilience. Institutional weaknesses are evident from limited access to credit and subsidies (0.33), while infrastructure vulnerabilities were indicated in a modest Infrastructure Resilience Score (0.44). The Climate Awareness Score (0.55) points to a moderate level of adaptive capacity. These interconnected stressors highlight the urgent need for integrated adaptation strategies, strengthened infrastructure, financial inclusion, and improved dissemination of climate-related information. Enhancing these factors is critical to building the long-term resilience and adaptive capacity of these vulnerable coastal fishing communities facing escalating climate risks.

Keywords: Climate change, Fishers, Vulnerability, Lower Gangetic delta.

Assessing the Socioeconomic Impacts of Pollution in the Jalangi River on Fishers' Livelihoods

Gitashree Thengal, B.K. Das*, Anurag Singh, Liton Paul, Yateeshh D.C.,
Arun Pandit

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata,
India- 700120

* basantakumard@gmail.com

This study explores the link between water pollution and the socio-economic conditions of fishers along the Jalangi River, a key 250 km tributary of the Ganga in India. The river is heavily polluted due to agricultural runoff, jute retting, domestic waste, and sand mining, leading to degraded water quality and a sharp decline in fish populations. Major contaminants include microplastics, and polystyrene, as well as harmful levels of heavy metals like aluminium, chromium, nickel, and Bisphenol A (eBPA). These pollutants threaten both aquatic life and the health of surrounding communities. The fishing community, mostly from Scheduled Castes, relies on the river for daily catches ranging from 0.8–1.2 kgs, increasing during monsoons. However, fish availability is declining, discouraging young people from pursuing the profession. Women’s participation is limited to post-harvest roles. The average monthly income is ₹5470, with 43% earning below ₹5000. The lack of livelihood alternatives and environmental stressors deepens their vulnerability. Interventions like the National Mission for Clean Ganga (NMCG) are crucial for restoring river health and supporting sustainable livelihoods, as pollution continues to undermine both ecological balance and economic stability in these riverine communities.

Keywords: Fishers, Livelihoods, Pollution, Socioeconomics

Socioeconomic determinants and constraints of fish consumption in Kabirdham District, Chhattisgarh

B. Nightingale*, Preeti Sahu, Priyanka Raj, Rishiraj and Rupesh Nishad

LSPN College of Fisheries, Kawardha, Chhattisgarh-491995

[*bn.devi@dsvckvdurg.ac.in](mailto:bn.devi@dsvckvdurg.ac.in)

Fish serves as a critical source of protein and essential nutrients for local communities, yet consumption varies significantly due to economic, cultural, and logistical factors. The present study analyses the socioeconomic determinants and constraints influencing fish consumption patterns in Bodla Block (Kabirdham District). Using a quadrant-based random sampling method, 120 respondents were surveyed to assess the correlation between income, education, occupation, market access, and dietary preferences. Findings revealed that 70% of respondents consumed fish, with 36% consuming fish twice weekly, while 26% consumed it monthly. *Labeo rohita* (30.95%) and *Catla catla* (14.28%) emerged as the most preferred species. While 44 respondents were in the low-income group, 60 in middle, and 16 in high, the correlation between average monthly income and fish expenditure varied across these groups ($r=0.26$ for low-income, $r=0.19$ for middle-income). Notably, high-income groups showed a negative correlation ($r=-0.12$) between income and fish spending, implying alternative protein preferences or market inefficiencies. The study identified critical barriers wherein price fluctuations (72.08%), lack of freshness (56.74%), and poor market hygiene (54.62%) were primary constraints. Non-consumers cited religious beliefs (22.22%) and distaste for fish (16.66%) as key deterrents. A multifaceted approach to improve fish accessibility and affordability as well as targeted interventions such as subsidised pricing, cold storage infrastructure, and community nutrition programmes can enhance the fish consumption pattern of the area.

Keywords: Socioeconomic, fish consumption, rural fisheries, market constraints

The integrated rice-fish system and opportunities in South Asia: an agroecological perspective

Ayan Samaddar

WorldFish-Odisha Program Office, Plot No. A15, Sharma Street, Unit 7,
Surya Nagar, Bhubaneswar 751025, Odisha State, India

*Ayan.Samaddar@cgiar.org

To investigate whether agroecology (AE) could accelerate an IRFS-based transition towards food and nutritional security (FNS), this review of 230 scientific articles on IRFS from 2005 to 2025 documented the AE traits of IRFS and their relevance to addressing FNS. The current IRFS of South Asian countries was assessed, first through a rapid review process to identify their qualitative traits consistent with AE. Next, we evaluated the IRFS's impact on FNS. In total, IRFS has shown 54 traits relevant to AE principles that address FNS. Among 13 AE principles, seven have been considered primary impact creators of FNS. Impact may be accelerated with strategies such as crop diversification, mixed crop-livestock systems, and farmer-to-farmer networks. Fish play a significant role in IRFS by preserving ecological and socioeconomic equilibrium, supporting livelihoods, income, and community engagement. In South Asia, an analysis of five distinct IRFS types identified qualitative features that could support a maximum of 10 relevant AE principles but for which pertinent empirical evidence was lacking. Although IRFS could potentially boost smallholder income, FNS, and overall productivity, many South Asian countries would need to address seven significant challenges, including initial investment costs, vulnerability to natural disasters, hilly terrain, loss of indigenous fish varieties, environmental impacts of inputs, land-use change, limited technical knowledge and financial constraints among the farming communities. AE frameworks can support scaling up IRFS adoption and diffusion through a holistic approach to performance evaluation and creating appropriate strategies and guidelines.

Keywords: Ecosystem, rice fish productivity, agroecological principles, agroecological transition, food security

Hilsa Conservation and Restoration in River Ganga: Steps Towards Sustainable Fisheries

Aryama Bhattacharya*, Basanta Kumar Das, Amiya Sahoo, Arghya Kunui, Saurav Nandy, Hena Chakraborty, Poonam Majumder

ICAR- Central Inland Fisheries Research Institute, Barrackpore, West Bengal

*bhattacharyaa303@gmail.com

Hilsa, an anadromous fish species, is vital for the ecological, economic, and cultural importance in South Asia, particularly in India, Bangladesh, and Myanmar. It connects marine and freshwater ecosystems through its migratory behaviour and holds high economic value, supporting millions of fishers and contributing significantly to local livelihoods. Culturally Hilsa is also cherished in festivals and traditional cuisines. However, Hilsa populations have declined due to overfishing, habitat degradation, pollution, altered patterns of river flow, and climate change, which threaten the sustainability of Hilsa fisheries and their ecosystems. In response, the Indian Council of Agricultural Research - Central Inland Fisheries Research Institute (ICAR-CIFRI), under the National Mission for Clean Ganga (NMCG) project, has implemented a range of conservation strategies. These include ranching, stakeholder collaboration, establishment of breeding and transportation infrastructure, promotion of sustainable fishing practices, and community-based awareness initiatives. This study evaluates the effectiveness of these interventions in restoring Hilsa populations and sustaining the livelihoods dependent on this iconic species. The findings highlight the crucial role of integrated conservation approaches in ensuring the long-term sustainability of Hilsa fisheries and preserving the ecological integrity of inland and coastal aquatic ecosystems.

Keywords: Hilsa, Conservation, Sustainability, Livelihood, Ranching, Awareness

Mixed carp culture in a leased community pond operated by SHGs under MMKY was successful Intervention for rural income and livelihood

P. Das^{1*}, B. B. J. Sahoo¹, S. Pradhan¹ and S. S. Das²

¹Office of the District Fisheries Officer, Bijipur, Ganjam, Odisha-76003

²Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-76008

*picklu9437@gmail.com

The study is based on the implementation of input assistance to women SHGs doing scientific pisciculture in GP tanks under Mukhy Matsyajibi Kalyan Yojana (MMKY). The program encompassed 20 WSHGs in the Chikiti block in 24 leased village community ponds, totalling 48.81 hectares of water spread area. The programme was highly participatory with respect to capacity-building initiatives, community involvement, scientific interventions in pisciculture, and knowledge and skill upgradation of WSHGs by Krishi Vigyan Kendra, Ganjam-II under OUAT, and Bhubaneswar. Water quality and feed management were emphasised and the provision of critical inputs under the MMKY scheme, such as fish fingerlings, feed, lime and need-based disease control aquifers, was ensured to motivate the group members. The results of the demonstration indicated that the average fish yield of the adopted community ponds was 4.09 tonnes/ha against the pre-adoption production level of 2.53 tonnes/ha. The average increase in fish production and net income was 61.66 and 103.42%, respectively, with an increased average benefit-cost ratio from 2.05 to 2.55. The study concludes that to sustain rural income and livelihoods, common property resources must be used properly with community participation, institutional commitment and scientific interventions through viable technology.

Keywords: Community aquaculture, SHG, MMKY, Ganjam

Early breeding of carps – a beacon of self-reliance in fish seed production in Odisha

B. B. J. Sahoo^{1*}, B. Gomango¹, S. S. Das² and S. S. Mishra³

¹Office of the District Fisheries Officer, Bijipur, Ganjam, Odisha-760 003

²Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-761 008

³Office of the Director of Fisheries (Odisha), Mangalabag, Cuttack, Odisha-753 001

[*bbjsahoo5@gmail.com](mailto:bbjsahoo5@gmail.com)

The study is based on the transformation of carp seed availability position from deficit to self-sufficiency and surplus within a period of 5 years from 2020-21 to 2024-25. Several structured initiatives in mission mode were undertaken by the Fisheries & ARD Department, Government of Odisha, to enhance the skills, knowledge, resources, and overall capabilities of both the government and private hatcheries in the state for the adoption of early breeding technology. These initiatives involve improving existing government hatcheries for early breeding and year-round fish seed production, creating new private fin fish hatcheries, providing support to private fish seed hatcheries for early breeding through the Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA) and state plan project, and helping a network of fish seed growers with fish seed production under the state plan. As a result, the total fish seed (fry) production from 28 government hatcheries and 149 private hatcheries, including 48 hatcheries under the Pradhan Mantri Matshya Sampad Yojana (PMMSY), has substantially increased from 119.43 crore in 2020-21 to 330.23 crore in 2024-25, an increase of 177.30. Now during the years 2024-25, the government hatcheries have produced 64.52 crore of fry (19.53%) and private hatcheries produced 265.71 crore of fry (80.47%). In 2024-25, early breeding contributed 35.30% (116.58 crore) of fish seed, compared to 64.70% (213.65 crore) from seasonal breeding. Encouraging early IMC breeding is important to make sure we have enough good fingerlings ready for ponds, tanks, bio-floc units, and reservoirs at the start of the monsoon season.

Keywords: Early breeding, IMC, Govt of Odisha, PMMSY

A Strategy to Improve the Socio-Economic Condition of the Fishermen Community of Paithan, Aurangabad, of the Marathwada Region, Maharashtra

Deshmukh D.R.

Professor and Head, Department of Zoology, Pratishthan Mahavidyalaya,
Paithan

*deshmukhdnyan@gmail.com

The present study was carried out to survey the socio-economic condition of the fishermen community of Paithan District, Aurangabad, in the Marathwada region in the year 2016–2017. During the preliminary study socio-economic survey, it was observed that the maximum number of fishermen families are engaged in part-time as well as full-time fishing. The results showed that there is an abundance of freshwater resources, but the economic condition of fishermen is far from expected. The income from fishing is not enough to feed their family's daily needs due to low catching productivity and raw fish selling prices. The government is not having clear and concrete policies to resolve the socio-economic problems of the fishermen community living in Paithan, as the study provides strategic policies to improve the socio-economic conditions of fishermen. These types of surveys are mostly carried out in coastal regions.

Keywords: Socio-economic condition, Fishermen community, Paithan.

Small-scale Hilsa fishery of West Bengal is in Stress: Assessing Vulnerability and a Roadmap to Sustainability

Shreya Bhattacharya^{1,2*}, Basanta Kumar Das¹, Prateep Kumar Nayak²

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India

²V2V Global Partnership, University of Waterloo, Canada

*info.shreya247@gmail.com

The Hilsa fish (*Tenulosa ilisha*) holds significant ecological, economic, and cultural value in West Bengal, particularly within the Hooghly and Rupnarayan river systems. Predominantly seasonal, Hilsa fishing occurs during the monsoon (June-August) and winter (October-December), offering limited employment and income security. This study found that 68.18% of fishers rely exclusively on Hilsa fishing, facing vulnerabilities from declining catches, shrinking fish sizes, and unstable livelihoods. Climate change has significantly impacted Hilsa migration, spawning, and growth, with early maturity observed at weights below 40 grams. Around 91% of fishers surveyed reported a marked reduction in fish size, with present-day catches averaging under 450 grams nearly half the average weight recorded two to three decades ago. The construction of the Farakka Barrage and the non-functional Fish Pass since 1989 have drastically reduced upstream Hilsa migration, estimating around 92% catch decline. Additionally, the indiscriminate use of monofilament gill nets (mesh size 80–85 mm) in marine zones has been flagged as a critical concern by over 85% of fishers across study sites. Ensuring the sustainability of Hilsa fisheries requires urgent policy enforcement, particularly regarding mesh size regulations, alongside community-based conservation strategies. The path forward lies in integrated management that addresses both ecological challenges and socio-economic resilience.

Keywords: Catch decline, Climate change, Livelihood, Conservation, Policy

Supply Chain Mapping and Market Economics of the Mud Crab Fishery in the Sundarbans Region

Liton Paul*, Archisman Ray, Sourav Kundu, Arun Pandit, Basanta Kumar Das

ICAR – Central Inland Fisheries Research Institute, Barrackpore, Kolkata
* litonpaul4377@gmail.com

This study provides a comprehensive analysis of the mud crab (*Scylla serrata*, *S. olivacea*, *S. tranquebarica*) marketing channel distribution, price dynamics, and the challenges and opportunities within this vital sector. A mixed-methods approach was employed for data collection from February to December 2024. Primary data was gathered through semi-structured interviews with 273 stakeholders, including 210 crab collectors, 16 suppliers, 6 middlemen, 28 retail shop owners, and 13 exporters across Gosaba and Basanti blocks. Snowball sampling was used to gather data from exporters and suppliers, while random sampling techniques were employed for crab collectors. Data analysis involved descriptive statistics, gross margin analysis, markup percentages, price spread calculations, and marketing efficiency ratios. The findings reveal a predominantly export-orientated market, with 91% of the harvested mud crabs destined for international markets such as China, Singapore, and Japan. Six distinct marketing chains were identified, with Chain-4 (Crab Collectors → Crab Fatteners → Suppliers → Exporters → International Market) being the most dominant, accounting for 52% of the total volume. This chain demonstrated significant value addition, particularly by crab fatteners who, despite contributing 46% of the value addition, only realised an 18% profit margin. Conversely, suppliers achieved the highest per-unit profit (₹215/kg) due to their role in bulk purchasing and providing credit. The overall market efficiency was found to be low at 19.23%, indicating substantial inefficiencies in price transmission to primary producers. Stakeholder-specific challenges include health risks and wild animal threats for collectors; low catch and grading rejections for aratdars; seed scarcity and price depression; etc.

Keywords: market segments, crab fishery, export, price dynamics, Sunderban

Studies on Nucleus Implantation and Development of Designer Pearl in Freshwater Mussel, *Lamellidens marginalis* (Lamarck, 1819)

Siddharth Sankar Das^{1,2*}, P.P. Srivastava¹, Shivendra Kumar¹, Adita Sharma¹, Tanushri Ghorai¹

¹College of Fisheries, Dholi, Dr RPCAU, Pusa, Bihar, 848 125

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, 700120

*siddharthmfsc@gmail.com

Freshwater mussels, highly valued for their ability to produce pearls, are also influenced by their cultural environment. An optimum culture environment is essential for better growth and enhanced pearl yield and quality. In the present study, two experimental trials were conducted to evaluate the effect of different culture environments on physiology and pearl formation in *Lamellidens marginalis*. In the first experiment, 94 individuals with an average weight and length of 33.89 ± 1.41 g and 7.07 ± 0.114 cm were implanted with designer pearls in the mantle cavity and reared in ponds and cemented tanks for a period of 8 months. Comparative analysis of pearl yield, growth, stress enzymes (SOD, catalase), glycolytic enzyme (LDH), and protein catabolic enzymes (ALT, AST) revealed better physiology and pearl formation in mussels reared in ponds. Similarly, in the second experiment, a trial was made to find the effect of varied Ca^{2+} levels on physiology and pearl yield in freshwater mussels. A total of 120 mussels weighing 33.78 ± 1.125 g and measuring 6.83 ± 0.114 cm were implanted and reared in FRP tanks containing 60ppm (T1), 80ppm (T2) and 100 ppm (T3) calcium levels. It was observed that attachment of the nucleus increased significantly ($p < 0.05$) with an increase in Ca^{2+} content, and the highest attachment of the nucleus was achieved in T3. However, elevated Ca^{2+} levels also led to higher mortality. Further study of stress enzymes (SOD, catalase), glycolytic enzymes (LDH) and protein catabolic enzymes (ALT, AST) revealed a proportional increase in stress with the elevated levels of Ca^{2+} .

Keywords: *Lamellidens marginalis*, pearl yield, designer pearl, calcium

Evaluation of the impact of Awareness Programs on Fish & Dolphin Conservation along the River Ganga, India: A Cross-Sectional study

Yateesh DC, Anurag Singh, Liton Paul, Aparna Roy, Basanta Kumar Das*

ICAR - Central Inland Fisheries Research Institute

* basantakumard@gmail.com

The Ganga River, regarded as the lifeline of India, sustains rich aquatic biodiversity and supports the livelihoods of millions of small-scale fishers along its course. However, increasing anthropogenic stress such as pollution, habitat fragmentation, and unsustainable fishing practices has led to the depletion of vital fish species like Hilsa and endangered aquatic fauna such as the Ganges River Dolphin (*Platanista gangetica*). To address these conservation concerns, the ICAR-Central Inland Fisheries Research Institute (CIFRI), under the National Mission for Clean Ganga (NMCG), has been conducting a series of awareness programs targeted at fishing communities residing along the river's upper, middle, and lower stretches. This study evaluates the impact of these programs in enhancing fishers' knowledge, attitudes, and conservation practices related to Hilsa and dolphin protection. The study was conducted in the middle and lower stretches of the Ganga, as these regions have a relatively higher abundance of Hilsa and dolphins, stratifying the river into ecological zones and purposively selecting districts based on proximity to the river and active fishing communities. A total of 649 fishers were randomly selected to ensure geographic and socio-economic diversity. The impact was assessed through a pre- and post-intervention evaluation using a knowledge test and attitude scale. The results revealed significant knowledge gains in both stretches, with the lower stretch showing greater improvement (7.41) than the middle stretch (6.4), and conceptual knowledge demonstrating the highest increase. A positive shift in attitude was also observed post-intervention. In terms of practice, the lower stretch exhibited a higher overall improvement, particularly in key areas such as dolphin rescue, legal awareness, and peer advocacy. Overall, the awareness programs significantly improved knowledge, attitude, and practices (KAP) toward conservation among fishing communities.

Keywords: Conservation, Awareness Programs, Hilsa and Ganges River Dolphin, Knowledge-Attitude-Practice (KAP)

Inland fisheries of Gujarat: status, opportunities and future perspective

Rajiv Ranjan^{1*}, Nidhi Chauhan¹, Ajay Baldaniya¹, S. P. Kamble¹ and
Basant Kumar Das²

¹ICAR-Central Inland Fisheries Research Institute, Vadodara Research Station, Vadodara-390021, Gujarat, India

²ICAR-Central Inland Fisheries Research Institute, Barrackpore-700120, West Bengal, India

*rajiranjan62@gmail.com

Gujarat state has the longest coastline and is also an important state for inland fisheries in India. The state has a variety of water bodies, such as rivers, reservoirs, ponds, and estuarine waters. These include 3,865 kilometres of rivers, 3.48 lakh hectares of reservoirs, 0.22 lakh hectares of ponds, and 0.21 lakh hectares of estuarine areas. In the year 2023–24, Gujarat produced over 2.03 lakh metric tonnes of inland fish, which was more than the target of 1.93 lakh metric tonnes, achieving 105.18 percent of the goal. In 2022–23, Gujarat ranked sixth in inland fish production, contributing 1.62% of total production in India. Approximately 1.84 lakh people are engaged in the inland fisheries sector in Gujarat, and among them, 0.64 lakh are working as active fishers. However, the average fish production from reservoirs is only 0.113 kg/ha, which is much lower than the national average. This shows that there is a lot of potential in the inland sector. Therefore, promoting cage and pen culture in reservoirs and river-based capture fisheries has ample scope to enhance livelihoods and economic returns in Gujarat. In recent years, the state's inland fisheries sector has also faced several major challenges, such as climate change, overfishing, destruction of fish habitats through illegal sand mining, pollution of water bodies, and inefficient post-harvest practices. To address these problems, it is important to introduce improved policies, adopt modern technologies and skill development programmes, and strengthen institutional support.

Keywords: Inland fisheries, water resources, fish production, challenges, future perspective

Understanding Knowledge and Attitude Towards Harvest and Post-Harvest Handling of Fish: Insights from Aquaculture Farmers of Minor Irrigation Tanks in Odisha, India

Amar Gaikwad^{ab}, Baban Bayan^a, Venkata Narayana Mullapudi^a, Aparajita Priyadarshini^a, Arun Padiyar Panemangalore^a

^a WorldFish-India Office, Bhubaneswar, Odisha- 751003

^b Centurion University of Technology & Management (CUTM), Bhubaneswar, Odisha– 751009

*babanbayan@gmail.com

Qualitative and quantitative fish loss from handling during harvest and post-harvest is an important concern in aquaculture. To design and adopt follow-up measures of capacity building to ensure better fish handling, assessing the existing knowledge and attitude traits of the fish farmers, and looking at the association of demographic factors with the knowledge and attitude level of better fish handling, acts as a precursor to bring down the avoidable fish loss. Using cross section data of 194 fish producers in minor irrigation tanks of Odisha and applying item response theory (IRT) and regression analysis, the study highlights that fish farmers possess lower than the average score for most of the knowledge items relating fish handling during harvest and post-harvest and lower than average attitude score for all attitude related items. The findings of the study further point out that demographic factors such as education, possession of a smartphone, membership of a farmer organization, and family size are important determinants for realizing higher knowledge and attitude towards better harvest and post-harvest fish handling. Based on the findings, the study recommends imparting training for the producers that emphasizes better fish handling practices during harvest and post-harvest. The training participants may be selected from specific target groups of fish farmers who have at least a basic education and are membership of a farmer organization for better training outcomes.

Keywords: Knowledge and attitude; post-harvest loss; Item response theory; Training; Aquaculture; Minor Irrigation Tank; Odisha

Domestic Consumption of Shrimp in India: A Review of Challenges and Opportunities

Naresh Mugada*

District Program Manager, PMMSY, Government of Andhra Pradesh.

* nareshjohn@andhrauniversity.edu.in

India stands as one of the world’s largest producers and exporters of shrimp, supplying a growing international demand driven by expanding seafood consumption in the United States, China, Japan, and the European Union. While the export sector has flourished, domestic consumption in India has historically remained modest. However, strong international demand continues to divert a large share of production toward exports, often resulting in limited availability and higher prices in the domestic market. Inadequate cold chain infrastructure, consumer price sensitivity, and limited awareness about the nutritional benefits of shrimp continue to restrict broader adoption across the country. A key development is the declining price of shrimp in the domestic market, partly driven by oversupply due to weakened export demand and increasing production. For India, Ecuador’s rise has dual impacts. On one hand, it increases downward pressure on global shrimp prices, a trend that could benefit domestic consumers by lowering retail costs. On the other hand, it intensifies competition in export markets, which may divert India’s production away from global buyers and open additional supply for local consumption. Coupled with the recent price decline in India driven by export pressures and weaker global demand, there’s a heightened opportunity to stimulate domestic consumption.

Keywords: Seafood, Domestic market, Cold chain infrastructure, Consumption

Statistical estimation of riverine fish catch: An example with Gomti river in India

Dharm Nath Jha*¹, A. Alam¹, V.R. Thakur¹, Vikas Kumar¹, Jeetendra Kumar¹, S. K. Manna², B.K. Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, 24 Panna Lal Road, Prayagraj, Uttar Pradesh, India – 211002

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700112

*dharmnath.jha@gmail.com

Rivers are important source of fresh water which provide water for different purposes and harbors living organism. India has about 4500 km of rivers comprising of larger to smaller one. Due to its vastness rivers are important for aquatics organisms including fishes. Fishes are easy and cheap source of protein to the indigent. Riverine fishes support livelihood to the large number of people in India. Knowledge about available fish population and their stock in the river is important for the policymaker for sustainable fishing and to monitor river ecosystem. Here one attempt has been made to estimate the fish catch from the river Gomti, a right bank tributary of river Ganga. River Gomti originates from Gomath taal of Pilibhit district of U.P. After traversing about 932 km. meets Ganga River. Artisan approach of fish estimation has been used to estimate the fish catch of the river. About 280 fishermen belonging to 85 villages along the river Gomti have been interviewed for information. Based on the collected individual catch data, the Estimated Total Fish Catch from the river is 3684.14 ton per annum with Variance as 12810.2538 Square ton. Estimated CPUE is varying from 0-8 kg/fisher/day.

Keywords: Gomti, Fish catch, Estimation, Artisan approach, CPUE.

Attaining Sustainable Development Goals: Role of Ecosystem Services of Floodplain Wetlands

Arun Pandit*¹, Anjana Ekka¹, B.K. Das¹, Aparna Roy¹, Gunjan Karnatak¹, Lianthuamluaia Lianthuamluaia¹, Archan Kanti Das¹, Bijoy Kumar Behera^{1,2}, Pranaya Parida¹, Amiya Sahoo¹, Avishek Saha¹, Shreya Bhattacharya¹, Purna Chandra¹, Sangeeta Chakraborty¹

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore-Kolkata

² National Fisheries Development Board, Hyderabad

*arunpandit@gmail.com

India, with its diverse landscape, is endowed with rich resources of wetlands which serve as crucial ecosystems with immense ecological, economic, and cultural significance. With over 150 wetlands covering 42,000 hectares in West Bengal state, these natural resources are essential for both ecological and economic sustainability. The present study analyses the critical role of floodplain wetlands in the Lower Gangetic Plains India, within the framework of Sustainable Development Goals (SDGs) by taking 4 floodplains, namely Beledanga, Kholsi, Sindrani and Chamta. The study deals with the correlation between the well-being of local communities, and their dependence on wetlands. The estimated value of annual fish production was approximately Rs. 264 lakhs, which shows the economic importance of wetlands. Approximately, 60 % of fisher households derive their livelihood from these water bodies. The wetlands also play a crucial role in generating employment, around 12,850 mandays of labor annually through fishing activities alone. Rice, jute, oilseeds, and vegetables are cultivated in the riparian areas of the wetlands. It estimates that 27,411 mandays of employment are generated annually, with Rs. 17.1 million directly attributable to the wetlands due to the use of wetland waters for cultivation. In the Sustainable Development Goals context, the findings emphasize the interconnectedness of environmental, economic, and social dimensions. Addressing these challenges is crucial for aligning with SDGs related to poverty alleviation, good health and well-being, zero hunger, life below water quality, and education. Furthermore, the study underscores the need for integrated and sustainable management practices to ensure the long-term resilience of these vital ecosystems and the communities dependent on them.

Keywords: Floodplains, ecosystem services, livelihood, fishers, Lower Gangetic Plains, West Bengal, SDG

Evaluating Women’s Empowerment in Small-Scale Aquaculture Using WEAI in Odisha

H. K. De*, Sushree Sangita Rath, S. K. Swain, S. N. Sethi, C. K. Mishra and U. L. Mohanty

ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar, Odisha, 751002

[*bhuthnath@gmail.com](mailto:bhuthnath@gmail.com)

The growth of aquaculture in India is reshaping rural landscapes by improving livelihoods, ensuring food availability, and empowering women, especially in agrarian states like Odisha. This study investigates the empowerment of women engaged in small-scale aquaculture through Self-Help Groups (SHGs) in Dhenkanal and Kandhamal districts, utilizing a customized Women Empowerment in Aquaculture Index (WEAI). Six SHGs were purposively selected, and data from 90 women were analyzed across six weighted domains: access to resources, control over income, decision-making autonomy, aquaculture knowledge, participation in socio-economic activities, and attitude. Results revealed considerable variation in empowerment levels, with Mauthima Matsya and Sankulei Matsya Groups achieving high scores (84.57% and 84.29%), while Baba Bholeswar SHG lagged at 70.10%. High-performing SHGs benefited from better access to inputs, infrastructure, and extension services. Garrett’s ranking technique identified poaching, high feed costs, and lack of water and soil testing facilities as the most pressing constraints that hinder women’s involvement in aquaculture. The study highlights the transformative potential of SHGs in enhancing women’s empowerment. Findings underscore the need for gender-responsive policies and localized support systems to unlock the full potential of women in aquaculture.

Keywords: Women Empowerment, Aquaculture, Self-Help Groups (SHGs), Rural Development, Food Security

Fisheries and Aquaculture sector of Assam: A path to Economic Prosperity in Northeast India

Pradip Chandra Bhuyan* and Debojit Dekari

Faculty of Fisheries Science, AAU, Raha, Nagaon – 782103

* dean_fishery@aau.ac.in

Assam, being a frontrunner among the North-Eastern states of India in the fisheries sector, has demonstrated substantial growth with a production of 4.99 lakh metric tonnes in 2023-24. Assam is now the fourth-ranked inland state in terms of fish production in India contributing 4 percent of the GSDP and 14 percent to AGDP of the state. The state has made significant strides in fish seed production and inland aquaculture, establishing itself as a regional leader in the Northeast. Richly endowed with abundant inland water resources including rivers, floodplains, wetlands, and ponds; Assam holds immense potential for further development of its fisheries sector. In the face of a rapidly increasing population and a projected surge in fish demand, there is a pressing need for a comprehensive strategic planning and implementation. Here, we put forward the sector’s untapped potential by integrating sustainable practices, technological innovation, value chain development, and institutional reforms. The strategy emphasizes boosting fish production through scientific aquaculture, promoting indigenous fish species, improving fish seed quality, adopting climate-resilient technologies, and reinforcing market linkages. Additionally, it highlights the significance of capacity building, policy support, and fostering public-private partnerships in scaling up the sector’s contribution to food security, employment generation, and increasing export potential. By aligning with the broader vision of India’s blue economy, Assam is poised to emerge as a regional hub for inland fisheries and aquaculture, ensuring inclusive growth and ecological stewardship in the Northeast India.

Keywords: Aquaculture, sustainable, Inland Fisheries, development, Northeast India, Assam

Evaluating cage culture of *Hypophthalmichthys molitrix* in mid-altitude reservoir of Northeast India through participatory mode

Pronob Das^{1*}, Sona Yengkokpam^{1,3}, Dipesh Debnath^{1,3}, Basanta Kumar Das², Thangjam Nirupada Chanu² and Sullip Kumar Majhi¹

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati-781006, India

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal-700120, India

³ICAR-NAARM, Hyderabad, Telangana-500030, India

*pronobjaan80@gmail.com

Cage culture of *Hypophthalmichthys molitrix* (Silver carp) was carried out with participation of local cage farmers in Mapithel reservoir. It is a medium reservoir was in mid-altitude region of India. Fingerlings of silver carp having average weight 32.45 ± 1.04 g and average length 15.3 ± 0.86 cm were used for the study. Individual cage dimension of 6 x 6 x 4 m (144 m^3) with effective water volume is 126 m^3 was used for culture. Four stocking densities viz., 8, 12, 16 and 20 fingerlings/ m^3 were tested in triplicates. The trial finish when the fish weighed 1 kg. Fish were fed with floating feed containing 28 % CP @ 2-3 % body weight. Fish stocked at lower density had higher growth performance than those stocked at higher stocking density. Fish stocked at 8 and 12 no./ m^3 reached harvesting size (1 kg) at shorter culture period although higher biomass was achieved at higher stocking densities. It can be recommended that initially silver carp fingerlings can be reared at 20 no./ m^3 for 4 months after which the stocking density can be reduced to 8 or 12 no./ m^3 to reduce the culture period.

Keywords: Cage culture, silver carp, Reservoir, Northeast India, Participatory approach

Socio-ecological implication of algal eutrophication in Kholsi beel, a floodplain wetland of Ganga basin, India

Ranjan Kumar Manna*, Suman Kumari, Lianthuamluaia Lianthuamluaia, Pritijyoti Majhi, Hemanta Chowdhury, Md. Aftabuddin, Subrata Das, Yousuf Ali, Abdul Ajij Al Amin, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute Barrackpore, Kolkata-700
120,
*rkmanna@yahoo.com

Among different forms of anthropogenic factors perturbing wetland ecosystem, algal eutrophication is now quite common caused by excessive nutrient loading from various sources. Impact of algal eutrophication was assessed in Kholsi beel, a 65 ha seasonally connected floodplain wetland in Nadia district of West Bengal, India. All the submerged macrophytes reported previously in 2015 completely vanished from the wetland due to increased plankton turbidity. Significant impact was noticed on fish diversity and catch pattern. As many as eight SIF species have disappeared from the wetland out of previously recorded 37 fish species. Fishery of *Trichogaster* spp. and *Puntius* sp. have been severely impacted. Analysis revealed that fishers significantly lost their income due to drastically declined catch of prized SIF (up to 1000/- per kg), where stocked indigenous and exotic carps were sold at much lower rate (Rs.140-250 per kg). A comparison of fish catch (kg) and sale price (Rs.) between 2015 and 2022 revealed that despite increase (about two-fold) of fish yield of stocked carp fishes, drastic reduction (about 10-fold) of SIF catch ultimately resulted in significant loss of income of the poor fishers. The study calls for scientific knowledge driven management measure for development of wetland fisheries.

Keywords: Eutrophication, SIF, livelihood

Socio-Economic Dynamics of Native and Migrant Labours in Marine Fisheries of West Bengal

Aparna Roy^{1*} and Shyam Selim²

¹ICAR-Central Inland Fisheries Research Institute Barrackpore, Kolkata-700 120

²ICAR- Central Marine Research Institute, Kochi

*aparnaroycifri@gmail.com

Labour migration in Marine Fisheries in West Bengal is a complex socio-economic phenomenon shaped by ecological, economic, and policy dynamics. West Bengal's marine fisheries, primarily along the coastal districts like Purba Medinipur and South 24 Parganas, play a crucial role in livelihoods. A study was conducted to understand the socio-economic characteristics of the migrant as well as the native labourers. Data was collected from Kakdwip, Diamond Harbour, Digha and Ramnagar with the pre-tested interview schedule. It was found that the age structure of the native and non-native people is similar. However, the majority (46%) of the migrant fishers belonged to the age group 41-50 years. Most of the respondents are Hindu (74%), and most of them belonged to the scheduled caste (62%), followed by OBC (24%), General (11%) and ST (3%). Fishery is a full-time job for most of the non-migrants (92%); a part-time job for 32% of the native labourers. Migrant labours have almost 16 years of experience in fishing-related whereas native labourers have almost 21 years of experience in fishing-related jobs (native). It was reported by most of the native fishers that their entry into the fishing job was by birth (64%); however, migrants reported entry into the fishing job for employment (53%), followed by persuasion by others for income (24%). The average household income for the migrants and natives is INR 22500 and INR 19800, respectively. Both inter-district and inter-state migration were noticed in the study area. In inter-state migration, 56% of the migrant labourers are recruited by the boat owners, 27% have migrated in consultation with friends and family members, and 8% by agents. There is an urgent need for inclusive policy frameworks, social security measures, and inter-state coordination to safeguard the rights and welfare of these native and migrant workers and to promote sustainable livelihoods within the marine fisheries sector.

Keywords: Socioeconomics, Migrant labour, Native labour,

'Bandh' Fisheries for Tribal Livelihood and Nutrition in the Chhotanagpur Plateau

Aparna Roy*, B.K. Das, Loknath Chokroborty and Sanjeet Debnath

ICAR-Central Inland Fisheries Research Institute Barrackpore, Kolkata-700
120

*aparnaroycifri@gmail.com

The Chhotanagpur Plateau, encompassing parts of Jharkhand, Odisha, Chhattisgarh, Bihar, and West Bengal, is home to a diverse range of tribal communities, including the Santhal, Munda, Oraon, Ho, and Kharia. This region is characterized by a unique socio-economic landscape shaped by traditional subsistence practices, forest-based livelihoods, and a strong cultural identity. The tribal economy is predominantly agrarian, supported by minor forest produce. Despite rich traditional knowledge and ecological stewardship, these communities face persistent challenges of poverty. Keeping this in view a livelihood improvement programme was initiated at Man Bazar, Purulia through fisheries enhancement in 'Bandhs', for the livelihood and nutritional security of the tribal of the Chhotanagpur plateau. Traditional water harvesting structures known as *Bandhs* in this region (small earthen dams or ponds) hold significant potential for fisheries development. These water bodies, often constructed for irrigation, remain underutilised for aquaculture. By introducing scientifically managed fish culture practices—such as composite fish farming, fingerling stocking, and community-based management, Bandhs can become a reliable source of income and nutrition for the local tribal communities. Govindapur village of Manbazar-I Block, Purulia district, was selected for this study. A semi-structured questionnaire was used to collect the data. It was found that about 52% of the beneficiaries are illiterate. About 66% of the beneficiaries' primary occupation is agriculture, and only 10% have practised fisheries as a primary occupation. The average annual income of the tribal populace is Rs 51552/-. Among the sampled populace, 31% of the tribal women and 22% of the men are underweight. Dietary diversity of the sampled populace was very low. About 86% of their diet consists of carbohydrates, and Protein intake is very low, i.e 4%. Initiative of fish production enhancement in the 'Bandh' will promote sustainable livelihoods and nutritional security to ensure the socio-economic upliftment of the tribal populace of the Chhotanagpur Plateau.

Keywords: Bandh, Chhotanagpur Plateau, fisheries, livelihood

Comparative Analysis of Community-Based Fisheries Governance: Cooperatives vs. Self-Help Groups in Kabirdham district, Chhattisgarh

B. Nightingale Devi*¹, Preeti², Preeti Kujur² and Rishabh Kumar Netam²

Department of Fisheries Basic Science and Humanities, LSPN College of Fisheries, Kawardha Chhattisgarh-491995

bn.devi@dsvckvdurg.ac.in

This study addresses a critical gap in community-based fisheries governance by conducting a comparative analysis of institutional models—Fisheries Cooperative Societies (FCS) and Self-Help Groups (SHGs)—in Kabirdham District, Chhattisgarh. Data were collected from 122 respondents (61 FCS members, 61 SHG members) through questionnaires, interviews, and focus group discussions during 2024–25. The data were analysed using the Cooperative Performance Index (CPI), NABARD's SHG assessment framework, and Garrett's ranking for constraint analysis. Results indicate that FCS exhibited average performance, excelling in legal compliance and management but performing poorly in market linkages. Three out of six FCS achieved "good" ratings, with their members reporting higher incomes (78.68% in the medium bracket). SHGs, exclusively female (100%), demonstrated strong participation and savings, yet faced significant financial constraints (54.47% cited inadequate capital) and low awareness of government schemes (64.86%). Both institutional models identified political bias (FCS: 62.31%; SHGs: 61.08%) and poaching (FCS: 49.06%; SHGs: 52.08%) as major challenges. While FCS leveraged their scale and infrastructure, SHGs fostered grassroots empowerment. The study concludes that policy interventions should target market linkage development for FCS and enhanced financial inclusion for SHGs to bolster socio-ecological resilience and promote sustainable livelihoods within the region's fisheries sector.

Keywords: Self-Help Group, Cooperative Societies, Cooperative Performance Index, Resource Governance, Sustainable Livelihoods

Dynamics of domestic fish marketing system in Raipur city, Chhattisgarh

B. Nightingale Devi^{*1}, Pratishtha Yadav², Preeti Chandrawanshi² and Rohit Sahu²

Department of Fisheries Basic Science and Humanities, LSPN College of Fisheries, Kawardha Chhattisgarh-491 995

bn.devi@dsvckvdurg.ac.in

The present study investigates the fish marketing system within Raipur City, Chhattisgarh, a vital hub for fish distribution and trade that significantly supports livelihoods, ensures food security, and contributes to the state's economy. Focusing on four major fish markets—Mana Camp, Amapara, Shashtri Bazar, and Mangal Bazar—the research aimed to analyze fish species diversity, marketing costs and margins, price spreads, distribution channels, and retailer constraints. From January to April 2025, data were collected from 100 respondents through questionnaires, interviews, and focus group discussions. The study identified 29 fish species, with Catla, Rohu, Tilapia, and Prawn being the most dominant. Three primary marketing channels were observed: direct sales (producer to consumer), sales through retailers, and a complex chain involving wholesalers and retailers. Retailers bore the highest marketing cost (Rs. 17.90/kg). The price spread was most significant in channels with multiple intermediaries (Rs. 55.29/kg), consequently reducing the producers' share to 77% of the consumer price. Key constraints included inadequate cold storage, high transportation costs, poor infrastructure, and exploitation by middlemen. The findings highlight the need for policy interventions to improve infrastructure, reduce intermediaries, and enhance the efficiency of the fish marketing system in Raipur, ultimately benefiting both producers and consumers.

Keywords: Fish marketing, Raipur, marketing channels, price spread, constraints

**Geo-Spatial Decision Support for Aquaculture Planning:
A Case Study of Maharashtra using CIFA AquaNIRNAY**

I.Sivaraman^{1*}, Nirmal Kumar², Saroj Kumar Swain¹, Himanshu Sekhar Swain¹ and Rabi N. Sahoo³

¹ ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar

² ICAR-National Bureau of Soil Survey and Land Use Planning, Nagpur

³ ICAR-Indian Agricultural Research Institute, New Delhi

*fishiva26@gmail.com

The CIFA AquaNIRNAY, a geospatial mapping and data analytics-driven planning framework, utilizing remote sensing data and cloud computing infrastructure was developed under ICAR-Network Program on Precision Agriculture (NePPA) to delineate and characterize water resources for optimizing aquaculture. It has been evaluated in Maharashtra state for temporal analysis of water surface area dynamics across pre- and post-monsoon periods from 2018-2023. The system identifies waterbodies demonstrating hydrological persistence of 6-8 months duration, with geospatial analysis revealing that waterbodies ranging 10-30 hectares exhibited high post-monsoon water surface area persistence (>83%) while smaller impoundments (0-2 ha) demonstrated approximately 68% retention rates, indicating significant aquaculture development potential for decentralized and smallholder farming systems. The system is being upgraded to provide site-specific recommendations and customized decision support, making it a valuable tool for comprehensive aquaculture development planning. This enhancement underscores the efficacy of geospatial decision support systems in promoting sustainable and inclusive growth of the aquaculture sector through evidence-based methodologies.

Keywords: Geo-spatial decision, aquaculture planning, Maharashtra

Assessment of the Economic Efficiency of Satellite-Derived Potential Fishing Zones (PFZs) Versus Non-PFZ Areas through Benefit-Cost Ratio Analysis in Case-2 Waters of India

Sanjeevan Kumar

ICAR-Central Institute of Fisheries Education, Kolkata centre, Salt Lake, Sector-V, Kolkata-91

The profitability of marine fishing operations is increasingly influenced by scientific advisories derived from satellite-based oceanographic parameters. This study evaluates the economic efficiency of fish catches from Potential Fishing Zones (PFZs) compared to non-PFZ areas along the case-2 waters of India, using the Benefit-Cost Ratio (BCR) as a key metric. BCR was computed using fuel and labour costs as major operational expenditures and the market value of fish catch as income. A total of 48 paired observations were analyzed across three coastal states-Gujarat and Maharashtra (Arabian Sea) and West Bengal (Bay of Bengal)—using standardized Catch Per Unit Effort (CPUE) sampling design. The results show that fishing in PFZs yields consistently higher BCRs across all regions: PFZ-BCRs averaged 5.23 in the Arabian Sea and 3.7 in the Bay of Bengal, whereas non-PFZ-BCRs averaged 4.25 and 1.8, respectively. The difference in average BCR between PFZ and Non-PFZ zones was 0.98 in the Arabian Sea and 1.9 in the Bay of Bengal, indicating a stronger economic impact of PFZ advisories in eastern coastal waters. These findings suggest that PFZ-based advisories, generated by INCOIS using satellite-derived Chlorophyll-a and Sea Surface Temperature (SST) data, significantly enhance fishing efficiency, reduce exploratory effort, and improve profitability. Statistical validation through t-tests, ANOVA, and multivariate regression confirmed that BCR differences between PFZ and Non-PFZ locations are significant ($p < 0.05$), with particularly strong effects observed in the Bay of Bengal. The study also highlights the critical role of operational strategies, species availability, and fisher adoption of advisories. It concludes that satellite-guided PFZ advisories can double the economic return in certain zones and should be integrated into national marine fisheries policy, supported by training, awareness programs, and mobile dissemination tools for fishermen.

Keywords: Potential Fishing Zone (PFZ), Benefit-Cost Ratio (BCR), Satellite Remote Sensing, Chlorophyll-a, Sea Surface Temperature (SST), Indian Coast

Enhancing freshwater fish seed supply chains in Odisha: A strategic initiative through demonstration of cluster seed villages approach

Pratap Chandra Das, Himanshu Sekhar Swain*, Himansu Kumar De and Sangram Ketan Sahoo

ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha-751002

*himanshufishco@gmail.com

ICAR-CIFA has undertaken a pioneering initiative to strengthen the freshwater fish seed supply chain in Odisha through the 'Cluster Seed Villages' (CSV) approach funded by PMMSY, DoF, and GOI. The aim of this study is to improve aquaculture productivity by enhancing the quality, accessibility and timely supply of fish seed. The CSV approach was implemented in the districts of Balasore and Mayurbhanj, Odisha, where local fish seed producers were strategically grouped into clusters to optimize resource use, knowledge sharing, and infrastructure access. A total of four locations were selected for the demonstration, including Katisahi, Palasia and Remuna from Balasore, along with Nitei from Mayurbhanj. The present study was conducted for fish seed rearing across three stages i.e., Spawn to fry, fry to fingerling and fingerling to juvenile. A spawn-to-fry rearing demonstration was carried out on a 0.72 ha area at Remuna, where 31 lakh IMC spawn were stocked, achieving a survival rate of. A total of 4.27 lakh fry was stocked at Katisahi and Palasia for the demonstration of fry to fingerling rearing, achieving a survival rate of 65.02%. Similarly, the fry to fingerling rearing demonstration was conducted at Nitei, Mayurbhanj district where 4.6 lakh fry were stocked and the survival rate was 53.3%. A total of 1.22 lakh fingerlings were provided for fingerling to juvenile rearing at Katisahi and Palasia, which encompassed an area of 12 ha while 0.74 lakh fingerlings were provided to Nitei for the same purpose. During the demonstration programme, farmers received training on measuring key water quality parameters and monitoring their ponds. They were provided with all necessary farm inputs, including seed, feed, manure and lime. Consequently, both clusters were able to supply seed to various areas of the district. This innovative initiative has significantly contributed to doubling the income of many farmers and advancing the state towards self-sufficiency in fish seed production.

Keywords: fish seed, Cluster Seed Villages, PMMSY

Towards a Resilient Blue Economy: A Conceptual Framework for Sustainable Development in the Indian Sundarbans

Anjana Ekka*, Arun Pandit, Piyashi Debroy, B.K. Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata

* ekka.anjana@gmail.com

The Indian Sundarbans, located in southern West Bengal, is part of the world's largest river delta and has been declared a UNESCO World Heritage Site. Covering an area of around 9,630 km² area including 4,263 km² of thick mangrove forests, the Indian Sundarbans is home to over 4.5 million people who rely directly on natural resources for their daily lives and livelihoods. This unique estuarine ecosystem comprises a complex mosaic of mangrove creeks, tidal rivers, mudflats, brackish ponds (Bheris), canals and waterlogged agricultural lands that serve as vital resources for fisheries and aquaculture. The ecological productivity of this region supports a rich biodiversity and a wide array of ecosystem services including fisheries, storm protection, carbon sequestration, and nutrient cycling. However, the Sundarbans faces mounting challenges from climate change, frequent cyclones, saline water intrusion, land subsidence, and socio-economic marginalisation. In this context, the present study proposes a Resilient Blue Economy (RBE) framework as a holistic strategy to ensure sustainable development and long-term ecological and social resilience in the region. The framework consists of four pillars: (1) ecological resilience through mangrove and wetland restoration (2) economic sustainability through diversified livelihoods (3) social and cultural inclusion that values traditional knowledge systems, promotes gender equity, and empowers local communities; and (4) institutional integration across water, forest, and fisheries sectors with cooperation at national and transboundary levels. By linking inland open waters with deltaic ecosystem processes, the RBE framework aligns with Sustainable Development Goals and offers a transformative pathway to reconcile conservation with the socio-economic needs of vulnerable communities in the Indian Sundarbans.

Keywords: Indian Sundarbans, Sustainable Development Goals, Resilient Blue Economy (RBE) framework

Seed Production of freshwater prawn in brackishwater pond: An alternative source of income generation in coastal district of Odisha

Swagatika Sahu*, Kamalakanta Behera, Niroj Kumar Jena, AmitJyoti Majhi, Amita Rani Patra and Pravamanjari Giri
Krishi Vigyan Kendra (OUAT), Balasore, Odisha-756023

* swagatikasahu@ouat.ac.in

Brackishwater ponds are preliminary used for aquaculture, specifically for culture various species of fishes and shellfish like shrimp, milkfish and crabs. In coastal districts of Odisha, especially Balasore, farmers are mainly culture *L. vannamei*. Vannamei production faced several challenges including disease outbreak, fluctuating water quality and environmental factors like high temperature which affect production and profitability. The present work investigated an alternate income source among the farmers by seed production of freshwater prawn in brackishwater ponds citing its economics and constrains. The data was collected through personal interview of the seed growers in Sadar block of Balasore district and analyzed through simple tabular analysis. Male farmers are dominating in production of *M. rosenbergii* seed with an age ranged from 45-50 years. Pond preparation started from the month of December, and two to three crops are harvested within 6 to 7 months. The survival rate of PL was found ranged from 1.8 to 10.2 % with an average 2.6%. The cost of seed production is Rs 0.24/- per seed with a profit ranged from 0.75 lakh to 2.84 lakhs per ha per crop. The major constrains is non-availability of adequate quality berried female, lack of seed acclimatization facilities and low price of seed due to undeveloped market strategy. By solving these issues with proper technical guidance, it will be a raising scope on income generation with entrepreneurship development.

Keywords: Brackish water pond, Freshwater prawn seed, income generation

Growth and Survival of *Puntius gonionotus* Fingerlings in Cages at Surada Reservoir, Ganjam district, Odisha

Maguni Ch. Moharana*, Saumyendra Nanda, Santosh Kumar Udgata,
Manoj Kumar Tripathy and Naba Kishore Sial,

College of Fisheries (OUAT), Rangeilunda, Berhampur-760007, Odisha

* mcmoharana@gmail.com

The production potentiality of silver barb (*Puntius gonionotus*) for culture in seasonal ponds, ditches and canals has already been proven and created a significant profitability in many countries of Southeast Asia. However, no research work on this species for its potential in different reservoirs has been conducted. Considering the above fact, this study was undertaken to observe the production potential and determine the feasibility of culturing silver barb in reservoir. The objective of this study was to grow *Puntius gonionotus* fingerlings in cages, to study growth performance and survival of *Puntius gonionotus* cultured in cages and to study water quality parameters in cages. For this purpose, Surada Reservoir of the Ganjam District was selected, and low cost locally available materials were used for installation of cage. A culture period 120 days was carried out to assess the feasibility of the fish species of interest. Findings of the study indicate that silver barb (*Puntius gonionotus*) is most suitable for cage culture in reservoirs. It has the potential to increase fish production and farmers income.

Keywords: reservoir fisheries, cage culture, *Puntius gonionotus*, Surada reservoir

Exploring Determinants of Empowerment among Women SHG Members in Aquaculture: Evidence from Rural Southern Odisha, India

Pritam Tripathy

Centurion University of Technology and Management, Paralakhemundi,
Odisha, India

tripathy.pritam@gmail.com

Women’s involvement in aquaculture through Self-Help Groups (SHGs) has steadily expanded across rural India, yet the pathways to their empowerment remain insufficiently understood. This study explores the key factors influencing empowerment among women engaged in aquaculture-based SHGs in Odisha. Employing the Overall Women Empowerment in Aquaculture Index (OWEAI) as a composite indicator, we examined how variables such as education, caste, landholding, and participation in extension programmes contribute to empowerment outcomes. Data from five SHGs were analysed using a mix of descriptive statistics, correlation analysis, regression modelling, and clustering techniques. The findings show that education, participation in extension programs, and caste identity significantly contribute to empowerment, whereas landholding size showed an inverse relationship. Interestingly, women with smaller landholdings were found to be more empowered than their better-resourced counterparts, possibly due to greater reliance on group-based livelihoods. These findings highlight the multifaceted nature of empowerment and underscore the need for context-sensitive interventions that enhance capacity-building, knowledge access, and inclusion for marginalized communities. The study suggests evidence to guide inclusive strategies that place women’s empowerment at the centre of aquaculture development efforts.

Keywords: Aquaculture, Odisha, Regression analysis, Self-Help Groups (SHGs), Women empowerment

Drivers of Supply-Side Dynamics in Wetland Fisheries of Gangetic Floodplains: Exploring the Social Aspects

Piyashi DebRoy, Basanta Kumar Das, Kousik Mandal and Sangeeta Chakraborty

ICAR – CIFRI, Barrackpore

The floodplain wetlands of river Ganga at North 24 Parganas district of West Bengal are important fisheries resources which impact the livelihood and social condition of fishers. Three wetlands under co-operative fisheries management, namely Chamardaha, Chamta and Sindrani were studied to identify how market conditions influenced fishers’ incomes, what the drivers of supply-side dynamics were, and how gender equity existed in co-operative management scenario. Data was collected during May 2023 through focus group discussions at the Offices of the Primary Fishermen Co-operative Societies. The price of Indian Major Carps in prevailing market conditions, its consumer demand, and consumption by fisher families from the daily or weekly fish catch was the highest in comparison to other fishes (exotic carps, tilapia and catfish). The drivers that influenced supply-side dynamics were seasonal market prices of fish, fish species most demanded by consumers, occupation pattern of fishers, fishers’ household fish consumption, number of fishers involved in a fishing trip, duration of fishing, and fishing assets owned by the fishers and co-operative societies. Gender equity was skewed as there was absence of women’s participation in fishing, with occasional involvement in ancillary activities and their nil representation in the Board of Management of Co-operative Societies.

Transforming tribal livelihoods through integrated farming: a success story from Meghalaya

S. Gojendro Singh, Tasso Tayung, Chandan Debnath*, Rahul Katiyar, H. Talang, N. Uttam Singh, B.P. Singh, S. Hazarika

ICAR Research Complex for NEH Region, Umiam, Meghalaya, PIN: 793103

*chandannath23@gmail.com

Mr. John Ignasius Majhong, a tribal farmer from Sarikushi Marngar, Ri Bhoi district, Meghalaya, transformed his subsistence farming operation into a profitable integrated enterprise through the Tribal Sub Plan project implemented by ICAR Research Complex for NEH Region, Meghalaya. Operating on one acre of land with a family of four members, Majhong's baseline annual income of ₹70,000 increased dramatically to ₹1.2 lakh within one year, representing a remarkable 71.4% growth. The aquaculture component utilized a constructed pond measuring 8 meters by 4 meters (32 square meters), accommodating 500 mixed fish fingerlings including common carp, puntius, gonius, mrigal, and rohu species. Horticultural production occupied approximately 0.6 acres, featuring diverse vegetables including French beans, cucumber, coriander, chili, pumpkins, tomato, brinjal, and bottle gourd cultivated through scientific crop rotation practices. Paddy cultivation utilizing local rice varieties covered 0.3 acres, while the remaining area supported infrastructure including housing for 20 poultry birds and a piggery unit with 2 pigs. The intervention included technical training programmes on scientific fish rearing, water quality management, and animal-plant health management, complemented by infrastructure support through *Jalkund* installation and a 1 HP electric water pump. Income diversification resulted from multiple revenue streams with fish farming contributing approximately ₹10,000 annually, vegetable production generating ₹40,000, paddy cultivation providing ₹20,000, poultry enterprises yielding ₹15,000, and piggery operations adding ₹35,000 to the total annual income. This success story demonstrates the transformative potential of community-based integrated farming systems in enhancing tribal livelihoods while promoting sustainable agricultural practices, providing a replicable model for similar agro-climatic regions across Northeast India's tribal communities.

Keywords: Integrated farming systems, Tribal sub plan, S livelihoods, Rural development

Pond based Integrated Farming System-Science for better livelihood

S. S. Das*¹, D. Choudhury² and M. K. Tripathy²

¹ Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-761008

² College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-760007

*sidharthasdas@ouat.ac.in

In the changing climatic conditions, Pond-based integrated farming enhances the livelihoods by combining aquaculture, agriculture, horticulture and livestock in a sustainable way. The Krishi Vigyan Kendra-Ganjam-II under Odisha University of Agriculture and Technology, Bhubaneswar, demonstrated a Pond-based Integrated Farming System (IFS) model on a 2.4acre area in Kukudakhandi block of Ganjam District, Odisha, showcasing sustainable aquaculture, livestock and agricultural practices and their benefits for the local farmers. The primary components of the Pond-based IFS included fish, duckery, fruits and vegetables creating a diversified and sustainable agricultural ecosystem that maximizes resource utilization and enhances overall productivity. The result revealed that from a culture period of eight months, a total of 12.98 quintals of fish, including Rohu, GI Catla, and Mrigal, was harvested from the 1-acre pond, yielding a net income of Rs. 1.55 lakh. The farmer maintained two dairy cattle of the Sahiwal and Gir breeds, generating an annual net profit of Rs. 1.08 lakhs from milk sales. From duckery, fruits and vegetables, a net income of Rs. 0.57 lakh was obtained. The farmer achieved an annual net income of Rs. 3.20 lakh from the 2.4 Acre Pond-based IFS model with a higher BC ratio of 2.18. Aquaculture contributes the largest share of income in the IFS model. It has completely fulfilled the household's requirements for milk, meat, fish, and eggs; however, it has met 58% of the family's fruit and vegetable needs. The present case of the Integrated Farming System can be replicated in resource-rich rural areas under different agroecological situations, ensuring sustainable income and improved family nutrition.

Keywords: Pond, IFS, Climate resilience, Livelihoods

Food & Feeding Protocol for Scampi Fisheries Enhancement in Small Reservoirs of Jharkhand

A K Das*, B K Das, Mukesh Kumar Ram, Manish Kujur and Upama Das
ICAR-Central Inland Fisheries Research Institute
Barrackpore, Kolkata 700120
[*archandas@yahoo.com](mailto:archandas@yahoo.com)

Macrobrachium rosenbergii, commonly known as Scampi, is a high-value freshwater prawn from the Palaemonidae family, distinguished by its large size, rapid growth, & ability to digest a wide range of foods. Enzymatic analysis of its alimentary tract reveals the presence of trypsin, aminopeptidases, proteases, amylases, chitinase, cellulase, esterases, and lipases (Mitra et al., 2005). In stock enhancement practices in reservoirs of Jharkhand, Scampi is fed with a high-protein diet (40% protein, 7% crude lipid) at a 5% ration, with mineral supplements (1 kg/5 kg feed) added during full moon and new moon periods when moulting probability is at high. Feeding begins at 8 kg/lakh/day—exceeding consumption needs—to fertilize the waters, enhance plankton density, and promote benthic growth. Feeding levels are adjusted based on daily intake evaluated via lift nets. During winter, experiencing 15-20°C, metabolism slows down; hence, initial feed levels are maintained in the first quarter. Water transparency is regularly monitored using a Secchi disc to examine phytoplankton abundance. As scampi are nocturnal feeders, feed is distributed in the evening to align with their natural foraging behavior. Daily feed requirements increase with growth and survival, peaking near harvest, but reduce to around 5 kg/lakh/day post-monsoon or with the onset of winter.

Keywords: Feeding, scampi, enhancement, reservoir

Evaluating Causes and Solutions for Fish Wastage in Inland Fisheries: A Case Study from Chhirpani Dam

Jitender Kumar Jakhar^{a*}, Domendra Dhruve^a, Girjalata Kanwar^a, Mamta Chandravanshi^a, Manisha Verma^a and Prachi Singh^a

^a Department of Fish Harvest and Post Harvest Technology, LSPN College of Fisheries, Kawardha 491995

*jitender.jakhar@dsvckvdurg.ac.in

The fisheries sector is crucial for food security, employment, and economic growth in developing countries but faces considerable post-harvest losses due to spoilage, poor handling, limited infrastructure, and disposal of bycatch. This study, conducted at Chhirpani Dam in Chhattisgarh, India, aimed to identify key causes of fish wastage and suggest practical solutions. A total of 92 respondents, including fisheries committee members and local fishers (representing 38.3% of the fishing community), were surveyed using random sampling. Data were gathered through field observations and literature review and analyzed using the Questionnaire Loss Assessment Method (QLAM). Findings revealed that high temperatures, delays in marketing, insufficient storage, and mishandling significantly contribute to post-harvest losses. It was found that about 5.33% of the annual fish harvest—around 4 tonnes out of 78 tonnes is wasted every year, causing a financial loss of about ₹5.20 lakhs at this site alone. Physical damage from inadequate infrastructure and negligence was identified as the primary cause. The study recommends expanding cold storage facilities, upgrading transport systems, and strengthening the overall supply chain to reduce losses effectively. These measures are essential to improve food availability and enhance the economic sustainability of the fisheries sector.

Keywords: Post-harvest, Chhirpani dam, fishery committee, fisher-folks, Physical loss,

Inclusivity of Transgender in Fisheries Sector: Call for a paradigm shift in Gender Mainstreaming

Pooja Priyadarshini*, Sushanta Kumar Patra, Santosh Kumar Udgata,
Manoj Kumar Tripathy and Arpit Acharya

College of Fisheries, OUAT, Rangailunda, Berhampur-07

* poojapriyadarshini2525@gmail.com

Gender equality, a universally agreed-upon principle, is adopted widely but implemented to varying degrees across different sectors. The inclusion of transgender individuals in the fisheries sector—a traditionally heteronormative and male-dominated domain—remains an underexplored yet crucial frontier in the pursuit of equity and social justice. Consequently, Transgender persons, often marginalized through systemic socio-economic and cultural exclusion, face formidable barriers in accessing equitable opportunities within fisheries, from labor rights to policy participation. Empirical studies suggest that diverse gender participation enriches ecological stewardship and community resilience, yet the invisibilities of transgender individuals continue to perpetuate inequity and resource misallocation. The integration of queer theory into marine policy discourse, the reformation of occupational norms, and the elevation of transgender voices in decision-making arenas is, thus, the need of the hour. Recognizing this, the review examines gender gaps in the fisheries sector and effective strategies to reduce inequalities, thereby contributing to gender equality (SDG 5) highlighting innovative gender-transformative approaches and the importance of gender mainstreaming. It foregrounds the imperative to transcend tokenistic engagement by advocating for structural transformation that embraces gender diversity in all its manifestations. A truly inclusive fisheries framework necessitates dismantling entrenched binaries and fostering intersectional paradigms that account for gender identity, expression, and socio-political positionality. Ultimately, embracing transgender inclusivity is not merely a moral imperative but a strategic one, fostering more resilient, just, and sustainable fisheries systems amid the growing complexities of global socio-environmental change.

Keywords: Gender Mainstreaming, Transgender inclusive perspective, SDG, Livelihood.

An insight into the prospects of cage culture management in the Hirakud reservoir

Ratul Chakraborty*, Basanta Kumar Das⁽¹⁾, Ramesh Chandra Malick, Pranab Gogoi, Satish Koushlesh, Canciyal Johnson, and Soubhagya Nayak

ICAR – CIFRI, Barrackpore

*ratul1c@yahoo.com

Cage culture within the Hirakud Reservoir presents considerable opportunities for sustainable aquaculture, capitalizing on the reservoir's abundant water resources and conducive environmental conditions. This research examines the feasibility of cage farming in the reservoir, with a focus on water quality parameters and their impact on fish growth and production. Being the largest reservoir of India, Hirakud acts as an optimal site for the cage culture of commercially significant species such as carp and catfish. Essential environmental parameters, including pH, water temperature, dissolved oxygen, and nutrient concentrations, play a vital role in the success of cage farming. The study highlights the necessity of monitoring water quality to enhance fish growth while reducing the risks associated with overfishing and habitat degradation. With appropriate management strategies, including careful site selection and consistent monitoring, cage culture in Hirakud Reservoir has the potential to boost fish production, support local economies, and contribute to regional food security. This research emphasizes the critical need for sustainable aquaculture practices to reconcile economic growth with environmental preservation in freshwater ecosystems.

Keywords: Hirakud reservoir, water quality parameters, cage culture

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

Sub-Theme-IV
Responsible Fisheries & Aquatic Ecosystem
Management (RFEM)

Towards Sustainable Fisheries: Ecological Insights and Developmental Strategies for the Sardar Sarovar Reservoir, Maharashtra

Sukham Munilkumar*¹, Arpita Sharma¹, A. K. Jaiswar¹, Karankumar K. Ramteke¹, Kapil Sukhdhane¹, Kiran Padvi², Jeevan T. M. ¹, Shyam Waghmare¹

¹. ICAR-Central Institute of Fisheries Education, Mumbai-400 061, India

². Department of Fisheries, Government of Maharashtra, Nandurbar, Maharashtra- 425 412

*munilkumars@cife.edu.in

The study presents a comprehensive fisheries development plan to enhance fish populations and support sustainable livelihoods around the Sardar Sarovar Dam in Maharashtra. The present study was carried out from September 2023 to June 2025 across 16 sampling stations, encompassing a total area of 73 kilometres from Manibeli to Badal with approximate water speared area of 6000 ha. The physico- chemical and nutrient parameters remained within the normal range throughout the study period but showed elevated levels during the Pre-monsoon season, which is likely due to the cutoff of river inflow and the resultant drop in reservoir water level. A total of 39 Phytoplankton genera were identified, and highest number of genera is from the class Bacillariophyceae, followed by Cyanophyceae and Chlorophyceae. A total of 17 genera of Zooplankton were observed where the species representatives of Cladocera, Rotifer, and Copepoda were dominant. The Margalef's Richness Index shows high species richness, whose value is >4 in most of the seasons. Pielou's Evenness Index showed an optimum level of evenness whose range varies from 0.55-0.74. Shannon-Wiener Diversity Index showed a moderate level of (1.89-2.36) diversity during the study. A total of 38 fish species, spread across 34 genera and 16 families, were recorded from Sardar Sarovar. The reservoir is mesotrophic according to Carlson's trophic state index and the fish production potential according to Morpho-edaphic index is as less as 7.81kg/hac/yr. Furthermore, the study emphasizes the need for ecosystem health monitoring, community engagement, infrastructure development and the conservation of important species like Mahseer. The study concludes that coordinated management of the reservoir by the stakeholder states of Gujarat, Maharashtra, and Madhya Pradesh is vital for fully realizing the reservoir's developmental potential and ensuring sustainable fisheries management.

Keywords: Fisheries, Aquaculture, Sardar Sarovar Dam, Stocking, Cage culture

Assessment of Carlson’s Trophic State Index of Tampara Lake, Odisha

Manoj Kumar Tripathy*, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam, Bikash Kumar Pati and Santosh Kumar Udgata

College of Fisheries (OUAT), Rangeilunda, Berhampur-760 007

*[mtriplthy.ouat@gmail.com](mailto:mtripathy.ouat@gmail.com)

A study was made to access the trophic status of Tampara Lake, Odisha by calculating Carlson’s Trophic State Index (TSI). The three independent variables of the Index – Total Phosphorus (TP), Secchidisc Depth (SD) and Chlorophyll-a (CHL) were determined by standard procedures for two years. The average values of these variables- Total Phosphorus (TP), Secchidisc Depth (SD) and Chlorophyll-a (CHL) were found to be 17.24 mg/m³, 1.25 m and 3.16 mg/m³ during first year and 18.16 mg/m³, 1.17 m and 3.42 mg/m³ during second year respectively. The average values of these variables were taken to calculate the Carlson’s TSI which ranges from 0-100 to access the trophic status of the water body. The average value Carlson’s TSI were found to be 47.86 and 49.06 during first and second year respectively indicating that the lake as mesotrophic.

Keywords: Total Phosphorus, Secchidisc Depth, Chlorophyll-a, Carlson’s Trophic State Index, mesotrophic

Assessing Habitat Disturbance Effects on Fish Community Structure: Patterns in Species Richness, Taxonomic Distinctness, and Functional Diversity in a Tropical Indian River

Abhilash W.*, Deependra Singh, Pranay Kumar Parida, Suman Kumari
Basanta Kumar Das

ICAR – Central Inland Fisheries Research Institute, Barrackpore, Kolkata

*abhilash.odeyar1@gmail.com

This study investigates the relationships among taxonomic distinctness indices (Δ^+ and λ^+), LCBD, and multiple functional diversity metrics, including Functional Dispersion (FDis), Evenness (FEve), Richness (FRic), Divergence (FDiv), Originality (FOri), Mean Pairwise Distance (FMpd), Nearest Neighbor Distance (FNnd), and Specialization (FSpe) within fish assemblages of the Rupnarayan River. Eight sampling stations were stratified into low, moderate, and highly disturbed categories based on habitat disturbance scores. Pearson correlation and linear regression analyses were employed to elucidate associations between species richness, taxonomic and functional diversity indices, and disturbance intensity. One-way multivariate analysis of variance assessed variation in diversity metrics across disturbance gradients. Species richness exhibited positive correlations with FRic and λ^+ , but a negative correlation with LCBD. Functional diversity indices were significantly intercorrelated, notably FDis, FMpd, and FSpe. Habitat disturbance demonstrated a positive association with species richness and λ^+ , whereas negative correlations were observed with FDis, FMpd, and LCBD. Linear modeling identified FNnd and FRic as significant predictors of LCBD. Sites with high disturbance intensity showed significant reductions in FEve, FSpe, Δ^+ , and λ^+ , indicating diminished taxonomic and functional distinctness. These results stress the significant negative impact of anthropogenic habitat disturbance on fish community structure and emphasize the importance of incorporating taxonomic, functional, and β -diversity metrics to guide conservation and management efforts in tropical riverine environments.

Keywords: Local contribution to β diversity, Habitat disturbance, taxonomic distinctness, Functional diversity indices

Ichthyofaunal biodiversity, fish catch and composition of the River Sutlej: Present status

Absar Alam^{1*}, Vikas Kumar^{*}, Jeetendra Kumar¹, Venkatesh Ramrao Thakur¹, Dharm Nath Jha¹, Vijay Kumar¹, S. K. Manna² and B. K. Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, 24 Panna Lal Road, Prayagraj, Uttar Pradesh, India – 211 002

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India – 700 120

[*absar_alam@rediffmail.com](mailto:absar_alam@rediffmail.com)

The Sutlej River is the longest tributary of the Indus River system and major river of Punjab. Fish biodiversity, catch and composition of the river was studied during 2024-25 at different centres between Bilaspur (HP) to Ferozpur (Punjab). A total of 72 fish species including 7 species exotics were recorded. Cyprinidae was the most dominant family followed by Danionidae, Bagridae, and Ambassidae, respectively. The fish catch was estimated following landing centre approach. There were wide variations in fish catch at different stretches of the river. The fish catch from the river Sutlej was estimated at 445 tons per annum. From Ferozpur to Rupnagar district, the highest total fish catch was recorded in Ferozpur (158.0 tons) followed by Rupnagar (133.0 tons), Harike (93.0 tons), Sultanpur (60 tons) and Ludhiana (51.0 tons). Indian Major Carps formed the major catch in the Sutlej River (31.5%) followed by the minor carps (23.7%), catfishes (19.3%), miscellaneous group (14.1%), exotics (11.3%), Mahseers (0.016%), and snow trouts (0.013%), respectively. The outcome of the present study would be highly useful for implementing appropriate fishing regulations and management strategies for ensuring sustainable utilization of the fisheries resources of the River Sutlej.

Keywords: Conservation, Fish diversity, Indus River system, Landing Centre

Studies on reproductive biology of orange fin pony fish, *Leiognathus bindus* (Valenciennes) along Gopalpur coast, Odisha

S. Mishra, D. Choudhury*, S. S. Das, M. K. Tripathy and S. K. Bhuyan

College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-760007

*dharitrichowdhury@ouat.ac.in

A study was conducted on reproductive biology of *Leiognathus bindus* along Gopalpur coast Odisha. In the study sampling was done at fort night interval from July'14 to June'15. A total 250 no. of fishes comprising 150 females and 100 males were collected from Gopalpur landing center and nearby fish market. The Total length and total weight were measured to the nearest millimeter and to the nearest gram. The length weight relationship was established for both the sexes separately showing no significant difference. Hence, a common regression line for the population is established for *Leiognathus bindus* as $\text{Log } W = -1.6777 + 2.864 \text{ Log } L$ ($r^2 = 0.939$). The result showed that the relative condition factor varied from 0.95-1.35 indicating favorable environmental condition for growth of the fish. The values of ponderal index and Gonado somatic index confirms the breeding season of the species from December to February. The maximum percentage of matured ovary were also seen during these months. The values of GaSI and HSI were lower during these months further confirms the breeding season. The overall sex ratio was found to be 1:1.5(M: F). Maximum percentage of matured ovary were seen from December to February. The spent ovaries started appearing from February and then the percentage of occurrence increases up to April indicating spawning of *Leiognathus bindus*. The length at first maturity was found to be 10-12cm for both male and female. The average fecundity was found to be 10772 ± 2335 which shows strongest relationship with total length of fish.

Keywords: Reproductive biology, *Leiognathus bindus*, GaSI, Length at first maturity

Navigating Hilsa Sustainability: A Comparative Assessment of Stock Status using Length and Catch-based dual Approaches in the Northwestern Bay of Bengal

Subal Kumar Roul*¹ and Gyanaranjan Dash²

¹Digha Regional Station of ICAR-CMFRI, Digha, Purba Medinipur - 721 441, West Bengal, India

²Puri Field Centre of ICAR-Central Marine Fisheries Research Institute, Puri - 752 002, Odisha, India

*subalroul@gmail.com

Tenualosa ilisha (Hamilton, 1822), commonly known as Hilsa shad, is a highly valued anadromous and trans-boundary species widely distributed in the northern Indian Ocean, particularly the Bay of Bengal, and in India, it is recognized as the state fish of West Bengal while also contributing the highest landings among all maritime states. However, Hilsa populations have been experiencing a persistent decline in recent decades in most of its distributional ranges, primarily due to overfishing, habitat loss, and the impacts of climate change. Therefore, the present study evaluates the stock status of Hilsa shad using length-frequency data collected from commercial catches between 2021 and 2024, along with catch and effort data spanning 1985 to 2024 along the West Bengal coast. The assessment was carried out using two independent, contemporary, and robust models: the length-based Bayesian biomass (LBB) model and the catch-based Bayesian surplus production model (BSM). The indicators of relative biomass (B/B_{MSY}) being less than 1.0 and relative fishing pressure (F/F_{MSY}) exceeding 1.0 suggest that Hilsa shad is currently overfished. The study revealed that a reduction of approximately 20% in fishing pressure is required to gradually restore the biomass to a sustainable and healthy state. These findings can serve as a scientific basis for developing sustainable management strategies for Hilsa shad in this region.

Keywords: *Tenualosa ilisha*, stock status, LBB, BSM, Bay of Bengal

East Kolkata Wetlands: A natural wonder functioning as the ecological kidney of Kolkata and supporting livelihood of fishers and farmers

Sayan Mandal, Srikanta Samanta, Basanta Kumar Das*, Gunjan Karnatak, Vikash Kumar, Archan Kanti Das, Lianthumluaia, Snehasis Dalal, Rumali Sahoo, Angana Majumder

ICAR - Central Inland Fisheries Research Institute, Barrackpore- 700120, West Bengal, India

*basantakumard@gmail.com

The East Kolkata Wetlands (EKW), recognized as a Ramsar site, serve as a distinctive socio-ecological model that combines wastewater-fed aquaculture with sustainable livelihood approaches. Covering an area of 12,500 hectares, EKW facilitates 308 bheries enabling local communities to utilize domestic sewage for pisciculture and cultivation of rice and vegetables. In the present study assessed the ecological parameters, fish diversity, and the basic pisciculture aspects through field-based surveys and at the same time, analysis of the related water and sediment quality parameters during March 2024–March 2025. The diversity of fish encompasses Indian Major Carps (*Labeo rohita*, *L. catla*, *Cirrhinus mrigala*), along with tilapia (*Oreochromis nilotica* and *O. mossambicus*), minor carp (*L. bata*), exotic carp *Hypophthalmichthys molitrix*, etc. The gradual increase in occurrence of invasive *Pterygoplichthys* spp. is a present-day challenge to the fisher folk. The wetlands function as a unique system, effectively purifying urban sewage through the processes of sedimentation, and microbial interactions. The nutrient rich water is then suitably utilized for the development of planktons which are consumed by the cultured fishes to obtain a good harvest in the range of 1.0 – 1.2 tonnes/ha/year. Socioeconomically, EKW supports marginal fishers and smallholder farmers, providing food security, employment opportunities. However, urban development, pollution, and occurrence of alien species are threatening its sustainability. The study emphasizes the need for coordinated conservation and policy measures to preserve EKW as a global paradigm for urban wetland management.

Keywords: East Kolkata Wetland, Fisheries, Bheri, Biodiversity and Productivity.

GIS-Based Monitoring and Management of the East Kolkata Wetlands for Sustainable Aquaculture Practices

Snehasis Dalal*, Bulu Basak, Srikanta Samanta, Basanta Kumar Das#, Archan Kanti Das, Vikash Kumar, Gunjan Karnatak, L. Lianthuamluaia, Angana Majumder, Rumali Sahoo and Sayan Mandal

ICAR - Central Inland Fisheries Research Institute, Barrackpore- 700120, West Bengal, India

[#basantakumard@gmail.com](mailto:basantakumard@gmail.com)

The East Kolkata Wetlands (EKW), a Ramsar site, represent a critical peri-urban aquatic ecosystem under growing anthropogenic pressure. This study utilizes Geographic Information Systems (GIS) and remote sensing to assess the spatio-temporal land use changes in the EKW. Satellite imagery from 2000, 2012, and 2024 was analyzed to identify wetland and agricultural areas. In contrast to earlier perceptions of wetland shrinkage, satellite-based land use assessment and ground-truthing indicate an overall increase in wetland area by 2024, primarily due to agricultural-to-aquaculture conversion. The number of operational wetlands rose to 308 in the year 2024 with respect to the 250 numbers recorded during 2012, and the total fishery area has expanded to approximately 6,000 ha. This expansion is basically due to a shift in land use for higher economic returns to strengthen the livelihood of the farmers. This study emphasizes the usefulness of geospatial tools for monitoring ecosystem changes and recommends their inclusion in urban planning and aquaculture management strategies.

Keywords: East Kolkata Wetlands, GIS, remote sensing, aquaculture zoning

Species diversity and distribution of seaweed along the coast of north Andhra Pradesh

Pralaya Ranjan Behera*, Manas HM, Joe K Kizhakudan, Suresh Kumar Pilli, P Bhaskar Rao, and Y Prasad Babu

Regional Centre of ICAR-Central Marine Fisheries Research Institute,
Visakhapatnam-530003, Andhra Pradesh

*beherapralaya213@gmail.com

Understanding seaweed diversity and distribution is crucial for effective coastal management and conservation, particularly in the context of climate change and increasing anthropogenic pressures. Extensive field surveys were carried out across 24 intertidal locations in four coastal districts of North Andhra Pradesh to assess the species composition and ecological distribution of macroalgae. The study documented a total of 84 taxa, representing 37 genera, 27 families, and 19 orders. Among the identified classes, Chlorophyceae was the most dominant with 32 species, followed by Rhodophyceae (27 species) and Phaeophyceae (25 species). The family Ulvaceae exhibited the highest species richness (1 genus, 10 species), followed by Cladophoraceae (2 genera, 8 species), Caulerpaceae, and Sargassaceae (each with 1 genus, 8 species). The most frequently encountered genera included *Ulva*, *Caulerpa*, *Sargassum*, *Padina*, and *Gracilaria*. Three new locations (Bavanapadu, Thanatadi, and Rambili) were identified for seaweed distribution, marking an expansion of known habitats in the region. Rocky and semi-sheltered habitats, especially at sites like Muthyalampalem, Rushikonda, Bheemunipatnam, Totlakonda, Betalapuram, and Erramukkam (Pithali), supported higher species diversity. Notably, 28 species were identified as economically important, though their utility remains largely unknown to local communities. The findings highlight the ecological significance of this relatively unexplored coastline and call for long-term biodiversity monitoring, awareness programs, and sustainable utilization strategies to conserve and harness the seaweed resources of North Andhra Pradesh.

Keywords: Macroalgae, diversity, intertidal and distribution

Intraspecific Morphometric Diversity in Native Gangetic Fish Species using Multivariate and Discriminant Methods

Archisman Ray*, Susmita Jana, Poonam Majumder, Sanatan Paul, Canciyal Johnson and Basanta Kumar Das

NMCG Laboratory, ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120

*aparnandrister@gmail.com

This study examines morphometric variation in three freshwater fish species *Pethia conchoni*, *Setipinna phasa*, and *Ailia coila* across three ecologically distinct rivers (Ganga, Jalangi, and Damodar) in the Gangetic basin, eastern India. Eighteen morphometric traits were analyzed using univariate (Kruskal-Wallis), multivariate (PCA), and discriminant (LDA) methods. Significant interspecific and intraspecific variation ($P < 0.05$) was observed, with *A. coila* showing the greatest morphological divergence. Species like *P. conchoni* and *S. phasa* exhibited lower divergence, possibly due to greater gene flow or environmental similarity. PCA indicated body size as the main axis of variation, while LDA highlighted distinct population structuring. The findings emphasize the influence of ecological heterogeneity on phenotypic differentiation and advocate for population-specific conservation, especially for morphologically distinct species like *A. coila*.

Keywords: Morphometry, Rivers, Intraspecific, Multivariate, Discriminant Analysis

Set bag net fishery in the Hooghly-Matlah estuarine system: status, challenges, and pathways to responsible management

Dibakar Bhakta*, Basanta Kumar Das, Canciyal Johnson, Mitesh H. Ramteke, Pranaya K. Parida, Susmita Jana, Archisman Ray and S. K. Manna

ICAR-Central Inland Fisheries Research Institute, Barrackpore,
Monirampore, Kolkata-700 120, West Bengal, India

* dibakarbhakta@gmail.com

The Estuarine Set Bag Net (ESBN) is a crucial fishing practice in the Hooghly-Matlah estuarine system of West Bengal, supporting the livelihoods of over 20,000 fishers in the Sundarbans region. Operating mainly in shallow tidal creeks and channels, ESBNs concentrate on a diverse array of estuarine and marine species, including *Tenualosa ilisha*, *Otolithoides pama*, *Mugil cephalus*, *Chelon planiceps*, *Harpadon nehereus*, *Setipinna phasa*, *S. tatty*, *Coilia ramcarati*, *Aetes* spp., etc. Annual catch estimates from ESBNs in this estuary vary between 12,000 and 15,000 tonnes, with peak landings observed during the pre-monsoon and post-monsoon periods. However, the fishery faces considerable challenges due to the substantial capture of juvenile fish as bycatch (over 80% of the total catch in certain seasons), which is caused using small mesh gear, inappropriate fishing practices, and a notable decrease in catch per unit effort (CPUE) over the last decade. The focus on small-size prawns and finfish for the dry fish trade raises important issues related to stock recruitment and the long-term viability of these species. This study looks at how the ESBN fishery operates now, what types of fish are being caught, and dependence of fisher’s livelihood, as well as the effects on the environment. Quick actions are necessary, like controlling fishing efforts, mesh size regulations, setting seasonal bans, using technologies to reduce bycatch, and looking for other ways for people to earn a living, to help move towards responsible and ecosystem-friendly fishery management. Involving the community and adopting co-management frameworks will be crucial for striking a balance between resource sustainability and the well-being of fishers in the estuarine socio-ecological system.

Keywords: Estuarine set bag net, Hooghly-Matlah estuary, juvenile bycatch, CPUE, Sundarbans

Assessing Long-Term Wetland Transformation through Remote Sensing and GIS: A Case Study of the Panpara Wetland

Tania Bhowmick, Pranaya Kumar Parida, Basanta Kumar Das*

NMCG Laboratory, ICAR-Central Inland Fisheries Research Institute,
Barrackpore, Kolkata, West Bengal-700120, India

*basantakumard@gmail.com

Wetlands are integral to ecological balance, offering habitat diversity, climate regulation, and socioeconomic benefits. This study explores the long-term transformations of the Panpara Wetland by analyzing multi-date Landsat satellite imagery classified into five land use/land cover (LULC) types for April, utilizing the Random Forest algorithm within the Google Earth Engine (GEE) framework. The Modified Normalized Difference Water Index (MNDWI) was applied to quantify the mean annual surface water extent. Findings reveal a marked 49.22% decline in the average surface water area—from 298.03 hectares in 1993 to 151.32 hectares in 2023—alongside a 33.87% reduction in total yearly rainfall, based on CHIRPS precipitation data. LULC assessment indicates a significant 338.79% increase in built-up areas and a noticeable rise in aquatic vegetation, both signaling intensified anthropogenic pressures. A strong association between decreasing rainfall and shrinking water extent underscores the dual impact of climatic shifts and land use change on wetland integrity. Using April datasets, the MOLUSCE model projects that surface water may further shrink to 45.90 hectares by April 2033, amounting to a 73.42% loss since April 1993 and a 67.45% drop in average annual water coverage. These patterns reflect a degradation of the wetland’s hydrological services and carbon storage potential, influenced by exposed soils, declining water tables, and broader climatic impacts. The study provides essential insights for ecosystem-based wetland management, land use planning, and climate resilience strategies.

Keywords: Wetland Transformation, LULC Analysis, Random Forest, Google Earth Engine

Dynamics of Fish Diversity and assemblage in relation to environmental factors in a tropical wetland

Absar Alam^{1*}, Jeetendra Kumar¹, Vikas Kumar¹, Venkatesh Ramrao Thakur¹, Dharm Nath Jha¹, Vijay Kumar¹, A. K. Das² and B. K. Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Prayagraj, Uttar Pradesh, India – 211002

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India – 700120

[*absar_alam@rediffmail.com](mailto:absar_alam@rediffmail.com)

Uttar Pradesh has extensive freshwater wetlands, locally known as Beels, Mauns, Tals and Jheels. Ecological investigation was carried out in the Ramgarh tal located in the Gorakhpur district of Uttar Pradesh. A sum of 52 fish species was documented. The highest diversity was observed in the monsoon followed by winter and summer seasons, respectively. Fish such as *Puntius chola*, *Salmophasia phulo*, and *Parambassis ranga* were the most abundant and contributed more than 88% of the fish density. The water quality parameters showed considerable variations. The high pH (9.73 ± 0.54), total alkalinity (189.87 ± 33.08) mg l⁻¹, Chloride (42.03 ± 16.02) mg l⁻¹, Dissolved Oxygen (9.96 ± 1.48) mg l⁻¹, TDS (209.13 ± 105.01) mg l⁻¹, specific conductivity (350.3 ± 110.5) mg l⁻¹, (DOM (4.27 ± 0.97) mg l⁻¹, high nutrients, and low transparency (27.2 ± 5.8) mg l⁻¹ might be due to the release of sewage effluents into the lake. The Canonical Correspondence Analysis showed significant influences of the environmental parameters on the fish abundance. The study emphasizes the need for measures to preserve native fish diversity, promote sustainable fisheries, and regulate fish culture within enclosures.

Keywords: conservation, fish abundance, Ramgarh Tal, water quality

Optimizing Larval Rearing of *Chitala chitala*: A Comparative Study on the Growth Performance and Survival by using Live, Mixed, and Formulated Feeds

Adipta Chakraborty*, Naba Kumar Acharjya, Sanatan Bera, Sanatan Paul, Dharmendra Kumar Meena, Basanta Kumar Das, and Aritriya jana

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700 120, West Bengal, India.

* adipta14c@gmail.com

Chitala chitala, also known as humped featherback, a member of the ancestral teleost lineage, is a valuable cultivable fish used for food, sport, and aquariums. This study holds conservation significance as *C. chitala* is listed as Near Threatened in IUCN Red List. The study involved three replicate treatments using feed combinations: (i) mashed boiled egg + rotifer + IMC eggs/spawns, (ii) decapsulated *Artemia* cysts + *Tubifex* worms, and (iii) a commercial formulated powder feed. Post-larvae were stocked in FRP tanks (n=100 per tank), and feeding was adjusted weekly based on body weight and feed intake. Growth performance was assessed using metrics such as weight gain, total length, specific growth rate (SGR), and survival. The highest SGR (5.69 ± 0.03 g/day) and weight gain ($46.93 \pm 0.99\%$) were observed in larvae fed *Artemia* and *Tubifex* (Tank 2), followed by Tank 1 (SGR: 5.4 ± 0.10 g/day), while Tank 3 showed significantly lower performance (SGR: 3.19 ± 1.69 g/day). Survival rate was highest in Tank 2 (92%) and lowest in Tank 3 (76%). Water quality stayed within optimal limits, though fouling occurred with egg-based diets. Live feed significantly improved growth and survival in *C. chitala* larvae over formulated feeds.

Keywords: *Chitala chitala*, Larval rearing, Feed combination, Growth performance

Zooplankton Diversity and Water Quality Assessment: A case study from the upper and middle Ganga River

Ashish Singh*¹, Jeetendra Kumar¹, Absar Alam¹, D.N. Jha¹, Venketesh R. Thakur¹, Vikas Kumar¹, Sandeep Kumar Mishra¹, Rayees Ahmad Bhat¹, Basanta Kumar Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Prayagraj – 211 002

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata – 700 120

*ashish10899singh@gmail.com

This study investigates the diversity of zooplankton and their correlation with water quality parameters in the Ganga River from January to December 2024. A total of 33 zooplankton species were identified across six phyla: Rotifera (22), Arthropoda (7), Chlorophyta (1), Amoebozoa (1), Protozoa (1), and Ciliophora (1). Dominant species included *Bosminopsis* spp., *Brachionus* spp., *Cyclops* spp., *Keratella* spp., *Lecane* spp., *Paramicium* spp., and *Trichocerca* spp., with the top ten species contributing 10–95% of the total zooplankton abundance. Water quality parameters analyzed included temperature (26.16°C), pH (8.87), total dissolved solids (316ppm), electrical conductivity (444μS/cm), chemical oxygen demand (4.86mgO₂/litre), and biological oxygen demand (4.46mg/litre). Pearson correlation analysis showed significant positive correlations between temperature and EC ($r = 0.640$, $p < 0.01$), EC and TDS ($r = 0.999$, $p < 0.01$). BOD showed significant positive correlations with *Paramicium* and Rotifera, whereas Protozoa exhibited negative correlations with temperature ($r = -0.669$, $p < 0.01$). These findings indicate that warmer, mineral-rich, and organically enriched environments favour *Paramicium* and Rotifera proliferation. The study concludes that these taxa can serve reliable effective bioindicators for monitoring organic pollution in freshwater ecosystems.

Keywords: Zooplankton, Rotifera, Bioindicators, Organic pollution, BOD and TDS, Ganga River.

Future Directions In Fisheries Management: An Ecosystem Based Approach

Chandan Roul*, Brundaban Sahu, Santosh Kumar Udgata, Manoj Kumar Tripathy and Arpit Acharya
College of Fisheries, O.U.A.T., Rangailunda, Berhampur-07
[*roulgudul2222@gmail.com](mailto:roulgudul2222@gmail.com)

A significant portion of the world’s fish stocks are overexploited, and the ecosystems that support them have deteriorated. Traditional fisheries management has often fallen short; it tends to emphasize maximizing harvests of individual target species while neglecting habitats, predator-prey relationships, and other key components of the ecosystem. This narrow focus can lead to considerable indirect social and economic consequences. Recognizing the need for a more effective, holistic management strategy, numerous advisory bodies have recommended incorporating ecosystem considerations into fisheries management in a comprehensive and consistent manner. Ecosystem-Based Fisheries Management (EBFM) offers a more integrated approach that focuses on maintaining the overall health of marine ecosystems as well as inland water bodies used for freshwater aquaculture to sustain the benefits they provide to us. Achieving the diverse goods and services expected from marine environments and inland water requires a wide-ranging, interdisciplinary strategy. EBFM implementation generally follows a three-step process: establishing clear goals, developing measurement systems, and applying management strategies. The core aim of ecosystem-based management is to ensure that ecosystems remain healthy, productive, and resilient, so they can continue delivering the services humans depend upon. However, there is often a limited perspective relying mainly on indicators tied to economic outcomes from fishing that can restrict the capacity to fully measure EBFM progress. To truly align with EBFM principles, it is essential to acknowledge that ecological and human factors are interdependent.

Keywords: Indicators, Ecosystem-Based Fisheries Management, Economic-Social-Cultural-Institutional-Ecosystem Models

Spatio-temporal Dynamics of Fish Guilds and Environmental Influences on Ichthyofaunal Assemblage in the Gandak River, Bihar, India

Deependra Singh*, Suraj Chauhan, Ajay Saha, Basanta Kumar Das, Abhilash W.

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700 120

*deep165.singh@gmail.com

The present study investigates the spatio-temporal variations in fish assemblages and functional guilds concerning environmental factors in the Gandak River. From March 2024 to February 2025, a total of 62 finfish species (43 genera, 25 families, 13 orders), with peak species richness observed during post-monsoon and the lowest during the monsoon. Fish were classified into nine trophic guilds (invertivores being dominant, followed by omnivores and piscivores), five ecological guilds (freshwater stragglers being the most prevalent, followed by migrants), and four reproductive guilds (oviparous benthic/pelagic egg-layers being dominant). Similarity percentage analysis identified *Amblypharyngodon mola* (6.3%), *Pethia ticto* (5.95%), *Ailia coila* (5.25%), *Puntius chola* (4.53%), and *Glossogobius giuris* (4.47%) as key contributors to seasonal assemblages. BIO-ENV analysis revealed a moderate but significant correlation ($r = 0.52$) between species composition and environmental variables, with transparency, specific conductivity, turbidity, alkalinity, and hardness ($r = 0.66$) being the most influential. The best subset of key species includes *Ailia coila*, *Channa gachua*, *Channa marulius*, *Johnius coitor*, and *Labeo calbasu* were strongly associated with these conditions. These findings highlight the ecological plasticity of fish assemblages across seasons and habitats, providing a baseline for assessing anthropogenic impacts on the Gandak River’s ichthyofauna. This study underscores the need for guild-specific conservation strategies, particularly for migratory and invertivore species, to sustain riverine biodiversity.

Keywords: Fish assemblage, Functional guilds, Trophic ecology, Riverine conservation, BIO-ENV analysis

Guild structure and ecological dynamics of fish assemblage in the Ichamati River, West Bengal, India

Poonam Majumder^{1*}, Basanta Kumar Das¹, Susmita Jana¹, Abhilash Wodeyar K¹, Archisman Ray¹, Saurav Nandy¹, Arghya Kunui¹

¹ICAR - Central Inland Fisheries Research Institute, Barrackpore, West Bengal

*majumderpoonam99@gmail.com

This study examined spatial and temporal variations in fish assemblages and functional guild structures in the Ichamati River during 2024. Monthly surveys recorded 60 finfish and 5 shellfish species, with peak richness in the post-monsoon and lowest diversity during the monsoon. Species were grouped into eight estuarine use guilds, five feeding guilds, six habitat types, and three reproductive strategies. Amphidromous fishes dominated, followed by estuarine stragglers and catadromous species. Zoobenthivores were the most abundant feeding guild. SIMPER analysis highlighted *Exopalaemon styliferus*, *Parapenaeopsis sculptilis*, and *Trichiurus lepturus* as key contributors to seasonal similarity. BIO-ENV analysis showed a strong correlation ($r = 0.69$) between species distribution and environmental variables, with TSS, TN, and TP being major drivers. *T. lepturus* and *Lepturacanthus savala* influenced community structure. The limited occurrence of marine stragglers underscores the importance of understanding spatio-seasonal diversity to support conservation and ecosystem-based fisheries management in the river.

Keywords: Estuarine fishes, Functional groups, Fish guilds, Fish diversity

Fish diversity, ecological factors, conservation and management issues of a non-glacial river upstream of the Ganga basin, India

Sushil Kumar Verma^{1*}, Absar Alam¹, Vikas Kumar¹, Venkatesh R. Thakur¹, Jeetendra Kumar¹, Upendra Singh¹, Sandeep Kumar Mishra¹, Jeetendra Singh Rana¹, Dharm Nath Jha¹, Basanta Kumar Das^{2*}

¹ICAR-Central Inland Fisheries Research Institute, 24-Panna Lal Road, Prayagraj

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700 120, West Bengal, India

*basantakumard@gmail.com

In the present communication, fish diversity, distribution, habitat ecology, ecological factors and different indices of fish biodiversity were studied second-largest non-glacial river (River Nayar, a tributary of the Ganga River) at Pauri Garhwal District in Uttarakhand, covering a cumulative distance of 100 Km at 483 m MSL altitudes. Altogether, 30 fish species belonging to 7 families, 3 orders and 19 genera were documented, from two sampling sites (Satpuli 29.946497 N, 78.693058 E and Vyasghat 30.06702 N, 78.599053 E). Cyprinidae were the most dominant family (57%) represented by 17 species, followed by Danionidae (23%) with 7 species, Sisoridae (7%) with 2 species, Mastacembelidae, Nimacheilidae, Cobitidae and Botiidae (3%) with one species, respectively. The distribution of fish showed an exciting pattern, and about 90% species were common to both sampling sites, showing a long migration range. The IUCN status of the 30 fishes revealed 24 species as (LC) least concern, 2 as (VU) vulnerable, 2 as (NE) not evaluated, one species as (DD) data deficient and (EN) endangered. The present study shows that the river supports significant fish diversity and about 7% fish fauna is vulnerable and 3% is endangered. Nemacheilidae, Sisoridae and Botiidae were the dominant fish species at higher altitudes in this Himalayan stream, which have adaptations for boulders, cobbles and fast-flowing water. Correlation between fish species abundance and habitat attributes showed a good relationship, and water temperature, water depth, dissolved oxygen and pH were found to be the most significant variables for shaping its fish assemblage. This study generates the baseline information which would be useful for the development of fisheries and conservation management strategies for the river.

Keywords: Fish diversity, River Nayar, Cyprinidae, Conservation, Assemblages, Ecological Factors

Potential Impact of Exotic Fish in the River Ganga

Rinki Kumari*¹, Absar Alam¹, Vikas Kumar¹, Dharm Nath Jha¹, Jeetendra Kumar¹, Venkatesh RamaRao Thakur¹ and Basanta Kumar Das^{2*}

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Prayagraj - 211 002, Uttar Pradesh, India

²*ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700 120, West Bengal, India

*basantakumard@gmail.com

Exotic fish species are non-native fish introduced, intentionally or accidentally, into ecosystems where they do not naturally occur, often from different regions, countries, or water systems. In India, around 300 exotic fish species have been reported, whereas in the Ganga River basin 10 exotic fish species viz. *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *H. nobilis*, *Cyprinus carpio*, *Oreochromis niloticus*, *Clarias gariepinus*, *Salmo trutta fario*, *Pangasianodon hypophthalmus* and *Pterygoplichthys disjunctivus* has been recorded between Headwater (Harshil) and Hooghly estuary (Fraserganj) and contributed 3.74% to total fish diversity. *C. carpio* var. *communis* (44.31%) and *O. niloticus* (30.15%) were the most widespread in the River Ganga. The introduction and proliferation of exotic fish species in the River Ganga have emerged as a significant ecological concern, affecting the river's native fish biodiversity and ecosystem stability. Exotic species which were cultured under a captive system might have escaped accidentally into the Ganga River. Traits like high adaptability, rapid growth, multiple spawning habits, omnivorous feeding behaviour, habitat modification along with climate change, favoured their successful establishment and proliferation in the river Ganga. This has led to intense competition for food and habitat with indigenous species. Consequently, there has been a noticeable decline in native fish populations, including several economically important large-sized fish species. Moreover, exotic fish alter the trophic structure, transmit diseases, and cause genetic dilution through hybridization. This study highlights the pressing need for stringent regulation of exotic fish introductions, restoration of native fish habitats, research and the development for sustainable fishery management practices to conserve the unique ichthyofaunal diversity of the Ganga River.

Keywords: Exotic, Ganga and ecological impact

Mapping of water bodies of Manipur - a north-eastern state of India for sustainable management of water resources

Tania Kayal¹, B. K. Das*, T.N. Chanu, S.K. Sahoo

ICAR-Central Inland Fisheries Research Institute, Barrackpore – 700120,
West Bengal

*taniakayal2016@gmail.com

Manipur is a state situated in the eastern-most corner of North-East India which covers a total area of 22,327 sq. km. The extraction of inland water bodies in Manipur state was carried out using remotely sensed satellite imagery, further images were downloaded from USGS Earth Explorer. Sentinel-2B images from April 2022 (pre-monsoon season) and November 2021 (post-monsoon season) were selected for water body delineation. After processing the images, water bodies larger than 0.5 hectares were extracted using the Normalized Difference Water Index (NDWI) and manual digitization within a GIS platform (ArcGIS). The extracted water bodies were then classified into five categories. Categories range from 0.5 to <5 ha, 5 to <10 ha, 10 to <50 ha, 50 to <200 ha and more than 200 ha. A total of 6,700 water bodies were delineated, covering an average area of 28,193.35 hectares. Of these, 3,774 were identified as perennial and 2,926 as seasonal water bodies. This study provides essential baseline information to support planners, researchers, and stakeholders in the sustainable management and utilization of water resources, particularly for fisheries development.

Keywords: Manipur, Sentinel-2B, NDWI, GIS, Inland water bodies

Length-weight relationships of eighteen fish species from river Ganga at Prayagraj, India

Rayees Ahmad Bhat¹, Absar Alam¹, Vikas Kumar¹, Dharm Nath Jha¹, Jeetendra Kumar¹, Venkatesh RamaRao Thakur¹ and Basanta Kumar Das^{2*}

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Prayagraj - 211 002, Uttar Pradesh, India

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700 120, West Bengal, India

*basantakumard@gmail.com

The present study describes the length-weight relationships (LWRs) of eighteen fish species collected from the river Ganga at Prayagraj. A total of 2,207 fish specimens belonging to eighteen species were analyzed for LWRs between December 2024 to March 2025. The LWRs showed a high degree of correlation, with *Cirrhinus mrigala* exhibiting the highest coefficient of determination ($r^2 \sim 0.99$). The slope (b) values of the length-weight relationships ranged from 0.74 (*Ailia coila*) to 3.78 (*Nandus nandus*). Among the eighteen species, nine displayed positive allometric growth. *Ailia coila* showed the most negative allometric growth among all recorded species. Notably, in the present investigation, a specimen of *Bagarius bagarius* measuring 149.4 cm in total length and weighing 27.51 kg was recorded, representing a new maximum total length (TL_{max}) for the species from the river Ganga. The findings of this study provide important baseline information for the conservation and management of these ecologically and economically significant fish species in the Ganga River at Prayagraj.

Keywords: LWRs, Ganga, allometric growth and conservation.

River Guardian as Citizen Science Model for Riverine Fisheries Resource Management

Bijay Kumar Gupta*

Faculty of Fishery Sciences, WBUAFS, Kolkata (W.B.)

* bk.com101@gmail.com

India’s extensive river network, spanning over 45,000 km, holds vast potential for inland fisheries but is increasingly threatened by pollution, habitat fragmentation, and unregulated human activities. Traditional community-based management, while valuable, often lacks scalability, technical support, and institutional backing. The *River Guardian* model introduces a citizen science-driven approach to bridge this gap, empowering local volunteers to monitor river health through standardized scientific protocols. These citizen scientists collect real-time data on water quality, biodiversity, and pollution sources, supported by expert validation and GIS-based habitat mapping. This participatory model strengthens ecological stewardship, fosters community ownership, and feeds reliable data into policy-making processes. Drawing insights from successful national and global case studies, River Guardian demonstrates how grassroots action, when aligned with scientific tools and institutional collaboration, can drive sustainable riverine fisheries management. The model directly supports key Sustainable Development Goals (SDGs)-notably SDG 6 (Clean Water), SDG 14 (Life Below Water), and SDG 17 (Partnerships). Scalable, inclusive, and adaptive, River Guardian offers a replicable blueprint for revitalizing freshwater ecosystems while enhancing livelihood resilience and conservation outcomes in India.

Keywords: Riverine fisheries, Citizen science, Water quality monitoring, Habitat restoration and Participatory conservation

Ecological Assessment of Phytoplankton Communities in the River Ramganga: Indicators of River Health

Ram Bhajan Verma*¹, Jeetendra Kumar¹, Absar Alam¹, Vikas Kumar¹, Dharm Nath Jha¹, Venkatesh R. Thakur¹ and Basanta Kumar Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Prayagraj - 211 002, Uttar Pradesh, India

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700 120, West Bengal, India

*vram18642@gmail.com

A total of 57 species of phytoplankton belonging to Heterokontophyta (diatoms), Chlorophyta (green algae), Cyanobacteriota (blue-green algae), Euglenophyta (euglenoids) and 2 phyla of Zooplankton, Arthropoda and Rotifera were documented. Seasonal samples were collected from Marchula (Uttarakhand) to Katghar (Uttar Pradesh) during 2024-25, covering 5 sampling stations. Heterokontophyta was the dominant phylum by density (35%), followed by Chlorophyta (56%) and Cyanobacteria (8%). Phytoplankton abundance ranged from 1×10^5 cells/L to 1×10^7 cells/L. During the summer season, Bacillariophyceae (diatoms) and Chlorophyceae (green algae) dominated the phytoplankton assemblage, particularly at Hullapur. In the monsoon, Cyanophyceae reached their peak density, with a maximum of 5.0×10^5 cells/ L recorded at Hullapur, reflecting high discharge and runoff-induced eutrophication. These cyanobacterial populations then declined in the post-monsoon, as water currents stabilized and nutrient inputs decreased.

Keywords: Phytoplankton, Bacillariophyceae, Temporal, density

Utilizing Data Science to unravel discovery pattern of Native Indian Freshwater Fish Taxa

Sanjeev Kumar Sahu*, Soma Das Sarkar and Malay Naskar
ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-
700120, West Bengal, India
*sksahu_2k@yahoo.com

India ranks ninth globally in freshwater fish diversity but lacks a mechanism for regularly updating checklists and discovery patterns. This study employs data science to establish a technique for consistently updating Native Indian Freshwater Fish (NIFF) information. A semi-automated procedure is proposed that facilitates regular updates of the checklist. The technique provides the latest updates of 1,239 NIFF species with minimal manual effort. It will allow taxonomists to prepare accurate, periodic updates in the future. Additionally, a new index called Cumulative Species Discovery (CSD) is introduced to analyze the discovery pattern of Native Indian Freshwater Fishes. By accounting for fluctuations caused by aggregate reporting, CSD offers more effective trend analysis, making it superior to conventional time series analysis for unravelling discovery patterns. Furthermore, CSD analytics provided insights into how technological advancements and political transitions influenced species discovery over time: *Early 19th Century Surge (CSD rate ~ 0.98)*, *Decline During 1876–1909 (CSD rate ~ 0.49)*, *Resurgence in Biodiversity Research during 1910–1998 (CSD rate ~ 2.28)*, and *21st Century Boom in Species Discovery (CSD rate ~ 18.86)*. Century-wise, discoveries varied: 46 species in the 18th century (CSD rate ~0.89), 511 in the 19th century (peaks in 1822, 1839, 1849, 1877; CSD rate ~6.45), 263 in the 20th century, and 421 in the 21st century. Regionally, the highest CSD rate was observed in the northeast (8.30), followed by Western Ghats (3.77), Himalayas (2.40), Deccan Peninsula (2.21) and Gangetic Plain (1.74), reflecting regional variations in discovery rates. This study has revealed how techno-political factors have influenced species discovery patterns and regional disparity in India, underscoring the importance of integrated research investment, and policy support in driving taxonomic advancements.

Keywords: Biogeography, Data analytics, Freshwater fish, India, Species discovery, Techno-political factor

Traditional fishing crafts and gears operated in Ganga River along Farakka, West Bengal, India

Karmveer Singh*, Basanta Kumar Das, Naba Kumar Acharjya, Mitesh Ramteke, Shailendra Patel, Canciyal Johnson and Deependra Singh

ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700 120, India

*thakurkarmveer1999@gmail.com

Traditional fishing crafts and gears along the Ganga River near Farakka, West Bengal, reflect a rich heritage of indigenous fishing practices adapted to the river's diverse ecosystems. These methods have been integral to the livelihoods of local communities. The present study documents Indigenous Technical Knowledge (ITK) related to traditional fishing crafts and gears used in the Ganga River at Farakka Murshidabad, West Bengal, India. While considerable research has been conducted on fishing crafts and gears in the freshwater sector across India, this is the first documented attempt specifically focused on the Ganga River at Farakka. During the survey conducted between 2024 and 2025, a total of three types of traditional fishing crafts and nine types of traditional fishing gears were recorded. The crafts included plank-built boats, tin-made boats, rubber tube platforms. The fishing gears encountered comprised gill nets, cast nets, drag nets, hook and line, Lift net, Trap net, Chak jal, scoop nets, and hand nets. This study highlights the rich traditional knowledge and diversity of fishing practices in the region.

Keywords: fishing craft, fishing gear, fishing net, ganga river

Seasonal Variation in Ichthyofaunal Diversity and its Environmental Drivers in two Snow-Fed Himalayan Rivers, India

Ravali Vallangi¹, Basanta Kumar Das¹, Simanku Borah², Amiya Kumar Sahoo¹, B. K. Bhattacharjya², Bigan Kumar Sahoo¹

¹ICAR – Central Inland Fisheries Research Institute, Barrackpore, Kolkata

²ICAR – Central Inland Fisheries Research Institute, Regional Centre, Guwahati, Assam

* ravali.au19@gmail.com

Hill streams are fast flowing; narrow watercourses originating in mountainous regions and are characterized by unique environmental conditions that support rich freshwater biodiversity. This study examines fish diversity and abundance in relation to environmental parameters in the Bichom and Digien Rivers, tributaries of the Kameng River in Arunachal Pradesh, India. Sampling was conducted at six sites across three seasons (pre-monsoon, monsoon, post-monsoon) from 2022 to 2024. The riverbeds, characterized by boulders, cobbles, and gravels, supported typical hill stream ecosystems with notable bank vegetation and features such as deep pools and riffles. Dominant species included *Schizothorax richardsonii* (snow trout), followed by *Neolissochilus hexagonolepis* and *S. progastus*. Seasonal patterns showed higher fish abundance during pre- and post monsoon, and lowest during monsoon. Spatial differences across upstream, reservoir, and downstream sites reflected transitions between lentic-lotic environments. Statistical analyses revealed positive correlations between fish abundance and both water temperature and current velocity, while negative correlations were observed with pollution and damming. Cyprinids dominated the catch (85%), serving as indicators of good water quality and ecosystem health. Four species, including *N. hexagonolepis* and *Tor tor*, exhibited upstream migration for spawning. The study underscores the ecological significance of hill streams and ichthyofaunal distribution as indicators of water quality and habitat integrity.

Keywords: Fish abundance, Hill stream ecosystem, Water quality parameters, Seasonal trends, Eastern Himalayas

Community Structure of the Benthic Macroinvertebrate Fauna of the River Adi Ganga and Its Response to Microplastic Pollution

Rinku Besra*, Arka Mandal, Shreya Roy, Debasmita Mohanty, Mala Kumari, Pranay Kumar Parida, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal

*rinkubesra1999@gmail.com

Microplastic pollution is silently infiltrating terrestrial, aquatic, and atmospheric ecosystems, posing a significant threat to environmental health. Monitoring microplastics (MP) in rivers is crucial to understanding their impact on freshwater ecosystems and human health, as microplastics are often transported to the oceans through riverine ecosystems. This study focused on the Adi Ganga River. Benthos, water, and sediment samples were collected year-round from multiple sites. Benthic species were identified and analyzed for community structure, and microplastics were examined under a microscope. Spearman, Pearson correlation, along with Canonical Correspondence Analysis (CCA), were performed to assess microplastics and environmental effects on macrobenthic diversity. The results showed heavy MP pollution with concentration of 97.67 ± 52.53 particles L^{-1} in water and 369.17 ± 179.99 particles Kg^{-1} in sediment. Fragments were the most abundant, followed by fibers. A total of 12 benthic invertebrate species belonging to 7 families were identified. The Shannon-Weiner diversity showed maximum ($H' = 1.92$) in Keoratala, dominated by pollution-tolerant *Tarebia granifera*. Macrobenthic diversity was moderately correlated with water MP levels ($\rho = 0.714$). CCA indicated dominance of tolerant species, reflecting a complex pollution-biodiversity relationship. Pollution in the Adi Ganga River favors tolerant species, indicating ecological imbalance and highlighting an urgent need for pollution control to protect ecosystems and human health.

Keywords: Microplastic pollution, Macrobenthic diversity, Adiganga River, Ecosystem health

Assessment of the Correlation Between Reproductive Parameters and Their Efficiency in *Tenualosa ilisha* (Hamilton, 1822) During the Spawning Season in the Ganga River

Sanatan Bera*, Adipta Chakraborty, Basanta Kumar Das, Amiya Kumar Sahoo, Sanatan Paul, Aritriya Jana, Karmveer Singh, Shailendra Kumar, Naba Kumar Acharjiya, D. K. Meena

ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal

*sanatanbera1418@gmail.com

Hilsa is an economically and culturally significant fish species, as its migration plays a crucial role in ensuring reproductive success and sustaining its population. Its reproductive biology was examined downstream of the Farakka Barrage (approximately a 5 square kilometre area) on the Ganga River. A total of 169 mature females and 131 males were analysed for body morphometrics, gonadal development, and fecundity. The study revealed that absolute fecundity increased significantly ($p < 0.05$) with body size (total length, body weight, gonad weight, and gonad length), while relative fecundity decreased, indicating a reduction in reproductive efficiency per unit of body mass in larger individuals. Interestingly, the gonadosomatic index (GSI) showed a significant ($p < 0.05$) inverse relationship with body size, peaking in the smallest length group (14-17 cm), suggesting early maturation in smaller fish. Correlation matrices confirmed strong positive associations between absolute fecundity and gonadal parameters ($r > 0.85$), whereas GSI was weakly and negatively correlated with body size ($r < -0.24$). It is concluded that the reproductive strategies of *T. ilisha* are possibly influenced by environmental or physiological conditions rather than strictly size-based maturation.

Keywords: *Tenualosa ilisha*, Reproductive Biology, GSI, Fecundity, Environmental Conditions

Impact of environmental factors on the Spatio-temporal distribution of fish community structure in the Kosi River

Suraj Kumar Chauhan*, Basanta Kumar Das, Trupti Rani Mohanty,
Deependra Singh, Archisman Ray, Dibakar Bhakta

ICAR- Central Inland Fisheries Research Institute, Barrackpore Kolkata-
700120

[*surajk96269@gmail.com](mailto:surajk96269@gmail.com)

The present study aimed to assess the water quality and freshwater fish diversity of the Kosi River in Bihar during March 2024 to February 2025. It is a significant tributary of the Ganga River system. The sampling was carried out on a quarterly basis. Water samples were collected from five different sites, including a sandy substrate site (Dubiahi), where water clarity was notably reduced compared to the other locations. The mean physicochemical parameters observed across sites were: pH (8.16), air temperature (26.29 °C), water temperature (23.55 °C), dissolved oxygen (7.84 mg/L), biochemical oxygen demand (1.45 mg/L), chemical oxygen demand (41.84 mg/L), total solids (0.155 g/L), total dissolved solids (0.109 g/L), total suspended solids (0.051 g/L), turbidity (98.35 NTU), total hardness (78.13 mg/L), total alkalinity (73.6 mg/L as CaCO₃), specific conductivity (0.179 mS/cm), chloride (0.033 ppt), total phosphorus (0.113 ppm), total nitrogen (0.043 ppm), salinity (0.0148 ppt), and silicate (16.12 ppm). A total of 55 fish species were recorded, representing 8 orders, 38 genera, and 20 families. The Cyprinidae family was the most dominant, reflecting the ecological character of the river. Canonical Correspondence Analysis (CCA) revealed that dissolved oxygen, transparency, total phosphorus, total nitrogen, and silicate are significantly influenced by fish distribution patterns. Additionally, the biota-environment relationship identified key physicochemical parameters shaping fish abundance, with the highest diversity observed at stations with favorable oxygen and temperature profiles. This study provides baseline data essential for the conservation and sustainable management of the Kosi River's aquatic biodiversity.

Keywords: Fish Diversity, Water quality, Spatio-temporal, CCA, Conservation, Kosi River

Assessing Fish Diversity in the Adi Ganga River: Ecological Insights from a Degraded Urban Waterway

Susmita Jana*, Arka Mandal, Poonam Majumder, Hirak Chakraborty, Debasmita Mohanty, Mala Kumari, Rajesh Jaiswal, Dibakar Bhakta, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal

* zmouzzyu999@gmail.com

The study attempts to document the ichthyofaunal diversity of the Adi Ganga, a river now deemed biologically "dead" due to urban dumping, chronic pollution, rampant urban encroachment, industrial effluents, domestic sewage, solid waste dumping, and unregulated anthropogenic pressure. The effects of ecological conditions on the diversity and composition of ichthyofauna in the Adi Ganga River were investigated seasonally from January 2024 to December 2024. The species diversity and composition fluctuated greatly with the ecological circumstances throughout the seasons. A total of 40 fish species is recorded from the river, among them, *Pterygoplichthys disjunctivus* and *Oreochromis niloticus* are non-native species. Increased turbidity and decreased dissolved oxygen concentrations create hypoxic conditions, further stressing aquatic life. The seasonal fish family diversity indices show significant temporal fluctuations in community structure. The most diverse and evenly distributed fish family community was supported by the monsoon, while the post-monsoon exhibited decreased diversity, most likely because of ecological shifts or recovery periods in the aquatic environment. Canonical correspondence analysis showed water temperature significantly correlated with the Loricaridae family, which includes exotic species. While the Cobitidae and Aplocheilidae families of fishes can withstand extreme turbidity levels. Invasive or tolerant species can survive in polluted water, often outcompeting or displacing native fish. The decline in fish diversity and abundance directly affects the livelihoods of local fishing communities. Addressing these challenges necessitates integrated river basin management approaches, habitat restoration, pollution control, and community engagement to safeguard the river's ecological integrity and the well-being of dependent populations.

Keywords: Ichthyofaunal diversity, Ecological stressors, Adi Ganga River, West Bengal

Physico-chemical parameters and disease occurrence in some fish farms of Ganjam and Kalahandi districts of Odisha, India

Santosh Kumar Udgata, Manoj Kumar Tripathy*, Brundaban Sahu, Nurshingha Charan Pashupalaka, Dharitri Choudhury and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur, Odisha, India

[*mtripathy.ouat@gmail.com](mailto:mtripathy.ouat@gmail.com)

A study has been conducted from November 2015 to March 2020 in 22 fish farms of Ganjam district and 21 fish farms of Kalahandi district of Odisha, India to assess the disease occurrence in fin fishes and physico-chemical parameters of water under ongoing National Surveillance Programme on Aquatic Animal Disease (NSPAAD) at College of Fisheries (OUAT), Odisha. During the survey, 86 water samples were collected and evaluated, 50 of which were from Ganjam district and 36 from the Kalahandi district. The water quality parameters selected for assessment were pH, Temperature, dissolved oxygen, ammonia, nitrite, phosphate, alkalinity, and hardness. Except for the ammonia level in some farms of the Kalahandi district, the values were found to be within desirable ranges. In fin fishes, argulosis and aeromoniasis were found to be predominant parasitic and bacterial infections. To investigate the association and influence of physico-chemical parameters on disease occurrence in two districts, appropriate statistical tools were used to establish the correlation. It was observed that water quality parameters, except ammonia, have minimal effect on the occurrence of disease. The occurrence of argulosis and aeromoniasis in some fishponds of both districts might be due to excess organic load at the bottom at poor pond environment.

Keywords: Physico- chemical water parameter; disease incidence; argulosis; aeromoniasis

Tackling Ghost Fishing: Assessment of Gear Losses, Fishers’ Perceptions, Causes, and Mitigation Strategies

Sandhya K. M*, Harsha, K. Shravan K.S. & Thomas S.N.

ICAR-Central Institute of Fisheries Technology, Kochi

[*sandhyafrm@gmail.com](mailto:sandhyafrm@gmail.com)

Marine pollution caused by non-biodegradable plastics has become one of the most serious problems worldwide. Fishing nets which are mostly made from synthetic materials when left in the sea or swept away, retain functionality for a long period of time, leading to capture and mortality of target and non-target species referred as “ghost fishing”. Addressing the ghost fishing problem involves assessing the causes of fishing gear loss, quantifying the extent of these losses, gathering evidence through gear retrieval studies, and ultimately developing effective mitigation strategies. In the present study, a survey was conducted using structured questionnaire at selected trap fishing sites at Enayam coast Tamil Nadu & gillnet fishing sites at Kochi, Kerala to estimate the gear loss, causes of gear loss based on fishers’ perception. Evidence of lost gears were assessed through scuba diving surveys & trawl surveys. As a measure to mitigate the intensity of ghost fishing, incorporation of biodegradable material was also tested. A study revealed that major reasons for trap loss were adverse weather (35%), currents or tides (34%) and gear damage (17%). Six types of lost fishing gears/gear parts were retrieved (33kg) from the trap fishing ground by scuba diving which includes nylon monofilament netting panels, traps, pieces of trawl codends, pieces of monofilament lines, ropes and squid jigs. Among the natural fibers tested, jute fibre had shown maximum deterioration, closely followed by cotton suggesting them as suitable materials for incorporation in traps to prevent ghost fishing. The information from the present work will assist in improving fishing methods (to reduce gear loss) and/or to design fishing gear that will become ineffective once lost.

Keywords: Synthetic nets, ghost fishing, gear loss, mitigation

Exploring fish diversity and fisheries of Pamba River, Kerala

Deepa Sudheesan*¹, Thankam Theresa Paul¹, Tanuja Abdulla¹, S. K. Manna²

¹Kochi Research Station of ICAR-CIFRI, CMFRI Campus, Kochi – 682018

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120

*deepasudheesan@gmail.com

The Pamba River, Kerala's third longest river, holds immense cultural, ecological, and socio-economic importance. Originating from the Western Ghats, it traverses 176 km across Pathanamthitta and Alappuzha districts, forming an extensive distributary network before draining into the Vembanad Lake and another branch into the Arabian Sea through the Thottappally Spillway. The present study, conducted during 2024–2025 at nine sampling stations along the river, aimed to assess fish diversity and fisheries of Pamba. A total of 27 finfish species representing 24 genera, 18 families, and 9 orders were recorded. Notably, species such as *Channa diplogramma*, *Horabagrus brachysoma*, and *Wallago attu*, categorized as ‘Vulnerable’ in the IUCN Red List, are prized catches from the river. *Labeo dussumieri* and *Systomus sarana* were the dominant species in the landings. While regular fishing activities prevail in the middle and lower stretches, fishing in the upper stretch remains largely part-time. The total annual fish production from the river was estimated at 913.505 tonnes. Gillnets are the predominant fishing gear in the middle and lower stretches, whereas hook and line fishing is common in the upper stretch. Catch per unit effort (CPUE) for gillnet fishery ranged from 2.5 kg/person/day in the upper stretch to 9.5 kg/person/day in the lower stretch, reflecting spatial variation in fish abundance and fishing intensity.

Keywords: Catch estimation, fish diversity, Pamba, CPUE

Meenkara reservoir: A platform for blue growth in Kerala

Thankam Theresa Paul*, Tanuja Abdulla, Deepa Sudheesan, and Sajina A.M.

ICAR-Central Inland Fisheries Research Institute

*thankamtheresa@gmail.com

The fish stock-production status of Meenkara, a small reservoir in Palakkad district of Kerala has been assessed for blue growth in this paper. The fish production and stocking data was procured from State Fisheries Department of Kerala. The analysis indicated that annual stocking in this reservoir ranged from 0.8 to 4.3 million fish seeds, average being 2.0 ± 1.28 million seeds. The production in this reservoir ranged from 10,367 kg to 42,185 kg, mean production being $25,390 \pm 11,347$ kg. The production in numbers from this reservoir ranged from 10,367 to 42,185 fishes, mean value being 20312 ± 9099 fishes. The study investigated the stocking conversion ratio and found that for every 100 fish seeds stocked, the reservoir produced adult fish of 2 nos only. This indicated the requirement of technical and species management in this reservoir. The trend analysis of stock-production of Meenkara reservoir indicated that despite negative trend in stocking, fish production from this reservoir exhibited a positive trend. The analysis indicated that this reservoir was stocked annually with 2.09 million fish seeds which is more than the optimum stocking density of 0.77 million fish seeds. The study revealed a need for species diversification in fisheries and adoption of enhancement strategies such as cage and pen culture for attaining the estimated fish production potential of the reservoir at 153.3Kg/ha/yr.

Keywords: Meenkara, stocking, enhancement, species diversification

Present status of water and sediment quality and trace metal contamination aspects of bheries of East Kolkata Wetlands

Srikanta Samanta*, Basant Kumar Das, Snehasis Dalal, Rumali Sahoo, Angana Majumder, Sayan Mandal, L. Chakraborty, D.J. Sarkar, G. Karnatak, Vikash Kumar, A. K. Das, Lianthumluaia

ICAR - Central Inland Fisheries Research Institute, Barrackpore, Kolkata
700120

*samantacifri@gmail.com

The East Kolkata Wetland (EKW) is internationally acknowledged for wastewater-fed aquaculture. Its reported fish production potential was about 4000 kg/ha/year. However, in recent days it has been recorded that the average fish production has been drastically reduced to the level of 1000 to 2000 kg/ha/year depending upon the nutrient rich wastewater availability, frequency of water intake, use of fish feed, etc. To understand the role of the abiotic component in the production process, the water and sediment quality parameters of 9 representative bheries were assed which have wide variability in sewage intake and spatially separated. As per expectations, majority of the water quality parameters including pH, alkalinity, hardness, nitrate and phosphate contents were recorded at moderately higher levels. Seasonal impacts were prominent with higher values mostly during premonsoon months. The sediment phase exhibited enrichment of organic matter and associated nutrients- nitrogen and phosphorus. Since a significant part of the wastewater is received from industrial sources, the contaminations due to trace metals were a question. To understand the present status of contamination, the water, sediment and fish samples were assessed for Cd, Cr, Cu, Mn, Ni, Pb, Zn contaminations. It is interesting to note that in the water phase the studied metals were recorded at levels below their associated permissible limits. The fish fleshes (IMCs, tilapia) also exhibited accumulation of these metals much below their associated permissible limits depicting human safety on its consumption. The sediment samples however, exhibited significant accumulation of majority of the studied metals which were even much above their associated pollution limits. From the present study, it is inferred that although there is some threat and environmental issues due to metal contaminations, the fish produced are safe for human consumption. The water and sediment quality aspects are suitable for higher productivity which is reflected in the present level of plankton production although the actual fish production level is quite low due to siltation and other management issues of the wetlands.

Keywords: Water and sediment quality, trace metal, nutrient, wastewater-fed aquaculture

Otolith Morphometrics as a Tool for Differentiating Two *Scomberomorus* Species Along the Northwest Coast of India

Pawan Kumar^{1*}, Thakurdas², S.K. Chakraborty¹ and B.B. Nayak¹

¹ICAR-Central Institute of Fisheries Education, Versova, Mumbai

²Mumbai Regional Station of ICAR-Central Marine Fisheries Research Institute, Versova, Mumbai

*pawankumar@cife.edu.in

Accurate species identification is critical for effective fisheries management, particularly for morphologically similar species such as those in the genus *Scomberomorus*. This study investigates the utility of otolith morphology as a diagnostic tool to differentiate between two economically important species, *Scomberomorus commerson* and *Scomberomorus guttatus*, along the Northwest coast of India. This research evaluates the effectiveness of otolith morphometrics in distinguishing between the two species. A total of 300 specimens (150 of each species) were collected from commercial fish landing centers across Gujarat and Maharashtra. Seven otolith measurements and five shape indices were recorded, revealing significant interspecific differences. Multivariate modelling, including linear discriminant analysis (LDA), successfully distinguished between the species based on otolith characteristics. Cross-validation demonstrated a predictive accuracy of at least 96%, indicating a high degree of morphological distinctiveness. The optimum LDA model incorporates fork length, ferret length, ferret width, perimeter, area, roundness, form factor, and rectangularity as explanatory variables. These results can enhance the accuracy of species-specific fisheries monitoring and resource assessments, contributing to the improved management of *Scomberomorus* species in the Northwest coast of India. Continued research on otolith morphology and shape is essential to further refine species identification methods, which is an area not much covered in the research arena. Additionally, representative otolith images may serve as valuable references for taxonomists confirming species identity. These findings support the use of otolith morphology as a reliable, cost-effective approach for species differentiation, with broad applications in fisheries biology, stock assessment, and marine biodiversity conservation.

Keywords: Otolith morphology, *Scomberomorus commerson*, *Scomberomorus guttatus*, species identification, discriminant analysis, fisheries management

Assessment of stomach contents of Gangetic *Ailia* of Ganga River at Prayagraj, Uttar Pradesh, India

Vandana Pal^{1*}, Jeetendra Kumar², and Amitabh Chandra Dwivedi²

¹Nehru Gram Bharati University, Prayagraj, Uttar Pradesh 221 505

²ICAR- Central Inland Fisheries Research Institute, Prayagraj, Uttar Pradesh 211002

*vandanapal0635@gmail.com

This study explores the food and feeding habits of the commercially important *Ailia coila* from the Ganga River at Prayagraj, Uttar Pradesh, India. A total of 250 specimens were collected from experimental fishing by gill nets from December 2024 to May 2025. Stomachs were categorized based on fullness and found to be 50% trace, 7% full, 25% half, 2% 1/3rd, 6% 1/4th and 10% empty stomach. A total of 47 stomachs were analysed to gather information on the dietary patterns of *Ailia coila*. The findings reveal that *Ailia coila* are carnivorous (particularly insectivorous), and fish primarily feed on aquatic insects. Dominant food items were Caddisflies, Chironomid larvae, Hydroporus, Mayflies, insect antennae, insect wings, beetle larvae, organic matters, and a very trace number of phytoplankton and zooplankton. Caddisfly species made up (90-95%) of the gut content analysis. The present information will be helpful for the fisheries management of *Ailia coila* of the Ganga River.

Keywords: Food and feeding, *Ailia coila*, stomach content, River Ganga

Identification of Ecosystem Services of Urban Lake Powai, its contribution in environmental diversity and human well-being in Mumbai, India

Bhukya Bhaskar^{1*}, Asha T. Landge¹, B.B Nayak¹, P. S. Ananthan¹, G.B. Sreekanth², Neha Wajahat Qureshi¹, Karan Kumar Ramteke¹ and Abu¹

¹Department of Fisheries Resource Management, Fisheries Resource Harvest and Post-Harvest Management Division, ICAR- Central Institute of Fisheries Education, Versova, Mumbai-400 061.

²ICAR - Central Coastal Agricultural Research Institute, GOA

*bhaskarkalyan2@gmail.com

The worldwide humanity is rising in urban areas but still depending on Nature for survival and well-being. Cities reported to play a leading role in our economic development as greater than 80 % of the gross world product (GWP) comes from cities. The world wetlands area is approximately 7–10 million km², it shares for 5–8% of the total land area. Worldwide the Lakes contribute 0.013% of freshwater resource on earth’s surface. The urban population of India was 35.4 %, and the population of Mumbai in this metro area was 20,668,000 in 2021. Present study aims to identify urban Powai Lake ecosystem services and its contribution in biodiversity and human well-being in Mumbai, India. Powai area about 11.88 km², its population is 2,169,57 nos’ during in 2020. This study multifaceted dynamic approach combined bio-physical and socio-cultural-ecological system descriptive approach. For identification of ecosystem services, the Millennium Ecosystem Assessment (MEA) and the Common International Classification of Ecosystem Services (CICES) were followed. Lake ecosystems were analysed in terms of their ES that can be assigned to individual classes listed in CICES V5.1. Present study identified ecosystem services and aquatic species groups were listed as 26 species of fishes, 40 individuals of Crocodiles, in addition to Birds, Reptiles, Earthworms, plants, Phytoplankton and zooplankton and microbial species on Powai lake ES, and their human use based on stakeholder’s perception and scientific literature, Present study identified ecosystem services (ES) of Powai Lake ES direct and indirect benefits to livelihood dependent and urban population were useful to managers for understanding importance of urban lake ecosystem services for ecosystem restoration, biodiversity conservation, recreational fishing, boating ,human well-being and livelihood dependent use of urban lake ecosystem Powai.

Keywords: Urban Lake Powai, Ecosystem services (ES), Provisional ecosystem services, Recreational ecosystem services, angling, subsistence fishing, sport fishing, Houseboats

Physio-metabolic responses of *Catla catla* (Hamilton,1822) against ammonia toxicity

Subhasrita Nayak*, Pratap Chandra Das, Himanshu Sekhar Swain,
Nabakishor Sial

ICAR- Central Institute of Freshwater Aquaculture, Bhubaneswar

*nayaksrt999@gmail.com

Aquatic ecosystems are increasingly impacted by anthropogenic stressors, with ammonia pollution posing a significant threat to freshwater fish populations, reflecting the same in the aquaculture systems. This study investigates the toxicological effects of ammonia on *Catla catla* fry by determining the 96-hour lethal concentration (LC₅₀) and analyzing physio-metabolic responses to sub-lethal ammonia exposure. The 96-hour LC₅₀ was calculated as 25.02 ppm, resulting in 100% mortality at concentrations of 75 ppm and above, and no mortality at up to 5 ppm. Fry were then exposed to sub-lethal concentrations of 12.51 ppm (1/2 LC₅₀), 6.25 ppm (1/4th of LC₅₀), and 2.50 ppm (1/10th of LC₅₀) for 30 days. Behavioural observations revealed erratic swimming, abnormal gill movements, and loss of equilibrium, intensifying with higher ammonia levels. Biochemical analysis indicated significant increase in blood glucose, SGOT, and SGPT, suggesting hepatic stress with respect to increase in the ammonia levels. Also, total protein, albumin, and globulin levels decreased, while the albumin-globulin (A/G) ratio increased at higher concentrations, indicating impaired protein synthesis. Elevated oxidative stress markers (SOD and catalase) highlighted adaptive responses of the fry to oxidative stress. Growth metrics including specific growth rate (SGR), daily growth index (DGI) and thermal growth coefficient (TGC) declined in a dose-dependent manner while the feed conversion ratio (FCR) and protein conversion ratio (PCR) increased under elevated ammonia concentrations and protein efficiency ratio (PER) declined, reflecting poor feed and protein utilization. Water quality analysis indicated a decline in dissolved oxygen and increased pH and nitrogen compounds with higher ammonia levels. These findings provide valuable insights into the physiological and biochemical responses of freshwater fish to ammonia toxicity.

Keywords: *Catla catla*, ammonia, fry, lethal concentration, stress

Fish community structure and dynamics across the different estuaries of the Sundarban mangrove ecosystem, India

Roshith C. M*, B. K. Das, Sangeetha M. Nair, P. Gogoi, Ajoy Saha, Lianthuamluaia, Asha T. Landge, Karan K. Ramteke

ICAR-Central Inland Fisheries Research Institute, Barrackpore – 700 120.

*roshithcmcfri@gmail.com

Comprehensive surveys on fish community structure were conducted at various sampling sites representing the major estuarine systems of the Indian Sundarbans during 2023-25, which include the Hooghly-Muriganga, Matla-Bidya, and Ichhamati-Raimangal. Data was collected through semi-structured interviews with fishers and by experimental fishing with bagnets by hired local fishermen. Wide variations were observed in the catch composition of bagnets at different sampling sites which can be attributed to the varied salinity regime in these areas. A total of 156 fish species were recorded during the study. More than half of the bagnet catch at Sandeskhali was comprised of *Escualosa thoracata* (26.74 %) and juveniles of *Lates calcarifer* (24.28 %). The Bombay duck (*Harpadon nehereus*) was the dominant species at Jharkhali contributing to 36.1 % of the total catch. The dominant component of the catch at Frasersganj was the gold-spotted grenadier anchovy *Coilia dussumieri* (35.8 % of the total catch), followed by *H. nehereus* (28.11 %) and *Setipinna taty* (7.95 %). The CPUE ranged from 14.2 (Sandeskhali) to 41.5 Kg/net/day. The fish community of the Indian Sundarbans is highly vulnerable to the impacts of overfishing, coupled with the sea level rise (SLR) and other climate change associated phenomena.

Keywords: Indian Sundarbans, estuaries, bagnets, overfishing, climate change

Exploratory survey for assessment of prawn fishery resources in Subarnarekha River, Jharkhand

S. K. Koushlesh*, Roshith C.M., S. K. Manna, A.K. Das, R. K. Manna, Manish Kujur & B. K. Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal 700120

*skoushlesh20009@gmail.com

This study reveals the findings of an exploratory survey in the Subarnarekha River, Jharkhand. In May 2025, Subarnarekha River, its predominant freshwater prawn fishery, and its species were surveyed. In Jharkhand, six river segments were surveyed. Prawn fishing is mostly done using prong spears of various shaft lengths. Except for one river stretch, the major prawn fishing season is pre-monsoon. In the river Subarnarekha, *Macrobrachium malcolmsonii* dominated the prawn fishery. *M. malcolmsonii* and *M. rosenbergii* constituted 90% and 10% of the prawn's catches. *M. rosenbergii* was only found in the Jamshola stretch, the Baheragora block. Only 230 of 1440 active fishers in the study region fished for freshwater prawns. The main catch at Digri Galudih, Bihinda, and Jamshola stretch was *M. malcolmsonii*. Fisherman targeted *M. lamarrei* as Maisara, Ichagarh, and Narenga (Kanikola-Naranga-Nischintapur) section lacks *M. malcolmsonii*. Digri Galudih had the highest catch per unit effort (3.5 Kg per fisher per day), followed by Jamshola (2 Kg) downstream of the barrage. The sandy riverbed of Bihinda in the Dalbungarh block had no prawn landings during the pre-monsoon survey. Prawn fishing in the river is targeted at one species, *M. malcolmsonii*, making it easier to adopt and enforce management measures for sustainable prawn fishery development. The present survey finds an excellent niche for *M. malcolmsonii*, demonstrating the species' natural growth and survival in state waters.

Keywords: freshwater prawn fishery, Subarnarekha River, *Macrobrachium malcolmsonii*, exploratory survey

Plankton diversity as an indicator of ecosystem health in a medium reservoir in Peninsular India

Jesna P. K.^{a*}, V. L. Ramya^a, P. Panikkar^a, S. Sahoo^a, Sibina Mol S^a,
Vijaykumar M. E.^a, B. K. Das^b

^aICAR-Central Inland Fisheries Research Institute, Regional Centre,
Bangalore, Karnataka

^bICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata,

*jesnamukundan@yahoo.com

Sathanur Reservoir (12.2064° N, 78.8567°E.), Tamil Nadu, India, is a medium reservoir built across the river Thenpennai with 2000 ha area at full reservoir level (FRL). Plankton dynamics of the reservoir was assessed and recorded 42 phytoplankton genera belonging to 11 classes, with nine perennial genera. Different diversity indices such as the Shannon-weiner diversity index, Simpsons index, evenness index and dominance index were estimated to assess the diversity. There were significant variations in diversity on spatial and temporal scale. Highest species diversity (1.68) and lowest dominance (0.25) were observed at riverine site during the summer season. The algal genus pollution index (AGPI) was estimated to be 15-20 during the pre-monsoon and summer seasons indicating high organic pollution. The AGPI was estimated to be 29 at the damsite during summer indicating severe organic pollution. Based on the phytoplankton biodiversity index, an aquatic ecosystem health index was derived. The threshold value of the system was estimated to be 25.7. The health indices derived during different seasons shows that the reservoir is a healthy ecosystem since the seasonal average health index is >25.7 throughout the year. These findings will be helpful in developing predictive models of similar tropical ecosystems for sustainable fisheries management.

Keywords: plankton, ecosystem health, Sathanur, diversity

Nutritional profiling of fishes from Sessa river, Brahmaputra basin, Assam

*Simanku Borah¹, B.K. Bhattacharjya¹, S.K. Majhi¹, Bhargab Saikia¹, Pritam Das¹, Muzammal Hoque¹, Satabdi Ganguli² and B.K. Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional centre, Guwahati-781006

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120

* simankuborah@gmail.com

Fish are increasingly recognized for their exceptional nutritional value, making them vital for achieving nutritional security. A study was conducted on 29 fish species collected from Sessa River, Dibrugarh, Assam, to assess their nutritional profile. Proximate analysis followed AOAC protocols, mineral content was assessed using ICP-MS, amino acids via UPLC, and fatty acids through GC-MS. Moisture content ranged from 67.45% in *Botia dario* to 81.31% in *Labeo catla*, with most species between 72%–79%. Protein content varied from 15.96% in *Labeo catla* to 20.51% in *Monopterusuchia*, with *Mastacembelus armatus* and *Botia dario* also showing high values. Fat content ranged widely from 0.64% (*Wallago attu*) to 10.03% (*Botia dario*), while ash content varied from 0.64% to 5.99%. Trace minerals showed considerable variation: Fe (24.448–276.935 mg/kg), Mn (48.351–50.533 mg/kg), Cr (0.049–0.613 mg/kg), Co (0.007–0.138 mg/kg), Cu (0.342–1.537 mg/kg), Zn (7.986–65.780 mg/kg), and As (0.230–0.585 mg/kg). Cd levels were low (0.001–0.024 mg/kg), and Pb was mostly below detectable limits. Among amino acids, leucine was the dominant essential amino acid (0.275–0.822 g/100g), while glutamic acid was the most abundant non-essential one (0.679–2.301 g/100g). Fatty acid profiling revealed myristic and palmitic acids as dominant SFAs, oleic acid as the main MUFA, and high PUFA content, particularly linoleic and linolenic acids, highlighting the species' potential to support health and nutrition.

Keywords: Nutritional composition, Freshwater fish, Amino acids, Fatty acids, Trace minerals

Assessment of optimal fish habitats in Keetham Lake, Agra using geospatial techniques for conservation and sustainable management

Shubham Kanaujiya*, Shruthi H U, Nitish Bansal, Kavita Sharma, Sujeet Kumar Rai, Vishal Soni, Chaturvedi Prabhutva Nikhil, and Krishan Kumar Yadav

College of Fisheries Science, CCS, HAU, Hisar-125 004, India

*shubhamfrm1@gmail.com

Optimal fish habitats are specific zones within aquatic ecosystems that consistently support fisheries by offering suitable conditions for fish growth, reproduction, and survival. Although Keetham Lake (Sur Sarovar), located in Agra, India, is designated as a Ramsar site since 2020, comprehensive spatial analysis of its fish-supporting areas remains limited. This study aims to identify and assess optimal fish habitats in Keetham Lake using Google Earth Engine (GEE) to enhance conservation and sustainable management strategies. The lake, a man-made, pentagon-shaped waterbody with a catchment of approximately 431ha, supports a diverse ichthyofauna of over 60 fish species, including three threatened species, *Ailia coila* (NT), *Chitala chitala* (NT), and *Wallago attu* (VU) and five exotic species. Using multi-temporal Sentinel-2 surface reflectance imagery (May 2020–2024), we derived spatial indicators such as the Normalized Difference Water Index (NDWI) for surface water extent and depth, the Normalized Difference Vegetation Index (NDVI) for vegetative cover, and the Normalized Difference Turbidity Index (NDTI) for water quality. Results indicate that only 14.33 ha (3.32%) of the lake presently be suitable as optimal fish habitat, emphasizing the vulnerability of these zones despite the lake's protected status. Spatial assessment highlights the need for conservation to sustain ecological integrity and fishery resources of this lake.

Keywords: Keetham Lake, Optimal fish habitat, Google earth engine, NDWI

Responsible management of *Carcharhinus falciformis* fisheries: A population dynamics approach from North-west coast of India

Ajay Baldaniya^{1*}, Pradeep Mankodi² and S. P. Kamble¹

¹ICAR – Central Inland Fisheries Research Institute, Vadodara Research Station, Vadodara -390021, Gujarat, India

²The Maharaja Sayajirao University of Baroda, Vadodara - 390002, Gujarat, India

*ajaybaldaniya92@gmail.com

The silky shark (*Carcharhinus falciformis*), a key predator in tropical marine ecosystems, faces increasing fishing pressure, necessitating a comprehensive assessment of its population dynamics and stock status. This study evaluates the population parameters of *C. falciformis* along the Gujarat coast using length-based stock assessment methods. Monthly length-frequency data (November 2021–October 2023) were analyzed using FAO-ICLARM Fish Stock Assessment Tools (FiSATII). The Von - Bertalanffy growth function (VBGF) parameters were estimated as L_{∞} = 326.55 cm and K = 0.13/year. The total mortality (Z), natural mortality (M), and fishing mortality (F) were estimated at 0.45, 0.22, and 0.23, respectively, yielding an exploitation rate (EE) of 0.51, suggesting overexploitation of the stock. Recruitment analysis indicated continuous recruitment with peaks in June and July, while virtual population analysis (VPA) revealed high fishing mortality in larger size groups. The estimated length at first capture (L_c) was 101 cm, significantly below the reported maturity size of 180–260 cm, highlighting concerns about juvenile overfishing. The yield-per-recruit analysis indicated an optimal exploitation rate (E_{max}) of 0.529, with the stock falling into the overexploitation quadrant. These findings emphasize the urgent need for sustainable management measures, such as mesh size regulations and fishing effort reduction, to ensure the long-term viability of *C. falciformis* in the Gujarat maritime zone.

Keywords: Elasmobranchii, Stock assessment, Gujarat Coast, Length-frequency, Silky shark.

Modeling Harmful Algal Bloom Dynamics Using Generalized Additive Models: Insights from a Tropical Ramsar Wetland in India

Simanku Borah¹, Pritam Das^{1,2}, Asha T. Landge², B.K. Das³, S.K. Majhi¹,
and *Anil Kumar Yadav¹

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre,
Guwahati, Assam, India, 781006

²ICAR-Central Institute of Fisheries Education, Versova, Mumbai,
Maharashtra, India, 400061

³ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata,
West Bengal, India, 700120

*yadav.anil.stats@gmail.com

Harmful algal blooms (HABs) are an emerging concern in tropical freshwater ecosystems, demanding advanced analytical tools to unravel their complex ecological drivers. This study presents a data-driven approach using Generalized Additive Models (GAMs) to evaluate seasonal phytoplankton dynamics in Deepor Beel, a Ramsar wetland in Assam, India. Monthly data were collected from December 2023 to November 2024 across three stations, including 17 key environmental parameters and phytoplankton abundance. GAMs were applied to model non-linear associations between environmental factors and five dominant taxa- *Cyclotella*, *Navicula*, *Microcystis*, *Spirulina*, and *Oscillatoria*. The models demonstrated high explanatory power (52%-80.2% deviance explained), identifying turbidity, total dissolved solids, dissolved oxygen, and nutrient levels (nitrate, ammonium) as major predictors. Notably, *Microcystis* abundance was strongly linked to turbidity and ammonium, while *Navicula* was associated with transparency and nitrate. These results highlight the ecological specificity of HAB-forming species and the utility of GAMs in modeling complex, seasonal ecological phenomena. This study underscores the importance of integrating flexible statistical modeling with ecological monitoring for effective HAB forecasting and wetland management strategies.

Keywords: Deepor Beel, Generalized Additive Models, Harmful algal blooms, non-linear relationships, phytoplankton

Hydrological connectivity is the major determining factor influencing ichthyofaunal diversity in tropical wetland ecosystems

Simanku Borah^{1*}, Pronob Das¹, Sullip Kumar Majhi¹, Muzammal Hoque¹, A.K. Yadav¹, B.K. Bhattacharjya¹, Pritam Das¹, Bhargav Saikia¹ and B.K. Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati-781006

²ICAR-Central Inland Fisheries Research Institute, Barrackpore – 700 120

*simankuborah@gmail.com

Wetlands are vital ecosystems that support high biodiversity, regulate hydrological cycles, and sustain local livelihoods, particularly in ecologically sensitive floodplain regions like Tamranga Beel and Lakhanabandha Beel. The study (2024–2025) conducted in Tamranga Beel documented over 68 fish species under 22 families, with Cyprinidae (33.82%) being the most dominant, followed by Danionidae (11.76%) and Bagridae (10.29%). Seasonal variation significantly influenced species richness, peaking during the monsoon (68 species), followed by the post-monsoon (54 species). In contrast, Lakhanabandha Beel exhibited 50 fish species across 18 families, with the highest diversity recorded during monsoon (50 species), then post-monsoon (24 species), and pre-monsoon (17 species). Cyprinidae also dominated here (38%), followed by Bagridae (12%). Despite high biodiversity, species dominance in fish catches was evident. In Tamranga Beel, post-monsoon catches were heavily dominated by *Gudusia chapra* (Karoti), contributing over 90% of the total. In winter, Indian Major Carps (IMCs) and exotic carps made up ~70%, while *G. chapra* declined to ~10%. Pre-monsoon and monsoon catches were dominated by *Chanda nama*, contributing 60% and 80% respectively. These seasonal shifts in species dominance reflect ecological dynamics and species-specific life cycles. The heavy reliance on a few dominant species in both beels, despite rich ichthyofaunal diversity, highlights the urgent need for sustainable fisheries management to ensure long-term ecological balance and livelihood resilience in these wetland ecosystems.

Keywords: Floodplain wetland, Fish diversity, Seasonal variation, Species dominance, Sustainable fisheries management

Modulating effects of submerged macrophytes on phytoplankton structure and limnological parameters in a tropical floodplain wetland of the Gangetic basin

Pritijyoti Majhi*, Suman Kumari, Pranab Gogoi, Lianthuamluaia Lianthuamluaia, Ranjan Kumar Manna, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute Barrackpore,
Kolkata-700120, West Bengal

*meet2pritijyoti@gmail.com

In this study, we investigated the influence of submerged macrophytes on phytoplankton community structure and water chemistry in Khalsi Beel. Specifically, we compared the overall phytoplankton community both in terms of composition and abundance during two distinct periods: one with the presence of submerged macrophytes such as *Hydrilla verticillata*, *Ceratophyllum demersum*, and *Vallisneria* sp., and one without. Seasonal monitoring was conducted over the course of one year. Results showed a significant increase in phytoplankton abundance during the period without submerged macrophytes (mean: $2.4 \times 10^5 \pm 1.2 \times 10^5$ cells L⁻¹), compared to the period with submerged macrophyte presence (mean: $6.7 \times 10^4 \pm 3.9 \times 10^4$ cells L⁻¹). In the period with submerged macrophyte, the phytoplankton community was dominated by unicellular flagellates whereas cyanobacteria such as *Microcystis* spp., *Merismopedia glauca*, *Chroococcus* sp., *Cylindrospermopsis* sp., was dominated during the period without submerged macrophytes. Significant differences in nutrient concentrations and phytoplankton composition were observed between vegetated and non-vegetated periods. PERMANOVA analysis showed significant temporal variation in both phytoplankton abundance ($F = 1.15$, $p = 0.02$) and environmental variables ($F = 1.82$, $p < 0.05$). Canonical Correspondence Analysis (CCA) identified key environmental drivers' temperature, pH, transparency, total alkalinity, total hardness, and nutrients (NO₃⁻-N, PO₄³⁻-P, and SiO₄²⁻-Si) as determinants of phytoplankton distribution and community composition. These findings underscore the ecological importance of submerged macrophytes in regulating phytoplankton dynamics and maintaining water quality. The study highlights the need to protect aquatic macrophytes for sustaining biodiversity and ensuring ecosystem-based wetland management.

Keywords: Phytoplankton community, Submerged macrophytes, floodplain wetland, Water quality

Spatio-temporal variability of macrobenthic invertebrates in the middle and lower stretch of the Teesta River, Sikkim

Shyamal Chandra Sukla Das^{1*}, Niti Sharma¹, Dibakar Bhakta², Amiya Kumar Sahoo², Sullip Kumar Majhi¹ and Basanta Kumar Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati, Assam

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal

*scsdtin@gmail.com

The spatio-temporal variation of macrobenthic invertebrates from the lower and middle stretch of the Teesta River was studied during 2024-2025. Altogether 12 genera of Insecta (10), Gastropoda (1), and Annelida (1) belonging to 9 families, were recorded across five sites. Species richness at Makha (S1), Manglay (S2), Singtham (S3), Ranikhola (S4), and Khanikhola (S5) was found to be 8, 3, 4, 4, and 5 respectively. The Shannon-Wiener index (H') varied from 0.60 (S2, monsoon) to 1.72 (S1, post-monsoon), while the evenness index ranged 0.36 (S5, post-monsoon) to 0.98 (S3, pre-monsoon). The benthos varied from 67(S4, monsoon)-710 (S5, post-monsoon) inds/m². One mollusc, *Physella acuata* was recorded at S5 with an abundance of 611 inds/m², which prefers polluted water. The mean water temperature (⁰C) ranged between 14.1 to 24.5. The mean values of water quality parameters viz., dissolved oxygen, total hardness, total alkalinity, specific conductance, and pH varied between 8.2-8.8; 20-86; 32-58 mg l⁻¹, 62.1-206 μ s/cm and 8.1-8.6, respectively across different seasons and sites. Based on Welch pattern, the river stretches falls under river health category as moderate status, i.e., $1 < H' < 3$, except site S2, which falls as polluted status. Study infers for improving the health of Teesta River for sustainable management.

Keywords: Diversity, Macroinvertebrate, Health status, Teesta River, Northeast India

Morphology of the largest otolith in *Oreochromis niloticus*, *Systomus sarana* and *Mystus vittatus*

Sibina Mol S¹., V. L. Ramya^{1*}, Jesna P. K.¹, S. Sahoo¹, P. Panikkar¹,
Vijaykumar M. E¹. and B. K. Das².

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre,
Bangalore – 560089, India

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata –
700120, India

[*ramya.kumar.bfsc@gmail.com](mailto:ramya.kumar.bfsc@gmail.com)

Otoliths in teleosts differ in location, size, shape, microstructure, and function. The present study investigated the morphology of the largest otolith in *Oreochromis niloticus* (sagitta), *Systomus sarana* (asteriscus), and *Mystus vittatus* (lapillus). In *O. niloticus*, sagitta was flat, ovoid in structure, with a concave lateral and convex medial surface, having a groove, *sulcus acusticus*. Anterior of the sagitta was truncated and pointed, while the posterior was rounded. Asteriscus in *S. sarana* was round, gyrotypic with convex lateral and concave medial surface. There were two lobes, *lobus minor* and *lobus major*, separated by a furrow, *fossa acustica* on the medial face. Lapillus in *M. vittatus* was kidney-shaped with a concave lateral view and a convex medial view. The relationship between the lengths of fish (TL) and otolith (OL) was derived as $TL = 2.7761OL - 1.133$ ($R^2 = 0.65$) in *O. niloticus*, $TL = 1.1162OL + 20.3332$ ($R^2 = 0.61$) in *S. sarana* and $TL = 1.9526OL + 8.5314$ ($R^2 = 0.32$) in *M. vittatus*. The morphological differences in otolith among various species act as a diagnostic tool for taxonomic studies. Establishing relationship between the fish size and otolith size aids in predicting prey size in food and feeding biology, where otoliths are found in the diet.

Keywords: Otolith, teleost, fisheries, taxonomy, biology

Evaluation of Plankton Diversity and Physico-Chemical Characteristics in Selected Reservoirs in Kabirdham District, Chhattisgarh, Central India

Kamalesh Panda*, Bhagchand Chhaba and Sarita Kumari Das
LSPN College of Fisheries, Kawardha, Kabirdham Dist, Chhattisgarh –
491995

*kamalesh.panda@dsvckvdurg.ac.in

The present study investigates the physico-chemical characteristics and plankton diversity of in the Sarodha Reservoir, Sutiya path Reservoir and Chhirpani reservoirs in Kabirdham district, Chhattisgarh, to assess the variance in physico-chemical characteristics of water and plankton diversity in the freshwater ecosystems of Kabirdham District, Chhattisgarh in Central India. The study was conducted between January to May 2025. The selected physico-chemical parameters temperature, pH, dissolved oxygen, hardness, ammonia, and nitrite-N etc., were analyzed and results were found in acceptable range for reservoir fisheries and diversity. Average temperature of the Sarodha reservoir was found to be 27.5 °C, pH 7.3, dissolve oxygen 4.8 mg/L, hardness of 153 mg/L, alkalinity of 90.4 mg/L, carbon dioxide of 1.4 mg/L. Sutiya path Reservoir has an average temperature of 25.92 °C, pH 7.64, dissolve oxygen 6.44 mg/L, hardness of 212.3 mg/L, an alkalinity of 183.56 mg/L, and carbon dioxide of 1.95 mg/L. The average temperature of the Chirpani reservoirs was 21.7 °C, pH 7.8, hardness 197 mg/L, alkalinity 201 mg/L, dissolved oxygen 5.38 mg/L. Plankton forms an integral component of freshwater environment and contributes significantly to biological productivity of the ecosystem. Concurrently, qualitative and quantitative assessments of plankton communities—comprising both phytoplankton and zooplankton—were conducted using standard plankton net and identification protocols. Phytoplankton from the class *Chlorophyceae*, including *Volvox*, *Microcystis*, and *Pediastrum*, were observed to be dominant. Among zooplankton, cladocerans such as *Daphnia* and *Moina* were the most abundant. The study concludes that the physico-chemical characteristics and plankton diversity in all three reservoirs are conducive to sustaining fish population and highlight the potential of these water bodies. The diversity and abundance of plankton served as effective bioindicators of water quality, highlighting the reservoirs' trophic status ranging from oligotrophic to mesotrophic conditions

Keywords: Ecosystem, Plankton, Physico-chemical parameters, Reservoir.

Spatial and seasonal patterns of fish diversity and functional traits in a tropical small reservoir in India

V. L. Ramya*, Jesna P. K., Preetha Panikkar, Sonalika Sahoo, Sibina Mol. S., Vijaykumar. M. E.

Regional Centre of ICAR-Central Inland Fisheries Research Institute,
Bangalore, India

*ramya.kumar.bfsc@gmail.com

The study assessed fish composition, taxonomic, and functional diversity in the Kanva reservoir across different habitat zones and seasons. A total of 22 fish species from seven orders and ten families were recorded, with Cyprinidae exhibiting the highest abundance and richness. Species richness was greatest in the riverine zone, followed by lacustrine and transitional zones, and peaked during the post-monsoon season. *Salmostoma belachi* dominated the fish population, accounting for more than 85% of the entire catch. Families such as Heteropneustidae and Mastacembalidae were confined to the riverine zone, indicating habitat-specific occurrence. Functional diversity analysis revealed higher functional dispersion (FDis) and evenness (FEve) in riverine habitats, particularly during the monsoon, reflecting a wider range of ecological traits and strategies. In contrast, reduced trait evenness during the pre-monsoon suggests environmental constraints affecting community structure. Functional divergence (FDiv) remained consistently high across zones, indicating strong niche differentiation. These results highlight the ecological significance of riverine habitats in maintaining both taxonomic and functional diversity, underscoring the need for habitat-specific conservation and management strategies in reservoir ecosystems.

Keywords: Functional diversity, Kanva reservoir, taxonomic diversity, habitat

Ecology and fisheries of selected lower Gangetic floodplains wetlands for sustainable fisheries development

Lianthuamluaia*, B.K. Das, A.K. Das, Pritijyoti Majhi, R.K. Manna, A.K. Bera, Md. Aftabuddin, Y. Ali, S. Das and Kausik Mondal,

ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal-700120

*eltry7@gmail.com

Wetlands are among the most productive aquatic ecosystems, providing a wide range of ecosystem services. Among these, fisheries are one of the most important, supporting the livelihood of numerous fishing communities. India has a vast area of floodplain wetlands, covering around 0.5 million ha, spreading mostly in West Bengal, Assam, Bihar, Uttar Pradesh, and the Northeastern States of India. Due to unscientific management and other reasons, the fish yield from most of the wetlands is far below the estimated potential yield. Culture-based fisheries (CBF) are one of the most reliable options for sustainably enhancing fish production in the wetlands. Scientific assessment of the ecology and fisheries is crucial for establishing a strategy for enhancing fish production in floodplain wetlands. The ecology and fisheries status of Rampara, Bellon, Dasirchawk, and Chhar wetland of Murshidabad, West Bengal, were assessed. Critical water quality parameters like dissolved oxygen, pH, and total alkalinity were within the desirable range for fish production. The fish yield potential of the wetlands ranged from 1300 to 2100 kg/ha/year, indicating a good scope for increasing fish production by adopting CBF protocols. Based on the findings, a recommendation for a stocking strategy was given for the sustainable enhancement of fish production in the wetlands.

Keywords: Wetland; fisheries; sustainable; culture-based fisheries (CBF); fish yield potential

Natural Farming practices for Small Indigenous species of fish

S.N. Sethi¹, G. Sahu¹, A.P. Nayak² and P.C. Das¹
¹ICAR-CIFA, Kausalyaganga, Bhubaneswar, Odisha
² OUAT, KVK, Sakhigopal, Puri, Odisha
* sethisatyanarayana@yahoo.co.in

Natural farming practices for Small Indigenous Species (SIS) fish, including *Osteobrama cotio*, *Gadusia chopra*, *Nandus nandus*, *Macragnathus pancalus*, *Amblypharyngodon mola*, *Mastacembelus armatus*, *Salmostoma bacaila*, and *Esomus danrica*, promote sustainable aquaculture and biodiversity conservation. SIS fish farming involves creating a balanced ecosystem that mimics natural conditions, with minimal external inputs and a focus on biodiversity conservation. Polyculture systems, where multiple species are co-farmed, can promote ecosystem services and reduce the need for artificial feed. Utilizing natural food sources, such as plankton and aquatic plants, can also reduce reliance on external inputs. Regular monitoring and maintenance of water quality, pond depth, and aquatic vegetation are crucial for a thriving ecosystem. This approach not only improves fish productivity but also contributes to biodiversity conservation and ecosystem health. By promoting ecosystem-based management, farmers can conserve biodiversity and ecosystem services, ensuring a sustainable aquaculture practice. The benefits of natural farming practices for SIS fish are numerous. Improved livelihoods for farmers can be achieved through increased fish productivity and income. SIS fish are a nutritious food source, contributing to local food security and health. Sustainable aquaculture practices reduce the environmental impact of fish farming, promoting sustainable development. These SIS fish species are rich in nutrients and micronutrients, making them an essential part of local diets. By adopting natural farming practices, farmers can capitalize on the growing demand for these nutritious fish, improving their livelihoods and contributing to food security. Government policies and support can encourage the adoption of natural farming practices, promoting sustainable aquaculture and biodiversity conservation. Natural farming practices for SIS fish offer a promising approach to sustainable aquaculture, biodiversity conservation, and community livelihoods.

Keywords: Natural farming practices for Small Indigenous Species (SIS) fish.

An integrative water quality index and multivariate modeling approach to assess surface water quality, trophic status and nutrient source apportionment in a large tropical reservoir, Hirakud – the longest earthen dam in Asia

Pranab Gogoi, *B. K. Das, S. K. Koushlesh, C. Johnson, R. Malick, A. Saha, T. Kayal, R. Chakraborty and A. K. Das
ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata – 700120, West Bengal, India
*pranabgogoi@gmail.com

The present study aimed to evaluate the spatio-temporal variations of surface water quality and trophic status of Hirakud reservoir, India based on the study of two annual periods (2022–2024). Nineteen limnological parameters were assessed seasonally at 14 sampling sites throughout the reservoir. Water variables showed significant ($p < 0.05$) spatial and seasonal variations where seasons had more impact on physicochemical variables. The calculated Arithmetic Weighted WQI value determined the reservoir water to be of ‘good’ water quality, especially in the pre- and post-monsoon period. However, during monsoon, increased turbidity was found to be a single potent factor for drastic deviation in WQI, rated as ‘poor to very poor’ water quality. Overall, the entire reservoir was in a mesotrophic state, with Carlson’s Trophic State Index (CTSI) ranging between 40.44 and 50.95. The insignificant ($p > 0.05$) spatio-temporal variation of CTSI value, which indicates the biological productivity of the reservoir, maintains its homogeneity. The land use land cover map was created for the reservoir with an overall accuracy Kappa index value of 0.85. The present study also evaluated the evolution of eutrophication in relation to Chl *a* using the Generalized Linear Model (GLM) and BEST Biota Environmental Matching (BIO–ENV). Our models suggest that water variables (dissolved oxygen, PO_4^{3-} , transparency, electrical conductivity) were the best explained variables for deviating Chl *a* in-reservoir water. Furthermore, the BIO–ENV model suggests that other factors (geographic and climatic) are equally responsible for the local evolution of eutrophication in the reservoir, including allochthonous inputs mainly by feeder river.

Keywords: Water variables, spatio-temporal, trophic state, WQI, modeling, reservoir

Fish assemblage and trophic guild structure of Thane creek, an urban Ramsar site in India

Sumanta Dey¹, Vineet Anand¹, Dayal Devdas¹, Shobha Rawat¹, Karan Ramteke¹ and Shashi Bhushan^{1*}

¹ICAR- Central Institute of Fisheries Education, Mumbai

*shashi@cife.edu.in

In the present investigation the fish species composition and trophic guild of Thane Creek, focusing on ecological roles and dietary habits were analyzed. Over six months, 1515 fish specimens from 54 species, 44 genera, 30 families, and 13 orders were collected from Vashi and Diwale jetties. The most abundant orders were Acanthuriformes, Clupeiformes, and Carangiformes, while the Sciaenidae family had the highest diversity species. The IUCN status indicated that most species were of Least Concern (67%), with smaller portions being Data Deficient (18%) and Near Threatened (4%). Biodiversity indices revealed variations in species richness and evenness. Species diversity was highest in September, corresponding with monsoon months, and lowest in May, during the pre-monsoon season. The Shannon-Weiner diversity index ranged from 3.06 (May) to 3.78 (September), and Margalef's richness index peaked in September (10.37). The evenness index indicated a more even species distribution in May than in other months. Dietary analysis involved 1492 specimens across 40 species, identifying 27 major food items, including *Acetes* spp., fish, copepods, and diatoms. Trophic levels ranged from 2.07 to 4.27, with *Scomberoides tol* and *Scomberomorus commerson* at the top, indicating piscivorous behavior. The average trophic level across species was 3.35, classifying the majority as mid-level carnivores. Diet breadth varied, with *Anodontostoma chacunda* and *Mystus gulio* exhibiting broader diets, while *Johnius carouna* and *Arius maculatus* had narrower diets, indicating specialization. The K- dominance curve suggested lower species evenness in May compared to September. The study identified ten trophic guilds, with *Acetes* feeders and carnivores being the most diverse. The analysis underscores the ecological significance of fish species in Thane Creek, with marine-estuarine opportunists being the most dominant ecological guild, followed by marine-estuarine-dependent species.

Keyword: Trophic Guild, Trophic level, Diet Breadth, Diversity Index

Geospatial Analysis of Trawl Catch Composition and Spatio-Temporal Distribution of Marine Species off the Mumbai Coast

Karankumar K. Ramteke*, Latha Shenoy, B.B. Nayak, Geetanjali Deshmukhe, Arun B. Inamdar and V.V. Singh
ICAR-Central Institute of Fisheries Education, Mumbai-400061,
Maharashtra, India
*karankumar@cife.edu.in

Experimental trawl fishing operations were conducted biweekly between latitudes 18°57'N to 19°12'N and longitudes 72°40'E to 72°43'E, covering a depth range of 6 to 21 meters off the Mumbai coast. These operations were carried out using the M.F.V. Narmada (IV), operated by ICAR-Central Institute of Fisheries Education (CIFE), Mumbai. A 35-meter bottom shrimp trawl net with a cod-end mesh size of 35 mm was employed to capture fish and other marine organisms. The analysis of the trawl catch composition revealed a notable predominance of bycatch, which constituted 79.43% of the total catch, compared to the commercial catch, which made up 20.12%. Marine debris accounted for a small proportion of the catch, about 0.45%. The estimated bycatch varied between 3.44 kg/h and 61.34 kg/h, while the commercial catch ranged from 3.80 kg/h to 57.25 kg/h. A total of 93 species were identified from the catch, categorized into the following groups: finfishes (53 species), shrimps (13 species), gastropods (11 species), crabs (4 species), cephalopods (4 species), stomatopods (3 species), elasmobranchs (3 species), a single species of lobster, and one species of hermit crab. The commercial catch primarily consisted of sciaenids (37%), shrimps (21%), and coilia (17%), with sciaenids representing the largest proportion of the targeted catch. Geospatial analysis of the spatial distribution of catch showed that species richness was highest in the depth range of 12 to 15 meters, where a maximum of 69 species were recorded. This geospatial analysis highlights the importance of depth zones in influencing species abundance and distribution, which can be utilized to optimize fishing operations and support sustainable marine resource management.

Keywords: Trawl fisheries, Bycatch composition, Species diversity, Depth stratification

Fishing Effort and Catch Dynamics in Nethravathi Estuary

Thamizhmani*¹ and Jaya Naik²

¹Dept. of Fisheries Engineering, College of Fisheries, Rangeilunda (OUAT).

²Dept.of.Fisheries Engineering and Technology, College of Fisheries,
Mangalore

* thamizhbfsc@gmail.com

Sustainable fisheries management requires a comprehensive understanding of both ecological and economic trade-offs in fishing practices. This study investigates the catch composition and efficiency of gill nets operated by motorized and non-motorized fishing boats in the Nethravathi Estuary, Mangalore, at a consistent depth of 10 metres. Fortnightly sampling was carried out using traditional fishing crafts (6.60 m × 1.15 m) fitted with monofilament gill nets (60 mm mesh size, 31.3 m headrope, 32 m footrope), supported by 33 floats and 100 sinkers. The total catch across all operations amounted to 266.07 kg, with motorized boats contributing 178.53 kg (67.10%) and non-motorized boats yielding 87.54 kg (32.90%). A t-test confirmed that the difference in catch between the two vessel types was statistically significant ($p < 0.05$). While motorized boats demonstrated greater catch efficiency, their use involved higher operational costs due to fuel consumption and raised potential concerns about ecological sustainability. These results highlight the trade-offs between technological advancement and environmental impact, emphasizing the need for species-specific monitoring and long-term assessments to ensure sustainable use of estuarine fisheries. It supports PMMSY incentives and proposes electric or hybrid engines in small FRP boats, aligning with SDG 14 and India’s Blue Economy goals.

Keywords: Gillnet Fisheries, catch efficiency, Estuarine Ecosystems, Motorized and Non-motorized Fishing, Nethravathi Estuary, Sustainable Fisheries Management

Comparative Study of Fish Production in Bay of Bengal vs Indian Ocean

Ananya Hrishita, Smile Satapathy, Md Shadab Alam

College of Fisheries, OUAT, Rangailunda, Berhampur-07

* shadab4u98@gmail.com

India's marine fisheries are shaped by the rich and diverse waters of both the Bay of Bengal and the broader Indian Ocean region which are ecologically and economically significant marine regions. They play a crucial role in sustaining coastal livelihoods and contributing to national and global fish production. The Bay of Bengal accounts for only a small portion of India's coastline, contributing nearly 40% of the country's total marine fish production, because of its productive estuarine systems and significant artisanal fishing activity. In contrast, the Indian Ocean, with its vast expanse and deeper waters, supports large-scale industrial fishing, especially for pelagic species like tuna. Climate variability, such as cyclones in the Bay and ocean warming in the Indian Ocean, are also shown to impact fish availability. Using publicly available fisheries data from national and international sources, we examine patterns over the past decade, focusing on total catch, dominant species, fishing pressure, and ecological changes such as sea surface temperature and salinity variation. Key challenges such as overfishing, habitat degradation, and international regulatory concerns are examined for both regions. The insights drawn aim to support region-specific strategies for sustainable marine resource management and policy development.

Keywords: Bay of Bengal, Climate, India Ocean, Maritime zones

Interaction of Physicochemical Factors and Plankton Diversity of a Floodplain Wetland: A Study in Bijpur Wetland of Ganga River Basin

Pradyut Malakar, Trupti Rani Mohanty, Arka Mondal, Bandana Das Ghosh,
Pranaya Kumar Parida and Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-
700120

[*basantakumard@gmail.com](mailto:basantakumard@gmail.com)

Aquatic ecosystems depend heavily on plankton, whose diversity and distribution are strongly impacted by physicochemical factors. The purpose of this study was to investigate the connection between plankton groups and water quality in Bijpur Wetland, North 24 Parganas (West Bengal), between January 2024 and December 2024. Key physicochemical properties and the density and diversity of plankton species were examined in water samples. Samples from 5 different sampling locations have revealed a wide variety of plankton, including 63 taxa in 15 taxonomic classes, of which 39.7% are zooplankton and 60.3% are phytoplankton. Chlorophyceae, Cyanophyceae, Bacillariophyceae, Euglenophyceae, and Monogononta are the dominant taxonomic classes. *Oedogonium* sp. (Chlorophyceae), *Chlorella* sp. (Trebouxiophyceae), *Cosmarium* sp. (Zygnematophyceae), *Trachelomonas* sp. (Euglenophyceae), *Aphanizomenon* sp. (Cyanophyceae), *Monostyla* sp. (Monogononta), and *Amoeba* sp. (Tubulinea) were among the dominant phytoplankton species. Cyanophyceae > Monogononta > Chlorophyceae > Euglenophyceae was the observed abundance trend. Seasonal variations in temperature, pH, hardness, alkalinity, and nutrient levels, particularly dissolved oxygen, nitrates, and phosphates, were found to affect phytoplankton density, according to correlation analysis. Some species serve as biological markers of water quality, and their existence suggests eutrophication.

Keywords: Environmental factors, seasonal variation, Bijpur wetland, plankton, global climate change.

Comparative Environmental Impact Assessment of Cage Culture in Maithon and Hirakud Reservoirs: A Step Towards Responsible Fisheries and Aquatic Ecosystem Management

Siddharth Sankar Das¹, Basanta Kumar Das^{1*} and Suhas Kamble²

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, 700120

²ICAR-Central Inland Fisheries Research Institute, Vadodara, Gujarat

*basantakumard@gmail.com

This partially evaluates the ecological implications of cage culture in Maithon and Hirakud reservoirs to support sustainable and responsible fisheries management. Comparative assessments were conducted at cage sites, adjacent areas and reference zones in both reservoirs. Parameters analysed included water quality, nutrient status of water and sediments, chlorophyll content, heavy metals, plankton and benthic communities. Maithon reservoir exhibited higher concentrations of nitrate and total nitrogen, whereas Hirakud showed elevated levels of available and total phosphorus. Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) values remained within permissible limits in both the water bodies. Similarly, heavy metal concentrations were also found within the acceptable range. Sediment analysis revealed greater nitrogen and phosphorous content in Maithon, contributing to a lower C/N ratio as compared to Hirakud reservoirs. Plankton diversity indicated dominance of *Microcystis spp.* in Maithon and *Navicula spp.* in Hirakud. Among benthic organisms, chironomids and other annelid worms were prevalent beneath the cage sites in both reservoirs, indicating moderate organic enrichment. These findings provide a holistic understanding of nutrient dynamics and ecological shifts associated with cage culture, emphasising the need for site-specific monitoring and adaptive management to ensure ecosystem sustainability.

Keywords: Maithon reservoir, Hirakud reservoir, nutrient status, *Microcystis sp.*, *Navicula sp.*

Phytoplankton Community Structure in the Ganga River: Influence of Ecohydrological and Climatic Factors

Trupti Rani Mohanty*, Suman Kumari, Suraj Chauhan, Pradyut Malakar and Basanta Kumar Das

NMCG Laboratory, ICAR-Central Inland Fisheries Research Institute,
Barrackpore, West Bengal
*trupti4774@gmail.com

Phytoplankton serve as key bio-indicators of riverine ecosystem health due to their sensitivity to environmental changes. This study investigated phytoplankton community assemblages along the Ganga River, from Harshil to Fraserganj, during the period from March 2017 to December 2022. It focused on ecohydrological and climatic influences. A total of 95 genera representing six phyla were identified, with Bacillariophyceae (28%) emerging as the dominant group. The mean seasonal abundance of phytoplankton was highest during the pre-monsoon (4.31×10^8 cells/l) and lowest during the post-monsoon (2.19×10^6 cells/l). Overall, phytoplankton density was higher in the lower stretch (4.46×10^8 cells/l) and lowest in the upper stretch (3.98×10^5 cells/l). *Aulacoseira granulata*, a nutrient-loving species, dominated the middle stretch, comprising 76% of the total phytoplankton population, indicating high nutrient availability in that region. The harmful genus *Microcystis aeruginosa* was conspicuously present between the Kanpur and Buxar stretches, indicating pollution stress in that area. Key environmental drivers influencing phytoplankton distribution included water temperature, transparency, flow velocity, and concentrations of silicate and phosphate. Karl-Pearson correlation analysis showed a significant positive correlation between Cyanobacteria abundance and both temperature ($r = 0.150$, $p < 0.05$) and rainfall ($r = 0.321$, $p < 0.05$). The Algal Pollution Index exceeded 20 at all stations except Jangipur, indicating a high organic load across most of the river. This comprehensive assessment highlights phytoplankton distribution patterns and the key factors influencing their habitat, emphasizing the need for pollution control and improved management strategies to protect aquatic biodiversity in the Ganga River.

Keywords: Phytoplankton, water variables, climatic factors, River Ganga, Algal pollution index

Planktonic Diversity Assessment in Manakudy Estuary, Kanyakumari, Tamil Nadu, India

Adyasha Sahu^{*1}, Jayakumar Natarajan¹, Durairaja Ramulu¹, Kamei Ringjonmeilu¹ and Sudhan Chandran²

¹Department of Fisheries Biology and Resource Management, Fisheries College and Research Institute, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Thoothukudi – 628 008, Tamil Nadu, India.

²Department of Fisheries Resource Management, Dr. M.G.R. Fisheries College and Research Institute, Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Ponneri – 601 204, Thiruvallur District, Tamil Nadu, India.

*adyashasahu6@gmail.com

Estuaries are vital components of coastal ecosystems due to their high biodiversity and ecological significance. India harbours approximately 1.44 million hectares of estuarine water resources, of which Tamil Nadu accounts for 56,000 hectares (3.88%). The Manakudy estuary, covering about 150 hectares, is located approximately 8 km northwest of Cape Comorin in Kanyakumari District, Tamil Nadu. The present study aimed to assess the diversity of phytoplankton and zooplankton in the Manakudy estuary over a one-year period from January to December 2024. Water samples were collected from three selected sites during morning hours (0800–0900 hrs) and preserved in 5% formalin. Plankton were concentrated through centrifugation, photographed, identified using standard taxonomic manuals, and quantified using a Sedgwick Rafter cell. A total of 85 species of phytoplankton (belonging to 57 genera, 42 families, and 34 orders) and 38 species of zooplankton (representing 24 genera, 21 families, and 12 orders) were recorded. Fourteen biodiversity indices were analyzed using the PRIMER v7 software, with the highest diversity observed at Site I, influenced by freshwater influx. The study highlights the ecological richness of the Manakudy estuary and the importance of monitoring plankton diversity as bioindicators of ecosystem health. The findings provide valuable baseline data for future conservation and management strategies in the region.

Keywords: Manakudy estuary, Plankton diversity, Diversity indices, Conservation management

Understanding Jellyfish Stings: Insights from Juhu Beach, Mumbai

Ashpel Mano M. R^{1*}, S. Abuthagir Iburahim¹, S. Ramkumar², Asha T. Landge¹, B. B. Nayak¹, Velumani. T³, Nikhil K¹

¹Fisheries Resource Harvest & Post Harvest Management Division, ICAR-Central Institute of Fisheries Education, Mumbai-61, India

²ICAR-Central Marine Fisheries Research Institute, Mumbai Regional Station, Mumbai-61, India.

³Project Scientist, Bay of Bengal Programme, Inter-Governmental Organisation, 91, Chennai-18, India.

*ashpel.frmph406@cife.edu.in

Jellyfish stings can range from mild rashes to severe, life-threatening reactions, highlighting the need for effective management of sting incidents. This study investigates the diversity and frequency of jellyfish stings among visitors at Juhu Beach in Mumbai, a location known for seasonal jellyfish blooms. Data on jellyfish stings along the Indian coast have been collected, including 20 years of citizen science observations on jellyfish occurrences. Structured information's were gathered from 60 beach visitors of juhu beach (Mumbai), split evenly between frequent and non-frequent visitors. Among non-frequent visitors, 33% were aware of the beach's vulnerability to jellyfish, with 3% having experienced stings. In contrast, 68% of frequent visitors were aware of jellyfish activity, with 30% reporting stings. The majority (92%) identified the monsoon season as the peak period for jellyfish occurrences, while 5% associated them with the post-monsoon season, and 3% with the pre-monsoon period. All individuals who were stung experienced symptoms such as inflammation, redness, and itching; 20% reported dizziness, and 13% experienced vomiting, though none reported cardiac symptoms. Regarding the duration of symptoms, 87% found relief within one hour, 7% within two hours, and 6% within five hours. Hospitalization was not required for 87% of those stung, while 13% required medical attention. In terms of remedies, 40% used lemon, 20% used salt, 14% used kerosene, 13% used urine, and 13% did not use any remedies. The incidence of jellyfish occurrences and stings is increasing nationwide. These findings highlight the growing public health concern posed by jellyfish stings and the varying levels of awareness among the public.

Keywords: Jellyfish, Sting, Coastal Tourism, Citizen Science, Juhu

Immersive VR in Fishing Gear Technology for Responsible Fisheries

* Thamizhmani, N. Das, S.K. Udgata, S.K. Bhuyan, S.K. Patra, M.K. Tripathy, B. Sahu, Dharitri Choudhury. B.K. Pathy

Dept.of Fisheries Engineering, College of Fisheries, Rangeilunda (OUAT).

*thamizhbfsc@gmail.com

Reducing bycatch is a critical component of promoting sustainable and responsible fisheries. Traditional pedagogical methods in fishing gear technology often fall short in modeling the dynamic interactions between fishing gear and both target and non-target species. To address this gap, we introduce a fully immersive and low-cost Virtual Reality (VR) simulation framework for teaching and training in gear selectivity. Developed using open-source platforms, OpenFOAM for computational fluid dynamics (CFD) and Unity 3D for VR visualization, the framework includes two main simulation modules: (1) hydrodynamics of gillnet systems and (2) selectivity mechanisms in trawl codends. The virtual environment allows users to adjust parameters like mesh size and towing speed, enabling them to see the real-time effects on species retention and escape. Validated according to FAO gear selectivity guidelines and tailored to field conditions in Indian fisheries, this scalable VR approach serves as a valuable educational tool, especially in resource-limited settings. It builds capacity in line with India's Blue Revolution goals and supports the UN Sustainable Development Goal 14 by promoting ecological sustainability through improved gear technology education.

Keywords: Virtual Reality, Fishing Gear Technology, Bycatch Reduction, Gear Selectivity, Fisheries Education, CFD Simulation.

Alternative fish baits from seafood processing wastes as an artificial fish bait for longline fishing

S. Emiema*., T. Ravikumar., N. Neethiselvan., K. Elavarasan and F. Parthiban

Department of Fishing Technology and Fisheries Engineering, Fisheries College and Research Institute, Thoothukudi

[*emiemarachel01@gmail.com](mailto:emiemarachel01@gmail.com)

The use of natural baits in longline fishing evoked fishing pressure on the forage fishes, thereby promoting the development of alternative baits as an essential need for responsible longline fisheries. In this context, this research investigated the potential for formulating artificial fish bait using a surimi incorporated with attractants derived from processing wastes of shrimp, grouper, and tuna. Their fatty acid profiles were analysed using GC-MS, revealing the presence of 37 distinct fatty acids across the samples. Notably, the bioattractant sourced from grouper exhibited the highest proportion of unsaturated fatty acids (85.88%), followed by tuna (64.62%) and shrimp (62.35%). Four experimental bait formulations were developed: a control surimi gel bait (SGB), and three variants supplemented with grouper (SGB-GB), tuna (SGB-TB), and shrimp (SGB-SB) bioattractants at inclusion levels of 1%, 3%, and 5%. These baits were evaluated for key properties including gel strength (GS), water holding capacity (WHC), expressible moisture content (EMC), fat leaching (FL), seawater stability, and attractability, to determine the most effective fish bait. In terms of performance, the 5% SGB-GB bait outperformed others, showing superior fat leaching rate (86.34%), seawater stability (81.69%), attractability (28/30), gel strength (153.46 g/cm), lower EMC (13.52%), and high WHC (78%), identifying it as the most promising artificial fish bait for commercial fishing use.

Keywords: Artificial fish bait, bioattractants, fatty acid, stability, Attractability, forage fish

Abandoned, Lost, and Discarded Fishing Gear (ALDFG): A Meta-Analysis of Global Trends, Environmental Impact, and Scientific Advancements

Abuthagir Ibrahlim.S*, Karankumar Ramteke, Nayak BB, Punam Shivaji Bhole, Sinchana R Mahale and Rajesh kumar

ICAR-Central Institute of Fisheries Education, Mumbai, 400061

Abandoned, Lost, and Discarded Fishing Gear (ALDFG) is a rapidly growing environmental issue that poses significant threats to marine ecosystems globally. This meta-analysis synthesizes data from the Global Ghost Gear Initiative (GGGI) Data Portal, peer-reviewed literature, and social media platforms to assess the prevalence, impacts, and mitigation strategies associated with ALDFG. Recent publication trends on ALDFG have shown a significant increase in scientific production, as evidenced by Scopus data, where the number of articles related to ghost gear has grown exponentially from the early 2000s, peaking around 2020. This trend is clearly visible in the Scopus annual scientific production graph, with a sharp rise after 2015, indicating heightened global attention on ALDFG. This analysis also integrates insights from social media platforms, such as Instagram, which play a crucial role in documenting ALDFG incidents and raising public awareness. The study reveals key ALDFG hotspots, with regions like Southeast Asia, the Mediterranean, and India being particularly affected. Exploratory survey conducted among the fisher of Maharashtra of India also confirms the increasing impact of ghost net to the aquatic biodiversity. Effective mitigation strategies, including gear retrieval programs, policy interventions, and technological innovations, are discussed considering these findings. The study underscores the need for continued research and global collaboration to mitigate the impacts of ghost gear on marine biodiversity.

Keywords: Ghost Gear, Fishing, Meta analysis, Global Ghost gear initiative, Citizen Science

Plastisphere in Aquatic Ecosystems: Microplastic Associated Biofilms as Emerging Threats

Payoja Mohanty^{1,#}, Vikash Kumar¹, and Basanta Kumar Das^{1*}

¹ICAR-Central Inland Fisheries Research Institute (CIFRI), Barrackpore, Kolkata 700120, India

²ICAR- Central Institute of Fisheries Education (CIFE), Mumbai, 400061, India

[*mohantypayoja0303@gmail.com](mailto:mohantypayoja0303@gmail.com)

Microplastics are emerging pollutants in aquatic ecosystems across India and the world, having a persistent impact. While plastisphere have been explored in various aquatic systems, estuarine and freshwater ecosystems, which are often proximal to sources of plastic pollution, its dynamics across different system require further investigation. This study aims to investigate the bacterial biofilms forming on microplastics in both the water column and sediments of different freshwater habitats. Rising temperatures, eutrophication, and erratic rainfall patterns due to climate change further exacerbate biofilm development and dispersal. Characterizing the biofilms on common plastic polymers like polyethylene (PE) and polypropylene (PP) reveals key bacterial genera such as *Pseudomonas*, *Salmonella*, *Enterococcus*, and *Shigella* pathogens with the potential to influence both aquatic biodiversity and food safety. This research also demonstrates that microplastics act as effective vectors for biofilm-forming bacteria and facilitate the transfer of genetic material, including antibiotic resistance genes, through horizontal gene transfer. Understanding the dynamics of biofilm formation under seasonal and anthropogenic pressures allows us to assess microbial risks and pollution pathways affecting fish production. As such, MPs represent not only physical pollutants but also biological and genetic hazards. By integrating microplastic-biofilm characterization with environmental and seasonal variables, this research will provide insights into the ecological resilience and vulnerability of freshwater ecosystems under climate stress.

Keywords: Microplastics (MPs), Plastisphere, Biofilm-forming bacteria, Opportunistic pathogens, Antibiotic resistance

Evaluating the Stock Health Status of Three Commercially Important Marine Crabs in Odisha: A Bayesian Approach

Gyanaranjan Dash^{1*}, Rajesh Kumar Pradhan¹ and Swatipriyanka Sen¹

¹Puri Field Centre of ICAR-Central Marine Fisheries Research Institute,
Puri-752 002, Odisha, India

*gyanranjandashcmfri@gmail.com

In 2024, marine fish landings in Odisha totaled approximately 1.5 lakh tonnes, with crustaceans contributing about 12 thousand tonnes (8%), primarily composed of penaeid shrimps (68%) and crabs (32%). Among crabs, *Portunus sanguinolentus* (46%) was the most exploited species, followed by *Charybdis feriata* (29%) and *P. pelagicus* (25%). This study evaluates the stock health of these three dominant species using insights into their life history traits, population dynamics, food preferences, and exploitation status. A Bayesian state-space implementation of the Schaefer surplus production model (BSM) was applied using CMSY++ to an 18-year time series (2007–2024) of catch and effort data. Key stock indicators showed that relative fishing mortality remained below unity ($F/F_{MSY} < 1.0$), and relative biomass was above unity ($B/B_{MSY} > 1.0$) for all the three species. Additionally, a relatively high unfished biomass ratio (B/B_0) ranging from 50–72% was also observed for these crabs, indicating healthy and sustainable stock status. The estimated maximum sustainable yield (MSY) was highest for *P. sanguinolentus* (2130 tonnes), followed by *C. feriata* (943 tonnes) and *P. pelagicus* (509 tonnes). This assessment offers critical scientific input to guide evidence-based fisheries management and ensure the long-term sustainability of crustacean resources in Odisha.

Keywords: crab fisheries, stock status, Odisha, sustainable fisheries

Fish Production Variability in the Ganga River Basin: A Multi-State Analysis

Canciya Johnson*, Basanta Kumar Das, Mitesh H. Ramteke, Dibakar Bhakta, Pranaya K. Parida and Archisman Ray

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700 120, West Bengal, India

[*canciya.cifri@gmail.com](mailto:canciya.cifri@gmail.com)

The river Ganga, a vital inland fishery resource, exhibits significant regional variation in fish production across its freshwater stretches. An eight-year dataset (2016–2024), collected from selected landing centers using village-based and observational methods, highlights changing fishery patterns in Uttar Pradesh, Bihar, and West Bengal. Uttar Pradesh, with 23 sampling sites, showed the highest increase in total landings from 333.9 t in 2016 to 420.3 t in 2024 (25.9%), along with leading IMC (12,260.14 t) and catfish (9,527.67 t) landings. Bihar, with fewer sites, recorded the highest percentage increase (56.8%) in total landings, with IMC rising from 2.18 t to 12.54 t. West Bengal also improved (35.3% increase), though catfish production remained low (2,495.76 t). These variations reflect differences in habitat, fishing pressure, and management. River ranching under the National Mission for Clean Ganga (NMCG) has contributed to stock enhancement and improved livelihoods. The lower Ganga stretch showed the highest catch per fisher (305.4 kg/month), with income increases from 2017 to 2024: 54.8% (lower), 43.7% (middle), and 36.94% (upper). Average income peaked at ₹11,273.70 in the lower stretch. These findings emphasize the need for sustained monitoring, region-specific management, and expansion of restocking efforts to enhance the riverine fishery potential of the Ganga.

Keywords: River Ganga, Fish landings, River ranching, Fisher income, Inland fisheries

Fisheries Development-driven Ecological Degradation and Non-Native Fish Invasions in Newly Created Small Reservoirs: Insights from Bhairavi Reservoir, Jharkhand

Sajina A. M.*, S. Kumari, R. K. Manna, P. Majhi, S. Koushlesh,
Lianthuamluaia, A. K. Das and B. K. Das

ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata
700 120, West Bengal, India

*sajnaali2000@gmail.com

This case study of Bhairavi Reservoir (Jharkhand, India), a small reservoir (<500 ha) filled in 2016, highlights how unregulated fisheries enhancement practices can accelerate non-native fish invasions and ecological degradation. Fisheries development activities in Bhairavi have included culture-based fisheries (CBF) of Indian major carps and Chinese carps, intensive cage culture with exotic species such as Pangas (*Pangasianodon hypophthalmus*) and Nile Tilapia (*Oreochromis niloticus*), and reservoir fish farming (RFF). Field assessments documented 27 fish species, including 7 exotics. Non-native species, predominantly escapees from cage and RFF units, accounted for over 50% of the total catch, indicating a marked shift in fish community composition. Water quality parameters suggested moderate productivity (DO 6.4–6.8 ppm; pH 8.02–8.22), while sediment was acidic (pH 4.32–5.53) with high organic carbon (1.56–1.86%). Localized contamination by potentially toxic elements was noted, with chromium 0.35–3.95 µg/L, arsenic 1.76–2.52 µg/L, and lead up to 14.05 µg/L in certain cage areas. Importantly, the small size of Bhairavi Reservoir makes it unsuitable for cage culture as per NFDB guidelines, yet these practices have been widely implemented, reflecting gaps in regulatory adherence. This case study underscores the urgent need for science-based planning, compliance with national guidelines, and regulation of enclosure coverage in small reservoirs. Ensuring sufficient open and littoral zones for native fish, aligning enhancement efforts with ecological succession, and strengthening monitoring are vital for balancing fisheries development with biodiversity conservation and ecosystem sustainability.

Keywords: Small reservoirs; fisheries development; non-native fish invasions; ecological degradation; cage culture

Spatio-Temporal Dynamics of Sediment Composition and Water Quality in the Jalangi River, West Bengal, India

Saurav Kumar Nandy*, Poonam Majumder, Ayan Biswas, Arghya Kunui, Shreya Roy, Sanatan Bera, Ajoy Saha, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal-700 120, India

*sauravnandy291@gmail.com

The Jalangi River, a vital distributary of the Ganges in West Bengal, exhibits significant seasonal variations in sediment composition and water quality due to natural hydrological changes. This study investigated these parameters during pre-monsoon, monsoon, and post-monsoon periods to understand the river's ecological dynamics. Sediment analysis revealed consistently alkaline conditions (pH 8.65–8.87) across all seasons, with sand as the dominant component (>81%). During the monsoon, there was a noticeable rise in silt and clay content (18.7%) and organic carbon levels (1.53%), indicating increased surface runoff and organic matter input. Post-monsoon sediments showed higher concentrations of nutrients such as total phosphorus, total nitrogen, and available nitrogen, suggesting nutrient accumulation following flood recession. Water quality also varied seasonally, with the highest surface and water temperatures recorded during the pre-monsoon (38.5°C and 33.35°C, respectively), and the lowest in the post-monsoon period. The monsoon season was marked by decreased pH and conductivity, elevated turbidity (273.17 NTU), and increased nutrient levels, reflecting strong catchment runoff and sediment input. Transparency and total solids showed significant seasonal fluctuations in response to changing hydrodynamic conditions. These observations highlight the dynamic nature of sediment and water quality parameters of the Jalangi River across different seasons.

Keywords: Sediment profile, Water quality, Seasonal variation, Climate change

Spatial and temporal distribution of plankton Diversity in Madamsilli Reservoir, Chhattisgarh, India

Sarita Kumari Das, Kamalesh Panda* and Niranjana Sarang

LSPN College of Fisheries, Kawardha, Kabirdham Dist, Chhattisgarh – 491 995

*kamalesh.panda@dsvckvdurg.ac.in

As bioindicators, phytoplankton and zooplankton are essential to the health of the ecosystem and provide a variety of ecosystem services. In the Indian state of Chhattisgarh, the Madamsilli reservoir on the Silliari River, a tributary of the Mahanadi basin, was studied for its diversity and composition of phytoplankton and zooplankton to understand ecosystem health and biological productivity patterns. Monthly samples were collected from multiple depths across different zones of the reservoir over one full annual cycle during September 2023 to August 2024. A total of 57 phytoplankton species belonging to 8 divisions were recorded indicating rich phytoplankton diversity in the reservoir. Bacillariophyta contributed the highest number of species followed by Chlorophyta. *Ankistrodesmus* spp., bacillariophyta, *Navicula* spp., and *Nitzschia* spp. were dominant phytoplankters. Filamentous algae such as *Geitlerinema* sp., *Pseudoanabaena* sp., *Oscillatoria* sp. and *Phormidium* sp. were highly abundant. Blooms of *Microcystis aeruginosa* occurred in shallow plain reservoirs receiving agricultural, industrial and municipal run-off during monsoon. Among 23 zooplankton species recorded in the said ecosystem, rotifer, *Brachionus* spp. and copepod, *Diaptomus* spp. were dominant. River inlet site (S1) had more phytoplankton species whereas middle part of the reservoir or the transition zone (S2) showed higher zooplankton species, and the dam site (S3) showed comparatively lower abundant of both phytoplankton and zooplankton species. Margaleef species richness index and Shannon index showed significant difference ($P < 0.05$) spatially. In case of temporal distribution, postmonsoon season showed more species richness and abundance followed by pre-monsoon and then monsoon. Margaleef species richness index and Simpsons index showed significant difference ($P < 0.05$) seasonally.

Keywords: Spatial distribution, Temporal distribution, Plankton Diversity, Diversity indices

Statistical Modelling of Catfish Landings in a Tropical River System Using SARIMA Models

Anil Kumar Yadav^{1*}, Simanku Borah¹, Rakesh Kumar¹, B. K. Bhattacharjya¹, S. K. Majhi¹ and B. K. Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati – 781006, Assam, India

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata – 700120, West Bengal, India

[*yadav.anil.stats@gmail.com](mailto:yadav.anil.stats@gmail.com)

Catfish are emerging as a significant component of inland fisheries, particularly in the River Brahmaputra, where catch compositions have shifted over the decades. This study analyzes the temporal patterns and forecasts catfish landings at the Uzanbazar landing centre, Guwahati, using quarterly data from 1987 to 2019. Employing a Seasonal Autoregressive Integrated Moving Average (SARIMA) modeling approach, the data were first examined for stationarity, seasonality, and autocorrelation structures. The optimal model identified was SARIMA(1,0,0)(2,0,0)_s, selected based on the lowest AIC and SBC values and supported by diagnostic checks such as residual autocorrelation and the Ljung–Box test ($p = 0.9794$). The model's adequacy was further validated using out-of-sample test data (2017–2019), yielding performance metrics including MAE of 0.6372, MAPE of 14.59%, and RMSE of 0.8701. Forecasts for 2020–2022 indicate that annual catfish landings will remain stable at approximately 21 tonnes, maintaining a consistent share in the total fishery despite declines in other major fish groups. These results not only reflect a shift in species dominance but also demonstrate the utility of SARIMA models in providing reliable forecasts for strategic fisheries planning and sustainable resource management in large tropical river systems.

Keywords: Brahmaputra River, catch prediction, inland fisheries, seasonal ARIMA

Sustainable management prospects for *Scoliodon laticaudus*: stock evaluation in the northern Bay of Bengal

Swatipriyanka Sen^{*1}, Gyanaranjan Dash¹, Rajesh Kumar Pradhan¹,
Madhumita Das¹, Shoba Joe Kizhakudan² and Joe K Kizhakudan³

¹Puri Field Centre of ICAR-Central Marine Fisheries Research Institute,
Puri-752 002, Odisha, India

²ICAR-CMFRI, Kochi-682018, Kerala, India

³Joe K Kizhakudan, ICAR-Visakhapatnam Regional centre,
Visakhapatnam-530 003, India

[*swatipriyank1a@gmail.com](mailto:swatipriyank1a@gmail.com)

Scoliodon laticaudus, commonly known as the spadenose shark, is a small coastal carcharhinid species widely distributed across the Indo-west Pacific, including Indian waters. In Odisha, it is frequently encountered as bycatch in both artisanal and trawls fisheries, constituting nearly 80% of the total shark landings. A stock assessment of this species was carried out using Bayesian Schaefer surplus production model (BSM) implemented through the CMSY++ interface. Standardized catch and effort time-series data from 2007 to 2024, sourced from NMFDC-CMFRI and processed using the FESa package, formed the basis of this analysis. The carrying capacity (K) and intrinsic rate of population increase (r) were estimated as 5030 tonnes and 0.241, respectively. Key stock status indicators derived through Markov Chain Monte Carlo (MCMC) simulation, such as F/F_{msy} (0.913) and B/B_{msy} (1.08), along with an estimated MSY of 304 tonnes, indicated that the stock is being exploited sustainably. Complementing this, the Rapid Stock Assessment (RSA) yielded a Final Year Average (FYA) score of 78, further confirming the species' healthy stock status along the Odisha coast. However, as a Near Threatened species (IUCN, 2021), continued monitoring and precautionary management are crucial to ensure its long-term conservation and sustainable use.

Keywords: Fisheries management, catch and effort, biological reference points, Bay of Bengal

Cephalopod Fisheries of Odisha: Stock Status and Biological Assessment

Rajesh Kumar Pradhan ^{1*}, Gyanaranjan Dash¹, Swatipriyanka Sen¹,
Dineshababu A.P. & Joe K. Kizhakudan

¹Puri Field Centre of ICAR-Central Marine Fisheries Research Institute,
Puri-752 002, Odisha, India

*rajeshfrm220@gmail.com

Cephalopods form a significant component of marine molluscan fisheries and are increasingly important for both ecological balance and economic returns. This study presents a comprehensive biological and stock assessment of major cephalopod species landed along the Odisha coast. Cephalopods contributed 17.84% to the total marine shellfish landings in Odisha, with an annual yield of 25.84 thousand tonnes. The catch was dominated by cuttlefish (75.36%), followed by squids (19.86%) and octopus (4.78%). The primary species observed were *Sepiella inermis*, *Sepia aculeata*, *Sepia pharaonis*, *Sepia elliptica*, and *Uroteuthis (Photololigo) duvaucelii*. Biological investigations revealed key life history traits, including mean length, sex ratio, LM₅₀, maturity percentage, and gut contents, which predominantly comprised digested fish, shrimp, crabs, and molluscs. Life history parameters (L_∞, K, M, LC₅₀, F, Z, E) were estimated, indicating extended breeding periods from October to March. Stock assessments using the Bayesian Surplus Production Model (BSM) showed all four species to be in a sustainable state. However, the Rapid Stock Assessment (RSA) method suggested all species were abundant except *Uroteuthis (Photololigo) duvaucelii*, which showed signs of lower abundance. These findings provide vital insights to guide sustainable fisheries management in the Bay of Bengal region.

Keywords: cephalopod, life history traits, stock, sustainable

Assessment of seasonal variation of phytoplankton and chlorophyll a in the Sutlej River, India

Jeetendra Kumar^{a*}, Absar Alam^a, Dharm Nath Jha^a, Vikas Kumar^a, Venkatesh R. Thakur^a, Sanjib Kumar Manna^b and Basanta Kumar Das^b

^aICAR- Central Inland Fisheries Research Institute, Prayagraj, Uttar Pradesh – 211002

^bICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal- 700120

*jeetendrak142@gmail.com

The current study was performed on the Gomti River, with samples collected periodically from summer 2024 to winter 2025. Fifty-six phytoplankton species were documented in the Sutlej River. Cell density varied from 3 lakh to 16 lakh cells per litre. Species richness peaked during the monsoon, whereas density reached its zenith in the summer. The predominant genera included *Cyclotella*, *Navicula*, and *Nitzschia*, among others. Chlorophyll-a concentrations varied from 2.7 to 3.3 µg/L, with the summer season exhibiting the peak value of chl-a. Species richness and density were greatest at Ferozpur, followed by Govind Sagar. The Palmer score indicated moderate to confirmed high levels of organic contamination. Ferozpur had greater organic contamination than the Mattewara forest. The Simpson index varied between 0.72 and 0.90, and the Shannon index fluctuated from 1.75 to 2.44. The most elevated diversity indices were seen at the Barmana setu.

Keywords: Phytoplankton, eutrophication, chlorophyll, Sutlej River

Assessment of seasonal variation of phytoplankton and chlorophyll a in Gomti River, Uttar Pradesh, India

Jeetendra Kumar^{a*}, Dharm Nath Jha^a, Absar Alam^a, Vikas Kumar^a, Venkatesh R. Thakur^a, Arun pamdit^b, Sanjib Kumar Manna^b and Basanta Kumar Das^b

^aICAR- Central Inland Fisheries Research Institute, Prayagraj, Uttar Pradesh – 211002

^bICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal- 700120

*jeetendrak142@gmail.com

The present investigation was conducted on the Gomti River, with samples taken periodically from summer 2024 to winter 2025. Ninety-five phytoplankton species from six phyla, nine classes, twenty-six orders, and forty-nine families were documented in the Gomti River. Species richness varied from 43 to 59, with the highest richness observed in summer. Density varied from 1 million cells/L to 6.5 million cells/L. The highest density was seen in summer, followed by winter. Chlorophyll-a concentrations were maximal in summer (average 77 µg/L), followed by winter (average 6.36 µg/L) and monsoon (average 5.3 µg/L). Species richness varied from 13 to 45, whereas density fluctuated between 200,000 and 6,300,000 cells per litre. Peak species richness and density were seen at Sultanpur, followed by Varanasi/Gazipur and Jaunpur. The highest density was observed in Varanasi/Gazipur. The highest concentration of Chl-a was observed at Lucknow US. Diatoms constituted the predominant category within phytoplankton. The Simpson diversity score varied between 0.77 and 0.90, and the Shannon index ranged from 1.93 to 2.83. Maximum diversity was seen at Sultanpur.

Keywords: Phytoplankton, Diatoms, Chlorophyll, Gomti River

Assemblage pattern and community structure of the macrobenthos from Haiderpur wetland of the Ganga basin, India

Thakur V.R*¹, Verma S.K¹, Singh U¹, Verma D¹, Rana J.S¹, Kumar V¹, Absar A¹, Kumar J¹, Mishra S.K¹, Bhat R.A¹, Jha D.N¹ and Das B.K²

¹Regional Centre, ICAR-Central Inland Fisheries Research Institute, 24 Panna Lal Road, Prayagraj, Uttar Pradesh, India - 211002

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal, India-700120

*venkateshciari@gmail.com

Haidarpur is a floodplain wetland and UNESCO Ramsar site located at 29°25'25" N latitude and 78°00'00" E longitude, within the boundaries of the Hastinapur Wildlife Sanctuary (6908 ha) near the Ganga Barrage, Bijnor in Uttar Pradesh, India. It is one of the largest artificial wetlands, formed in 1984 after the construction of the Madhya Ganga Barrage and nourished by the Ganges and its tributary, the Solani River. The present study was conducted at this wetland, encompassing three seasons, to investigate the abundance, species richness, and diversity indices of the macrobenthos. The study revealed the community richness with 21 species belonging to 9 orders and 12 families. The community abundance was observed to be higher in the pre-monsoon seasons (606 ind/m²), followed by the post-monsoon (455 ind/m²) and in the monsoon season (83 ind/m²). The average Simpson, Shannon, and Margalef diversity indices for Haidarpur were calculated as 0.87, 2.38, and 2.63, respectively. The community assemblage of the wetland showed the dominance of the Gastropoda (48%), followed by Bivalvia (29%), Insecta (19%) and Clitellata (5%). The study discovered the better ecosystem health of the Haiderpur wetland in sustaining aquatic diversity. Therefore, the current study delivers the baseline and first-of-its-kind particulars on the assemblage patterns and community structure of macrobenthos from Ramsar wetland for the efficient management of its aquatic ecology.

Keywords: Ramsar, Macrobenthos, Haidarpur, community structure, and Assemblage

Spatiotemporal assessment of water quality of the river Sutlej

Vikas Kumar^{*a}, Absar Alam^a, Jeetendra Kumar^a, Venkatesh Ramrao Thakur^a, Vijay Kumar^a, Dharm Nath Jha^a, Arun Pandit^b, Sanjib Kumar Manna^b, Basanta Kumar Das^b, Manish Kumar^a, Nandan Kumar^a

^aICAR-Central Inland Fisheries Research Institute, Regional Centre, Prayagraj - 211002

^bICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120

*kumarvikasiari@gmail.com

The present study investigated the spatiotemporal water quality assessment of the Sutlej River and its suitability for drinking purposes. Water samples were collected at 8 locations in three seasons, namely pre-monsoon, monsoon and post-monsoon. The result suggested that the water quality of the Sutlej River varies significantly across different locations and seasons, indicating varying degrees of pollution. Locations such as Buda Nala exhibit severe contamination with extremely high turbidity (80.85 NTU), electrical conductivity (545 μ S/cm), total dissolved solids (387.50 mg/l), and biochemical oxygen demand (BOD) (12.60 mg/l), indicating heavy organic pollution load. During the monsoon, the high turbidity and low transparency at most sampling sites were due to surface runoff of sediment-laden rainfall water. Water quality below the confluence point of Buda nala drain (a sewage cum industrial wastewater drain that meets in the river Sutlej) has severely deteriorated the water quality of Sutlej River. The WQI indicated that the water of the Sutlej River was in good condition in the upper stretch and not suitable for drinking in the middle and lower stretches, and the major affecting water quality parameters are turbidity, BOD and COD. The present study suggests that anthropogenic attributes are responsible for river water quality deterioration beyond the river resistance limits, especially at the Buda Nala region; thus, necessary steps should be taken to revive and restore the pristine nature of the river.

Keywords: Sutlej River, water quality assessment, WQI,

A study on the Physico-chemical characteristic of River Gomti

Vijay Kumar^a, Vikas Kumar^{*a}, Dharm Nath Jha^a, Absar Alam^a, Jeetendra Kumar^a, Venkatesh Ramrao Thakur^a, Arun Pandit^b, Sanjib Kumar Manna^b, Basanta Kumar Das^b, Manish Kumar^a, Nandan Kumar^a

^aICAR- Central Inland Fisheries Research Institute, Regional Centre, Prayagraj - 211002

^bICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120

*ivijay_cifri@rediffmail.com

The Gomati River is a tributary of the river Ganga, originating from Gomati Tal in the Philibhit district and merging into the river Ganga at Shekpur. The water samples were collected from eight selected sites viz. Panghat, Jahane Khera, Namisaran, Lucknow, Sultanpur, Jaunpur and Rajwari. Various water quality parameters, like water temperature, free CO₂, alkalinity, chloride, DO, TDS, EC, total hardness, phosphorus, nitrate, biological oxygen demand (BOD) and chemical oxygen demand (COD) were analysed. The lowest DO (< 3.0 mg/l) and the highest alkalinity, TDS, hardness, specific conductivity, available phosphate, nitrate N, BOD and COD were reported at Lucknow (downstream and upstream), probably due to high anthropogenic pressure in these areas. All the water quality parameters were within the prescribed limits for fisheries except DO at Lucknow (downstream and upstream). The highest phosphate, nitrate, BOD and COD were also reported at Lucknow (downstream and upstream), above the desirable limits for drinking water. WQI indicated that the water of the Gomati River was not suitable for drinking purposes, and major influencing parameters were turbidity, BOD, alkalinity and COD. The present study suggests that anthropogenic activities are major factors for river water quality deterioration in the Gomati River beyond their resistance limits, especially near the Lucknow region; thus, necessary steps should be taken to revive and restore the pristine nature of the river.

Keywords: Gomati River, DO, BOD, COD, turbidity, WQI.

Indigenous Fish culture in wastewater fed pond of East Kolkata Wetlands

Rumali Sahoo*, Gunjan Karnatak, Basant Kumar Das, Sayan Mandal, Snehasis Dalal, Angana Majumder, Lianthumluaia, Srikanta Samanta, Vikash Kumar, and Archan Kanti Das

ICAR - Central Inland Fisheries Research Institute, Barrackpore- 700120, West Bengal, India

*rumalisahoo668@gmail.com

The East Kolkata Wetlands are distinctive blend of man-made and natural wetlands known for wastewater-fed aquaculture with reported very high production potential and fish yield. But with passage of time the fish yield has been drastically reduced leading to decrease in profit margin. The cultivation of indigenous fish species, in low-input systems within the EKW region has been planned to overcome the situation and practiced in this study. A 110-days culture trial of two small indigenous fish species—*Systomus sarana* and *Labeo bata* were practiced in a nutrient-rich pond (Chacharia bheri) in the EKW. Monitoring of water quality parameters during the season revealed good culture environment with a mean dissolved oxygen content of $5.42 \pm 1.22 \text{ mg L}^{-1}$, pH of 8.7 ± 0.64 , and a temperature of $25.9 \pm 3.39 \text{ }^\circ\text{C}$. The indigenous fish culture unit showed good primary production (GPP: $0.780 \text{ mgC/m}^3/\text{h}$) and plankton density (mean: 24,301 units/l). *S. sarana* out performed *L. bata* in growth performance ($R^2 = 0.923$, condition factor = 1.67) ($R^2 = 0.838$, condition factor = 1.00). Using wastewater culture in wetlands can be profitable with proper management, which promote environmentally integrated aquaculture system, sustainability, conserve biodiversity, and food security. This study demonstrates that Small Indigenous Fishes culture in urban wetlands can facilitate scaling up of aquaculture in emerging markets.

Keywords: Wastewater, indigenous fish, plankton, diversity, water quality, wetland

Structural heterogeneity: A prominent ecosystem vulnerability driver of Malampuzha reservoir, Kerala

Thankam Theresa Paul*, Deepa Sudheesan, Tanuja Abdulla and Sajina A

ICAR-Central Inland Fisheries Research Institute

*thankamtheresa@gmail.com

The ecosystem vulnerability of Malampuzha reservoir, Kerala in a fisheries perspective was assessed by estimating the structural heterogeneity score of the reservoir. Historical and present data of the morphological and water quality variables of the reservoir were collected for this study. Morphological indices such as Allochthonous input (AI), Volume development Index (VDI), Shoreline development index (SDI) and Morpho-edaphic index (MEI) were extracted from these variables. T-test (critical t-value=0.002, $p < 0.05$) indicated significant difference in these morphological indices between the historical and present data. The study used equal weightage method to assess the ecosystem vulnerability of the reservoir. The increase in the AI to the tune of 5.17% indicated accumulation of organic load from allochthonous sources in the reservoir further impacting the reservoir ecosystem. 9 (nine) times increase in the VDI indicated the transition of reservoir bottom morphology from conical depressions to flat bottoms. Increase in SDI at 49.9% indicated more accessible littoral zone and indicated scope for increase in higher productivity using pen culture and stocking in reservoirs. The study evaluated the ecosystem vulnerability score at 41.1 and suggested improvement of VDI by appropriate dredging operations and depth maintenance in the reservoir. Such interventions would improve the scope for enhanced fisheries using cage culture of appropriate species.

Keywords: Allochthonous input, Volume development Index, Shoreline development index, Morpho-edaphic index, Structural heterogeneity

Evaluation of the Diversity of Ichthyofauna in Madamsilli Reservoir, Chhattisgarh, India

Sarita Kumari Das, Kamalesh Panda* and Niranjan Sarang

LSPN College of Fisheries, Kawardha, Kabirdham Dist, Chhattisgarh – 491995

* kamalesh.panda@dsvckvdurg.ac.in

Freshwater reservoirs serve as critical aquatic ecosystems, providing both ecological benefits and socio-economic value. Fish assemblage structure in Madamsilli Reservoir across river Silliyari, a major tributary of river Ganga in India, was studied. Fish sample were collected monthly during September 2023 to August 2024 using gillnets, cast nets. Fish community structure in terms of species composition, relative abundance, and trophic guild and conservation status were recorded. Forty fish species were recorded wherein the family Cyprinidae dominated in number of species (17) followed by Mastacembelidae (3), and Bagridae (2). Trophic guild of fishes indicated dominance of omnivorous species followed by carnivorous. Conservation status (IUCN 2017.3) showed four fish species in Near Threatened category. Diversity indices revealed a healthy ichthyofaunal composition: Shannon–Wiener index averaged 2.85, Simpson’s diversity index was 0.93, and dominance index remained low ($D=0.06$), indicating no single species monopolized the community. The study suggests conservation of fish habitats to maintain diversity and sustained production. Despite overall richness, some indigenous species appeared underrepresented compared to other Chhattisgarh reservoirs, hinting at potential habitat degradation or overfishing. Limnological parameters (e.g., dissolved oxygen, pH, temperature) remained within optimal ranges for fish survival. However, observed fluctuations in water level and anthropogenic activities (e.g., shoreline settlement, agricultural runoff) could threaten future diversity. This study establishes a baseline for ichthyofauna of Madamsilli Reservoir and underscores the need for monitoring the alteration in fish assemblage, conservation of fish diversity, management planning, and integrated conservation strategies to ensure ecological integrity alongside fishery productivity.

Keywords: Ichthyofauna. Diversity. Fish assemblage. Trophic guild

Fisheries of Brahmaputra River in Assam, India: Emerging issues

B. K. Bhattacharjya^{1*}, S. K. Majhi¹, A. K. Yadav¹, P. Das¹, S.C.S. Das¹, S. Borah¹, R. Kumar¹, S. K. Majhi¹, N. Sharma¹, B. C. Ray¹, A. Kakat¹i, S. K. Manna², P. Gogoi² and B. K. Das²

¹ICAR-CIFRI, Regional Centre, HOUSEFED Complex, Guwahati–781 006, Assam.

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120.

*bkbhattacharjya@yahoo.com

River Brahmaputra is a trans-boundary major river flowing through Tibet (China), India and Bangladesh; it flows through Assam for about 640 km. The river with 42 important tributaries is lifeline of natural fisheries in the region. Studies by ICAR-CIFRI showed occurrence of 138 finfish species under 80 genera and 29 families in the river stretch including *Labeo angra*, *L. boggut*, *Ompok padba*, and *Channa stewartii* that were recently recorded. Two commercially important prawns (*Macrobrachium gangeticum*, *M. malcolmsonii*) and the river dolphin (*Platanista gangetica*) were also observed. Hilsa (*Tenualosa ilisha*) was landed in the lower stretch of the river between Guwahati and Dhubri. Fish catch ranged from 6 to 237 kg/day during the monsoon season, which increased to 10 to 326 kg/day during the post-monsoon season. *Cabdio morar* (small cyprinid) was the most dominant fish species contributing 60-90% of total fish catch. Main fishing gear used in the river are gill nets, drag nets, shore seine, bag net, cast net, hooks and line and Chinese dip net operated using non-mechanized wooden fishing boats (OAL 3.5-6.5 m). Emerging issues affecting fisheries in the river stretch include siltation, over-fishing, changing rainfall patterns, aquatic pollution, river valley projects and multiple-use conflicts.

Keywords: River Brahmaputra, fisheries, India, ichthyo-fauna, emerging issues

Threat risk assessment of native Indian freshwater fishes using Machine Learning

Malay Naskar* S. K. Sahu and Soma Das Sarkar

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata
700120

* malaynaskar@icar.org.in

Globally, the International Union for Conservation of Nature (IUCN) database has been mainly used to study the conservation status of freshwater fish species. However, data analytics has received little attention in India, which limited critical insights into conservation status. As a result, freshwater fish conservation and management in India have mostly been knowledge-driven. Several studies have investigated the use of machine learning (ML) to evaluate the threat risk of fish species global freshwater fishes. But this approach was limited in prioritizing key risk factors. Moreover, those studies were conducted on broader scale. Country-level applications of ML for freshwater fish species remain largely unexplored in India. The present investigation aims risk assessment using ML to prioritize factors influencing species threats. Among various machine learning approaches—such as Neural Network and Random Forest, Gradient Boosting Trees (GBT) was selected due to its optimal balance between accuracy, interpretability, and computational efficiency, particularly for the structured tabular data in the present investigation. The receiver operating characteristic (ROC) curve revealed the area under the curve (AUC) values for training (0.94) and testing (0.87) confirmed the model’s high accuracy in predicting threat status. Habitat degradation (0.89) was the top predictor of species threat, followed by alien invasion (0.68), land use change (0.56), developmental activities (0.43), unsustainable fishing (0.39), pollution (0.36), destructive fishing (0.28), and water abstraction (0.25). This quantitative ranking of risk factors facilitates planners to guide conservation priorities. Furthermore, the model output also suggests the need for proactive conservation of ‘*Least Concern*’ species, focusing urgently on habitat degradation and unsustainable fishing.

Keywords: IUCN threats; freshwater fish, Machine Learning, Gradient Boosting Tree

Mapping Fisheries and Ecological Parameters in Beledanga Wetland Using GIS Tools

Gunjan Karnatak, Sanjeet Debnath, P. K. Parida, A. Roy, Lianthuamluaia, A.K. Das and B. K. Das

ICAR-Central Inland Fisheries Research Institute, Barrckpore-700120

gunjankarnatak87@gmail.com

Floodplain wetlands serve as vital inland aquatic ecosystems, offering a range of ecological services and supporting local livelihoods through fisheries. To ensure their sustainable utilization, a comprehensive ecological and fisheries assessment was carried out in the Beledanga wetland of West Bengal, India. Key environmental indicators, including water and sediment quality, macroinvertebrate diversity, fish assemblages, and aquatic plant distribution, were evaluated across multiple sampling sites. Spatial analysis using Geographic Information System (GIS) tools provided a detailed visualization of the ecological parameters. The study found that water quality was generally suitable for fish health, and sediment analysis revealed adequate nutrient levels and pH balance, supporting productive fisheries. The diversity and abundance of macroinvertebrates reflected a stable ecological condition. Nineteen species of Small Indigenous Fishes (SIFs) were recorded, with *Puntius sophore*, *Amblypharyngodon mola*, and *Chanda nama* being the most prevalent. Seasonal changes in macrophyte cover were effectively captured through remote sensing, emphasizing increased vegetation during the monsoon period. The research underscores the importance of adopting science-based management practices and geospatial tools to enhance wetland conservation and sustain fish productivity amid mounting anthropogenic and climate-induced pressures.

Keywords: Floodplain wetland, Ecology, Benthic macroinvertebrate, Macrophyte, GIS

A Comprehensive Overview of the Seasonal Dynamics and Environmental Influences on Fish Diversity in the Downstream of the Narmada River Basin, Gujarat, India

Bigan Kumar Sahoo¹, Ganesh Chandra¹, Basanta Kumar Das^{1*}, S. P. Kamble², Roshith C. M.¹, Sajina A. M.¹, Subrata Das¹, J. K. Solanki², Hemanta Chowdhury¹ and Archan Kanti Das¹

¹ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal – 700120

²ICAR- Central Inland Fisheries Research Institute, Regional Research Center, Vadodara, Gujarat – 390021

*bigankumar48@gmail.com

The present study investigates the seasonal variation in ichthyofaunal diversity and its relationship with key environmental drivers in the Narmada River, India. As one of the country's major west-flowing rivers, the Narmada supports rich biodiversity, particularly ichthyofauna that are vital for ecological balance and local livelihoods. Sampling was conducted across pre-monsoon, monsoon, and post-monsoon seasons at selected sampling sites along the river and reservoir during 2018-2021 and recorded 101 fish species belonging to 38 family and 13 orders. The diversity indices were calculated to study the temporal and spatial variation in the dominance and evenness in fish community composition and species richness. A comparatively higher dominance was observed in the estuarine zone during the monsoon and fresher water zone during the post-monsoon season. This was due to the less species diversity at the zones during the respective seasons. Concurrently, physicochemical parameters including water temperature, pH, dissolved oxygen, total dissolved solid, total hardness, total alkalinity, salinity, and nutrient concentrations were recorded to determine their influence on fish distribution. The results revealed significant seasonal fluctuations in species composition and abundance, with the highest diversity observed during the post-monsoon season. Multivariate analysis indicated that dissolved oxygen, temperature, salinity, electrical conductivity and nutrient load were the primary environmental drivers influencing ichthyofaunal diversity. Limno-chemical parameters in this stretch of river Narmada have shown very conducive range for fish production. This study underscores the importance of monitoring temporal ecological patterns and environmental conditions for sustainable management and conservation of fish resources in the Narmada River ecosystem.

Keywords: Habitat heterogeneity, Fish assemblages, Species richness, Biodiversity indices, Migratory patterns

Distribution pattern of ichthyofaunal diversity and its conservation status in major rivers of Himalayan state Sikkim, India

Niti Sharma^{1*}, S. C. S. Das¹, S. K. Majhi¹, D. Bhakta², A. K. Sahoo² and B. K. Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati, Assam

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal

*sharma.niti352@gmail.com

The Himalayan Sikkim state is recognized as a biodiversity hotspot of global significance with vast natural resources mainly the rivers. In the study, we assessed the distribution pattern of ichthyofaunal diversity in rivers of Sikkim along with its conservation status. The exploratory survey was carried out during wet and dry seasons in 2024 covering two major rivers of Sikkim, Teesta and Rangeet along with eight major tributaries. A total of 26 fish species under 14 genus, 4 family and 3 order were recorded during the seasons. Among the families, Cyprinidae (61.53%) dominates followed by Nemacheilidae (26.92%), Sisoridae (7.69%) and Salmonidae (3.85%), respectively. The most dominating fish species were chocolate mahseer (*Neolissochilus hexagonolepis*) contributing 42.0-78.5% and snow trout (*Schizothorax richardsonii*) contributing 33.87-90% in both the seasons. Species richness and diversity in dry season was significantly higher than wet season ($H' = 2.54, D_I = 0.85$). Most of the fish species observed were indigenous, with a few endemic and rare species in the region. The ichthyofaunal diversity in Sikkim is declining over time, possibly as a result of anthropogenic activities such as dam construction, cloud bursting, flash floods, and climate change, leading a significant concern for conservation of the fish diversity.

Keywords: Fish diversity, conservation, threats, Sikkim, Northeast India

**Reproductive Biology of Four Species of Torpedinoid Electric Rays
(Pisces: Torpediniformes) from Indian waters**

Ravali Vallangi^{1*}, V. A. Iswarya Deepti², K. Sujatha²

¹ICAR – Central Inland Fisheries Research Institute, Barrackpore, Kolkata,
West Bengal – 700 120

²Department of Marine Living Resources, Andhra University,
Visakhapatnam, Andhra Pradesh – 530 003

*ravali.au19@gmail.com

Understanding reproductive biology is essential for effective fisheries management, especially for elasmobranchs frequently caught as by-catch. This study examines the reproductive traits of four electric ray species from Visakhapatnam waters: *Torpedo panthera*, *T. marmorata*, *Narcine brunnea*, and *Narke impennis*. A total of 664 specimens were analyzed to determine maturity stages, length at first maturity, gestation period, fecundity, sex ratios, and embryonic development. Maturity was assessed by clasper development in males and ovarian and uterine condition in females. Results indicate that these species share life history characteristics typical of chondrichthyans, including slow growth, late maturity (115–338 mm TL), and low fecundity (1–12 offspring). Females of *Torpedo* and *Narke* have paired reproductive organs, while only the left ovary and uterus are functional in *Narcine*. Gestation lasts 6–8 months, with embryos developing freely in the uterus and nourished by uterine secretions. Reproductive asymmetry favors the right uterus in most cases. Sex ratios varied among species, with males being more numerous except in *N. brunnea*. These findings provide critical baseline data for assessing population dynamics and reproductive output. Given their biological vulnerability and IUCN Data Deficient status, species-specific management and ongoing monitoring are essential for sustainable management and conservation.

Keywords: Electric rays, Reproduction, Fecundity, Life history traits

A Web application software for assessment of native Indian freshwater fishes and their conservation status

Malay Naskar*, Soma Das Sarkar, Chayna Jana, S. K. Sahu and Md. Naim

ICAR-Central Inland Fisheries Research Institute

Barrackpore, Kolkata 700120

*malaynaskar@icar.org.in

India's freshwater fish diversity is rich and globally significant, constituting nearly 5-6% of global freshwater fish species. However, the country faces challenges in updating fish taxon checklists periodically due to the extensive time required, limiting updated information on fish diversity and conservation status. Currently, the method of checklist updates is manual, involving internet searches and printed document reviews. Additionally, there is no readily available platform that offers diversity and conservation status analysis. This article presents the development of a web application designed to periodically update the database of native Indian freshwater fish taxa and provide user-friendly analytics on Indian fish diversity and conservation patterns. The software was developed using R Shiny, a robust tool for web application development. For stability and scalability, PostgreSQL hosted on a Debian Linux server was used as the backend database server. The application is a cost-effective solution utilizing an open-source hosting environment. Key features of the application include: (a) Retrieval of fish species lists from recognized sources such as *FishBase* and *Catalogue of Fishes*, with the ability to clean the data as needed, (b) Taxon-level search functionality, (c) Analysis of species discovery patterns since 1758, and (d) IUCN threat status and risk analysis. The application offers a current update of 1239 native Indian freshwater fish taxa and ensures prompt updates on fish taxonomic classification and new discoveries, with a negligible 1% non-detection error. This application, with minimal manual intervention, will enable fish biologists to efficiently update checklists and perform analyses, thus reducing reliance on manual effort.

Keywords: freshwater fish taxa, web application, R shiny, PostgreSQL, India, risk analysis

MeenMozhi: Breaking Language Barriers in Fish Identification Through a Smart Vernacular Name-Based Android Application.

Adithyan A R*, Aswin B B, Aman A Nambiar, Ajith A
*adithyanar2001@gmail.com

Fish species across India are referred to by a wide range of vernacular names. This linguistic diversity poses significant challenges to communication, hindering knowledge transfer, effective learning, accurate species identification and trade within the fisheries sector. The present innovation addresses this challenge through an Android application, *MeenMozhi*, which offers a searchable, multilingual database interlinking vernacular, common, and scientific names. Users can input any known name and retrieve accurate taxonomic details, high-resolution images, and associated information which facilitates standardized fish identification. *MeenMozhi* provides a scalable digital solution to unify fish identification practices across the country. By fostering inclusivity and improving access to reliable species information, the app strengthens fisheries education, streamlines the supply chain, and empowers stakeholders with accessible user-friendly technology. Moreover, this initiative aligns with national priorities under the Sustainable Development Goals by advancing digital transformation and promoting sustainable resource management within the fisheries sector.

Keywords: Fisheries, e-learning, Digital platform, Android application, Species identification

A study on the plankton assemblage pattern of Hirakud reservoir

Ratul Chakraborty (*), Basanta Kumar Das⁽¹⁾, Ramesh Chandra Malick, Pranab Gogoi, Satish Koushlesh, Canciyal Johnson, and Soubhagya Nayak

ICAR – CIFRI, Barrackpore

ratul1c@yahoo.com,

The study examines the pattern of plankton assemblage in Hirakud Reservoir, with particular attention to species abundance, composition, and seasonal changes in environmental conditions. Phytoplankton and zooplankton communities were sampled across the course of several seasons at different locations inside the reservoir. Cyanophyceae dominated the phytoplankton seasonal fluctuations in November, primarily due to *Microcystis* sp. Chlorophyceae were dominant in June, while the dominance of Bacillariophyceae was seen in August. Spatially, the lentic zone of the reservoir showed high variations in phytoplankton abundance. Copepods and rotifers made up most of the zooplankton populations that inhabited the Hirakud reservoir. The pre-monsoon season was the apex of the spectrum, followed by the monsoon and post-monsoon seasons. The variations in species richness were statistically significant ($F = 5.414$; $p=0.009$) between the seasons. A correlation study indicated substantial relationships between plankton dispersion and environmental variables, including temperature, pH, dissolved oxygen, and nutrient levels. Effective management and maintenance of the reservoir's biodiversity and fish production trends depend on an understanding of these patterns.

Keywords: Hirakud reservoir, Cyanophyceae, Chlorophyceae, Copepods, rotifers

**Population parameters of *Mugil cephalus* in Jatadhari river,
Jagatsinghpur district, Odisha**

Nabakishor Sial*, Ganesh Chandra Kund and Sushanta Kumar Patra

College of Fisheries (OUAT), Berhampur-7, Odisha, India

*nabakishor12@yahoo.com

Fish population dynamics is the study of fish populations and the effects of growth, recruitment and mortality over a period of time. The fish stock assessment is an important factor in fisheries resource management. In the present investigation, a total of 360 numbers of *Mugil cephalus* with a length range of 11.2 cm to 38.4cm and weight ranges 40.1 g to 540.6g were collected from Jatadhari river during the period from August 2023 to July 2024. The total mortality, natural mortality and fishing mortality of *Mugil cephalus* were estimated as 1.13/yr, 0.55/yr and 0.58/yr respectively. The value of Z/K is calculated as 2.40 indicate the stock was mortality dominated. The probability of capture of *Mugil cephalus* at the length of L_{25} , L_{50} and L_{75} were estimated as 25.98cm, 28.67cm and 31.03 cm respectively during the sampling period. The size at first maturity of *Mugil cephalus* in the study area is 30.5 cm. The probability of capture (L_{50}) is less than the size at first maturity. So it could be better to enhance the mesh size so as to facilitate the maturation of fishes in Jatadhari river.

Keywords: *Mugil cephalus*, mortality, probability of capture

Assessment of the mass bathing event impact on the water quality of the river Ganga at Prayagraj, during Magh Mela 2021- 2024

Sandeep Kumar Mishra*¹, Vikas Kumar¹, Dharm Nath Jha¹, Absar Alam¹, Jeetendra Kumar¹, Venkatesh Ramrao Thakur¹, Vijay Kumar¹, Sushil Kumar Verma¹, Ram Bhajan Verma¹, Ashish Singh¹, and Basanta Kumar Das²

¹ICAR-Central Inland Fisheries Research Institute, Regional Centre, Prayagraj - 211 002, Uttar Pradesh, India

²ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700 120, West Bengal, India

*mishra9sandeep@gmail.com

The present study evaluates the water quality of the River Ganga at Prayagraj during the Magh Mela (2021-2024), a major annual mass-bathing event that attracts millions of pilgrims. Water samples were collected from three locations above Sangam, Sangam, and below Sangam across three temporal phases: Pre-Mela, Mela, and Post-Mela. The Water samples were analyzed for various physicochemical parameters, including pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), electrical conductivity (EC), total dissolved solids (TDS), turbidity, sulphates, nitrates, total hardness, total alkalinity, calcium, and magnesium hardness. Water Quality Index (WQI) values were used as the primary indicator to assess pollution levels. Results indicated a marked improvement in water quality during the Mela period, with WQI values were as 277.20 (above Sangam), 376.82 (Sangam), and 411.13 (below Sangam), compared to higher pre-Mela values of 452.34, 450.17, and 482.79, respectively. Turbidity and BOD were the most influential parameters that deteriorate the water quality. WQI showed that the water was not suitable for drinking during the study period. However, post-Mela showed a substantial deterioration, with WQI values of 684.59 above Sangam, 529.73 at Sangam, and 518.37 below Sangam. The temporary improvement during the Mela period can be attributed to owing to the release of extra water from the Tehri dam, administrative interventions such as the discharge of water into the river after treatment and other pollution control measures. The post-Mela decline suggests a lapse in these measures and highlights the need for sustained water management strategies. The findings underscore the dynamic nature of river water quality during large-scale religious events and emphasize the necessity of continuous monitoring and long-term policy implementation.

Keywords: Mass bathing, Magh Mela, Ganga, Prayagraj, WQI

Sex Ratio, Gonadal Development and Reproductive Characteristics of *Ariomma indica* (Day, 1871) in the Trawl Bycatch from Visakhapatnam

Manas H M^{1*}, Muktha Menon, Indira Divipala, **Shubhadeep Ghosh**,
Pralaya Ranjan Behera, **Mamidi Satishkumar and Joe K.**

Kizhakudan

Visakhapatnam Regional Centre of ICAR-Central Marine Fisheries
Research Institute Visakhapatnam, Andhra Pradesh 530003, India

*manas2u@gmail.com

Ariomma indica, commonly known as the Indian driftfish, is an important yet understudied bycatch species in bottom trawl fisheries along the Visakhapatnam coast, Andhra Pradesh. Although it holds considerable market demand, limited biological information has hindered effective management. This study aimed to address these gaps by investigating the length-weight relationship and reproductive biology of the species using specimens collected from Visakhapatnam fishing harbour. The length-weight relationship was determined for males, females and pooled samples, relationship reflecting near-isometric growth patterns. A significant female-biased sex ratio was observed, with marked female dominance in few months. Maturity assessment revealed a prolonged spawning season, with a peak in first quarter of the year, corroborated by high Gonado Somatic Index (GSI) values. Notably, all females sampled during March and April were mature, suggesting peak reproductive activity. The size at first maturity (L_m) was estimated at 17.6 cm for females, which closely aligns with the mean catch length (17.59 cm), indicating that a significant portion of the harvested population may consist of first-time spawners. These findings offer critical baseline data on the reproductive cycle and biological traits of *A. indica*, highlighting the need for size-selective fishing practices to ensure sustainable exploitation and long-term conservation of this economically significant species.

Keywords: Bottom trawl bycatch, Fishery biology, Spawning, Reproductive strategy

Sub-Theme-V

**POST-HARVEST PROCESSING, VALUE ADDITION
& FOOD SAFETY (PPAS)**

Sustainable valorization of Catla (*Catla catla*) visceral waste for peptone production and application as a potential ingredient in culture media

Shivbhajan, Bahni Dhar* and Pritha Kumar

College of Fisheries, Lembucherra, Tripura – 799 210, Central Agricultural University, Imphal, India

*bahnicof2010@gmail.com

This study explored the production and characterization of peptone derived from Catla viscera using papain enzyme with an enzyme-substrate ratio of 1:100. The resulting peptone demonstrated a yield of 4.86%, with degree of hydrolysis 94.31%, and excellent solubility (98.06%). The colour properties included lightness of 83.71, redness of 0.73, yellowness of 17.81 and whiteness of 76.30. The proximate composition of the peptone was 4.27% moisture, 61.97% protein, 0.14% lipid, and 32.66% ash. The study also evaluated the growth and biomass production of *Bacillus velenzensis* in broths and agar supplemented with both commercial and fish peptone separately. Results showed that broths supplemented with fish peptone (NBFP) significantly enhanced *B. velenzensis* growth and biomass production. Optimal biomass yield observed was 142.7 mg per 100 ml at a peptone concentration of 30 g/L. Growth of *B. velenzensis* on agar media was better than commercial peptone and media. Statistical analysis indicated significantly higher growth rates ($p < 0.05$) in broths with fish peptone compared to those with commercial or standard nutrient broths. This research underscores the potential of Catla visceral peptone as a sustainable and nutrient-rich alternative for microbial culture media, supporting enhanced growth and biomass yield.

Keywords: *Bacillus velenzensis*, fish peptone, Catla viscera, biomass production, microbial growth

Enhancing Shelf Life of Croaker Fillets Using Roselle Calyces Extract: A Natural Preservation Approach

Diwakar kumar *, S. Nath, S. Chowdhury, K. C. Dora and P. Murmu

Department of Fish Processing Technology, Faculty of Fishery Sciences,
WBUAFS, Kolkata-700 094

* diwakarkumarsoni@gmail.com

Fresh fish, though highly demanded, has a short shelf life due to rapid spoilage. This study investigated the potential of Roselle calyces extract (RCE), a natural antimicrobial, to extend the shelf life of croaker (*Johnius belangerii*) fillets during refrigerated storage ($4 \pm 1^\circ\text{C}$). Among the extracts, ethanolic RCE (ERE) exhibited the highest total phenolic content (68.73 ± 1.74 mg GAE/g) and the strongest antimicrobial activity against *B. cereus*, *S. aureus*, *E. coli*, and *S. typhi*. During storage, a decrease in pH up to day 6 was followed by an increase, likely due to volatile base formation. Treated samples showed lower TVBN and TBA values than the control, indicating reduced protein and lipid degradation. Notably, treatment T3 (3% RCE) maintained microbial loads within acceptable limits (5.92 ± 0.05 CFU/g) up to day 15, outperforming T1 and T2, which became unacceptable on days 12 and 15, respectively. T3 also retained the best sensory qualities, attributed to RCE's antioxidant and antimicrobial properties and oxygen barrier function. Overall, RCE at 3% concentration effectively preserved fish quality and extended shelf life under refrigeration, making it a promising natural preservative.

Keywords: Antimicrobial, Roselle, Phenolic compounds, Antioxidant

Licorice Root Extract (*Glycyrrhiza glabra L*): A natural solution for prolonging shelf life of frozen fish croquette

Sayani Roy*, K. C. Dora, S. Chowdhury and Diwakar Kumar

Department of Fish Processing Technology, Faculty of Fishery Sciences,
WBUAFS, Kolkata-700 094

*sayani24roy@gmail.com

Value addition is the most promising sector in food processing industry and there is an increasing demand for such ready to eat fishery products. This study aimed to assess the quality and shelf life of fish croquettes prepared from *Pangasianodon hypophthalmus* using licorice (*Glycyrrhiza glabra L.*) root extract as a natural preservative. Phenolic compounds were extracted using 70% ethanol and water, with the ethanolic extract (ELE) showing higher total phenolic content (46.12 ± 1.04 mg GAE/g) than the water licorice extract (WLE). ELE also exhibited greater antioxidant and antimicrobial activities. Four concentrations of ELE (T₁: 0.01%, T₂: 0.04%, T₃: 0.07%, T₄: 0.1%) were applied to croquettes stored at $-18 \pm 1^\circ\text{C}$. Results showed significantly lower TBARS, TVB-N, peroxide values and microbial counts (TVC and PBC) in treated samples, especially T₄, compared to the control. Sensory evaluation revealed higher acceptability for T₄, followed by T₃, T₂, and T₁. The shelf life of control sample was 120th day but ethanolic extract treated samples maintained their quality throughout the storage period. Thus, ethanolic licorice extract can be a good option as a potential natural preservative due to its promising antimicrobial and antioxidant properties, without compromising the nutritional value of food products.

Keywords: Antioxidant activity, antimicrobial activity, Shelf life, Fish croquette

Studies on quality parameters and microbial diversity of *Shidal* - A traditional fermented fish products of Northeast India

Bipul Kakati, Armaan U. Muzaddadi^{2*} and Inam Akhtar¹

^{1,2}Department of Fisheries Engineering, Faculty of Fisheries Science, Assam Agricultural University, Raha, Nagaon, Assam-782 103, India

*ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700 120, West Bengal, India

*drarmaan@gmail.com

This study was conducted to the quality parameters and microbial diversity of *shidal* during its repining process. *Shidal* was prepared in the laboratory condition following the standardized method. Proximate composition, biochemical, microbiological and organoleptic quality study of *Shidal* samples were carried out using standard methods, collected from different layers of *Shidal* in earthen pots used during fermentation, at 30 days interval for 6 months. The moisture, protein, lipid and ash content of *Shidal* samples were recorded in the range of 31.95-44.87%, 31.75-36.90%, 12.12-23.36% and 10.70-17.92%, respectively during 180 days of fermentation. The total aerobic and anaerobic bacterial count was also found in the range of 6.00 – 8.52 log cfu/g and 3.84 – 5.90 log cfu/g, respectively for 180 days. The result of quality parameters assessment revealed that the best quality *Shidal* could be produced during 120-150 days of fermentation having high nutritional quality. Bergeys’ manual of determinative bacteriology was taken as reference for biochemical tests for presumptive confirmation of unknown bacterial isolates. The 16S rRNA gene sequences of 15 bacterial isolates from *Shidal* were subjected to BLAST in the NCBI database and the sequence were deposited in the Genbank (Accession Numbers MW433830 to MW433844). The sequences were analysed for genetic relatedness by MEGA 11 software. The bacterial species found were *Pseudomonas monteilii*, *Citrobacter freundii*, *Pseudomonas stutzeri*, *Kocuria sediminis*, *Lactipantibacillus plantarum* and *Lactobacillus pobuzihii*. The dominant LAB in the samples was found *Lactobacillus pobuzihii* and *Lactipantibacillus plantarum* which contributed 60% and 13%, respectively. Both the identified LAB species have the potential to use them as the starter culture for accelerating the process of *Shidal* preparation.

Keywords: Fermentation, Traditional Fish Product, *Shidal*, Microbial diversity, Nutritional quality, starter culture, India.

Enhancing nutritional profile of chapati through Pangas fish powder supplementation: Influence on physicochemical quality, dough rheology and acceptability

Jai Bansal and Vijay Kumar Reddy Surasani*

College of Fisheries, Guru Angad Dev Veterinary and Animal Sciences
University, Ludhiana, Punjab 141 004

*vijaykumar@gadvasu.in

This study investigates the fortification of chapatis, a staple flatbread in the Indian subcontinent, with processed Pangas fish powder (PFP) to enhance its nutritional quality. For this, the wheat flour supplemented with varying concentrations of PFP (0, 2.5, 5, 10, and 20%), followed by analysis of product quality in terms of dough rheology, physico-chemical attributes and eating quality of chapatis. Increasing PFP levels in wheat flour to 20%, increased the protein content of chapatis from 9.62 ± 0.03 to $17.54 \pm 0.04\%$, while causing a decrease in its moisture content ($P \leq 0.05$). The farinographic analysis, showed variations in the dough's rheological properties with different levels of PFP. The water absorption values ranged from 63 to 63.06%. However, in the case of dough development time, the addition of PFP increased the value to 6.2 min (at a 10% level), after which, it started to reduce to 5.03 min (at a 20% level). Colour analysis indicated that FPP addition has a minor impact on chapatti color, with slight increases in redness and yellowness. Texture analysis demonstrated that chapatti hardness varied across treatments, with the lowest hardness at 20% FPP and the highest at 10% FPP (1312.74 ± 148.76 kgf). Sensory evaluation showed that chapattis with 10% FPP were the most palatable. These findings suggest that incorporating FPP into chapattis is a viable approach to enhance their nutritional value, particularly for addressing protein and micronutrient deficiencies, while maintaining acceptable sensory attributes up to a 10% concentration.

Keywords: Pangas fish powder, chapati, supplementation, dough rheology, texture

Nutritional value and acceptability of balls incorporated with shrimp protein isolate powder extracted from (*Litopenaeus vannamei*) head waste

Ankita Kataria^{1*}, Vijay Kumar Reddy Surasani¹, Dr Ajeet Singh²

¹Department of Fish Processing Technology, College of Fisheries, Chandrashekhar Azad University of Agriculture and Technology, Etawah, Uttar Pradesh, India 208 002

²Department of Aquaculture, College of Fisheries & Research Centre, Guru Angad Dev Veterinary and Animal Science University, Ludhiana (Punjab) 141 004

*ankitakataria06@gmail.com,

In recent past, demand of protein enriched foods has increased tremendously as people became aware about health but snack foods available in the market are either nutritionally poor or rich in carbohydrate. Keeping in view convenient snack along with nutrition, the study was conducted to extract protein powder from shrimp waste and supplemented into balls. Shrimp isolate powder was added at different levels i.e. 10% (T₁), 20% (T₂), 30% (T₃), 40% (T₄) and 50% (T₅) whereas in control (C) no Shrimp protein isolate powder was added. The results of proximate composition showed that the protein content was 8.54% in Control, 13.20% in T₁, 17.55% in T₂, 21.93% in T₃, 26.02 in T₄ and 29.64 in T₅. Fat content varied from 12.10% in control, 11.95% in T₁, 11.81% in T₂, 12.27% in T₃, 11.70% in T₄ and 12.13% in T₅, Ash content varied from 2.02% in control, 2.12% in T₁, 2.17% in T₂, 2.29% in T₃, 2.73% in T₄ and 3.77% in T₅ and Carbohydrate content varied from 33.70% in control, 28.95% in T₁, 24.53% in T₂, 19.99% in T₃, 15.49% in T₄ and 10.76% in T₅. Among all the treatments, the highest sensory acceptability of balls was observed in T₁.

Keywords: Balls, Shrimp protein isolate, Snack food, and Sensory properties

Harvesting the Unharvested: Converting Shrimp Shell Waste into Nano-biomaterials for Sustainable Aquaculture, Antimicrobial Defense, and Post-Harvest Preservation

Barsha Baisakhi^{a*}, Jyotirmayee Pradhan^a, Basanta Kumar Das^b

^aP. G Department of Zoology, Kuntala Kumari Sabat Women’s College, Affiliated to Fakir Mohan University, Balasore – 756001, Odisha, India.

^bICAR- Central Inland Fisheries Research Institute, Barrackpore– 700120, Kolkata, India.

*jyotirmayee_sahani@yahoo.com

In the context of sustainable aquaculture and the circular bioeconomy, crustacean shell waste is a valuable but underutilised resource. This study reveals the environmentally friendly production of chitosan-tripolyphosphate nanoparticles (ChNPs) from *Penaeus monodon* shell waste using ionic gelation. Detailed physicochemical characterisation (FESEM, FTIR, XRD, TGA, DLS, and TEM) revealed appropriate nanoscale morphology, crystallinity, and heat stability. The ChNPs exhibited broad-spectrum antimicrobial activity against important fish pathogens (*Aeromonas hydrophila*, *Escherichia coli*, *Saprolegnia parasitica*, and *Aphanomyces invadens*) and demonstrated substantial antioxidant capacity, as determined by DPPH and H₂O₂ tests. Cytotoxicity studies on NIH 3T3 fibroblast cells revealed high biocompatibility, indicating their potential for biomedical applications. Furthermore, a chitosan-carboxymethyl cellulose (CMC-CH) composite hydrogel was developed and applied as a natural edible coating to grapes, substantially minimising post-harvest weight loss and microbiological deterioration for 14 days. The dual activity of ChNPs in aquatic disease control and food preservation demonstrates a scalable, long-term solution to valorising seafood waste. This work combines nanotechnology and fisheries biotechnology to develop multifunctional, environmentally friendly materials for aquaculture health management and post-harvest innovation, so contributing significantly to resource efficiency and food security in the blue economy.

Keywords: Antimicrobial, Antioxidant Activity, Aquatic Health, Chitosan Nanoparticles, Post-Harvest Food Preservation, Waste Valorisation

From shrimp shell waste to sustainable packaging: Chitosan–nanochitin composite films for eco-friendly food applications

Soibam Ngasotter^{1, 2*}, K.A. Martin Xavier², and George Ninan²

¹LSPN College of Fisheries, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Kawardha-49 1995, Chhattisgarh, India

²ICAR-Central Institute of Fisheries Technology, Kochi-682 029, Kerala, India

*ngasotter@gmail.com

The growing demand for sustainable and biodegradable alternatives to conventional plastic packaging has prompted exploration into bio-based materials derived from waste sources. This study presents an innovative approach to utilizing shrimp shell waste for the development of chitosan–nanochitin composite films aimed at eco-friendly food packaging applications. By extracting nanochitin and integrating it into a chitosan matrix, we fabricated bio-composite films using a simple casting technique. The resulting films were systematically examined to assess their suitability as packaging materials. Compared to unmodified chitosan films, the composites exhibited improved structural integrity, better moisture resistance, and enhanced thermal stability, making them more viable for practical use. Additionally, they demonstrated favorable optical properties, such as improved light-blocking capacity, which is crucial for preserving food quality. Microscopic and spectroscopic analyses confirmed the successful incorporation and uniform dispersion of nanochitin within the polymer matrix. Overall, this study emphasizes the potential of seafood waste valorization in developing high-performance, biodegradable packaging materials, contributing to both environmental sustainability and circular economy initiatives.

Keywords: Biodegradable films, Chitin nanocrystals, Nanocomposites, Sustainable food packaging

Valorization of shrimp shell waste into chito-oligosaccharides: a potential functional component for food industry applications

Parmeet Kaur^{1*}, Vijay Kumar Reddy Surasani¹ and Ashok Kumar²

¹Department of Fish Processing Technology
College of Fisheries

Guru Angad Dev Veterinary and Animal Science University, Ludhiana
(Punjab), 141004

²Department of Animal Disease Research Centre
College of Veterinary Science

Guru Angad Dev Veterinary and Animal Science University, Ludhiana
(Punjab), 141004

*parmeetsaini75@gmail.com

Shrimp shell chitosan exhibits various functional properties, but its poor solubility in neutral solutions limits its applications in the food industry. The present study aimed to produce Chito-oligosaccharides (COS), the low molecular weight hydrolysis products of chitosan, from *Litopenaeus vannamei* (Whiteleg shrimp) shell and to evaluate their physicochemical properties as well as antimicrobial potential. The produced COSs had a yield of 12.66% with an excellent water solubility of (99.32%) and it exhibited an off-white to pale yellow colour ($L^* = 59.282$, $a^* = 2.908$, $b^* = 12.642$). The produced COSs had a water binding capacity of 1.195% and a fat binding capacity of 440.347%, indicating its suitability as a food ingredient. Antimicrobial activity assessment against *Aeromonas hydrophila*, *Escherichia coli* and *Vibrio parahaemolyticus* demonstrated largest inhibition zones among the tested concentrations at 6 mg/mL concentration. Minimum Inhibitory Concentrations (MICs) were found to be 0.093 mg/mL for *A. hydrophila*, 0.185 mg/mL for *E. coli*, and 0.0468 mg/mL for *V. parahaemolyticus*. These findings highlight the potential of shrimp shell-derived COS as a potential antimicrobial agent and its high solubility and binding capacities further support its application in food and biomedical industries.

Keywords: Antimicrobial, Chito-oligosaccharides, Functional ingredient, Minimum Inhibitory Concentrations

Development of a health drink from bio-fermented *Nannochloropsis gaditana*: Advancing microalgae-based human nutrition

Viji P^{1*}., Madhusudana Rao, B.,¹ Yamini D¹ and Binsi P.K²

Visakhapatnam Research Centre of ICAR-Central Institute of Fisheries Technology, Ocean View layout, Andhra University P.O., Visakhapatnam, Andhra Pradesh

² ICAR- Central Institute of Fisheries Technology, Willington Island, Matsyapuri P.O.

[*pankyammaviji@gmail.com](mailto:pankyammaviji@gmail.com)

Nannochloropsis gaditana is a marine microalga popularly used as live feed in mariculture practices but has potential human health benefits. *N. gaditana* has an interesting composition of polyunsaturated fatty acids (PUFAs), minerals, protein, pigments and other valuable biomolecules. Fermentation of microalgae is a viable approach to release those bioactive molecules from the cytoplasm. In this study, processes for the fermentation of microalgae, *Nannochloropsis gaditana* using *Lactobacillus plantarum* and the preparation of a healthy drink from fermented *N. gaditana* were standardized. *Nannochloropsis gaditana* was fermented using *Lactobacillus plantarum* NCIM 2374 strain. Based on several experiments, the optimum conditions for the fermentation process of *N. gaditana* are standardised as 24 h fermentation of microalgae in normal saline containing 1% *Lactobacillus* cell culture and 0.5% lactose sugar. Formulation of a healthy drink was carried out using fermented algae and fruit juices (pineapple and grapes). The addition of fermented algae up to a ratio of 6:4 (fermented algae: fruit juice) was acceptable. The findings of the study suggest that fermented microalgae can be used as a raw material for preparing health drinks, offering the benefits of microalgal bioactive compounds.

Keywords: *Nannochloropsis gaditana*, fermentation, lactic acid, functional drink

Production and Antioxidant Profiling of Bioactive Peptides Derived from Squid Proteins

B. Sivaraman¹, Abhinanda Jena^{*2}, V. Renuka³, R. Shalini¹, U. Arisekar¹, S. Sundhar¹

¹Department of Fish Quality Assurance and Management, FC&RI, TNJFU

²College of Fisheries, OUAT, Odisha

³ICAR-Central Institute of Fisheries Technology

* jenaabhinanda27@gmail.com

Squid protein hydrolysates (SPH) were prepared using different enzymes from *Loligo duvauceli* to examine their antioxidative properties. Its proximate composition showed the protein content of 15.31%. Response surface methodology was used to optimize the hydrolysis conditions. DPPH radical scavenging activity was taken as a response to evaluate the optimum conditions for SPH. Among the SPH, alcalase SPH had the higher DPPH activity (78.37%). Different *in vitro* antioxidative assays were used to determine the antioxidative properties of SPH at different protein concentrations viz. 0.5, 1.0, 1.5, 2 and 2.5 mg/ml. Alcalase SPH had the highest metal chelating activity, papain SPH exhibited good superoxide anion radical scavenging activity and trypsin had more reducing power. Meanwhile alcalase and papain SPH exhibited similar ABTS and hydroxyl scavenging activities. *In vivo* antioxidant activity determined using sardine mince model system showed that papain and alcalase SPH reduced the formation of secondary oxidation product, thiobarbituric acid reactive substances (TBARS) by 40%, which is similar to the reduction brought in by commercial in widely used antioxidant, ascorbic acid. This *in vivo* result support SPH prepared from papain and alcalase could be used as potential antioxidant in food processing industries.

Keywords: SPH, Anti-oxidative properties, RSM, Papain, Alcalase.

Effect of Chitosan and Spice Addition on the Quality and Shelf Life of *Sous-vide* Processed Ready-to-Serve Shrimp under Storage Conditions

Rupali Das^{a*}, Martin Xavier^{a,b}, Subal Kumar Ghosh^a, Binaya Bhusan Nayak^a, Amjad Khansaheb Balange^{a,c},

^aDepartment of Post-Harvest Technology, ICAR-Central Institute of Fisheries Education, Versova, Mumbai-400061, Maharashtra, India

^bQuality Assurance and Management Division, ICAR-Central Institute of Fisheries Technology, Cochin-682029, Kerala, India

^cDepartment of Animal & Poultry Science, ICAR-Indian Agricultural Research Institute, Assam-787034, India

* rupalidascife@gmail.com

The sous-vide (SV) cooking technique serves as a conventional cooking replacement that meets modern consumer demands by improving the flavor, juiciness, and softness of ready-to-eat shrimp products. This study assesses the physicochemical and microbial quality of chitosan treated spiced SV-cooked whiteleg shrimp during chilled storage. A total of five treatments were designed utilizing varying chitosan concentrations (0%, 0.125%, 0.250%, 0.375%, and 0.500% w/v), along with a spice mix were added to the sous-vide shrimp. Results show that chitosan-treated spiced sous-vide shrimp had a lower rate of lipid oxidation than the control sample, as indicated by free fatty acid content (FFA), peroxide value (PV), and levels of thiobarbituric acid-reactive substances (TBARs). After 60 days of storage, the sensory scores for the control shrimp sample continued to decline with a typical slimy, musky flavor and soft texture. The products were found to be safe for consumption since their total mesophilic bacterial counts (2.03–2.98 log cfu/g) and total psychrophilic bacterial counts (2.32–3.22 log cfu/g) were under the permissible limit during chilled storage. The findings of the study indicated that adding 0.25% chitosan gel to the masala combination improves the quality and shelf life of sous-vide shrimp products for up to 90 days when stored at 2±1°C.

Keywords: Sous-vide; Chitosan; Shrimp; Protein oxidation; Microbial change; Chill storage

Valorization of Fish Scales through Extraction and Characterisation of Gelatin and its Hydrolysate

Abhinanda Jena*^{1,2}, B. Sivaraman³, V. Renuka⁴, R. Shalini³, U. Arisekar³

¹Department of Fish Processing Technology, FC&RI, TNJFU

²College of Fisheries, OUAT

³Department of Fish Quality Assurance and Management, FC&RI, TNJFU

⁴Fish Processing Division, Central Institute of Fisheries Technology

*jenaabhinanda27@gmail.com

The hydrothermal extraction of gelatin from the Lethrinid fish scales was done using an autoclave at 121°C and 15 psi pressure whereas the time for the hydrothermal extraction was optimised. The maximum gelatin yield of 22.52% and protein recovery of 17.2% was obtained at 90 min using decalcified scales. Fish scale gelatin hydrolysate (FSGH) was prepared using the papain enzyme through enzymatic hydrolysis. FSGH reported a degree of hydrolysis (DH) of 17.71% and an average peptide chain length (PCL) of 5.64. Further the crude FSGH was subjected to fractionation based on the molecular weight using molecular cut-off filters to obtain 3 fractions, 10FSGH (10kDa), 3-10FSGH (3-10kDa) and 3FSGH (3kDa). The bioactive properties, particularly, the anti-diabetic property was studied for the various fractions of the fish scale gelatin hydrolysate. The results of α -amylase inhibitory activity, conducted to study the anti-diabetic properties of the FSGH, showed that the highest α -amylase inhibitory activity of 67.61% was reported by the 10FSGH fraction. The FSGH and its molecular fractions also showed satisfactory results for anti-hypertensive and antioxidant ability studies. The study thus concluded that gelatin obtained from hydrothermal extraction possesses bioactive properties.

Keywords: Gelatin, Hydrothermal extraction, Fish scale gelatin hydrolysate, Papain, Anti-diabetic

Evaluation of fish silage as a replacement to fish soluble in the diet of Amur carp (*Cyprinus carpio hematopterus*)

Bhagaban Barik, Brundaban Sahu*, Manoj Kumar Tripathy, Kedar Nath Mohanta[#] and Santosh Kumar Udgata

College of Fisheries (OUAT), Rangailunda, Berhampur 7, Odisha
[#]ICAR-CIFE (Deemed University), Off yari Road, Versova, Mumbai – 61

*brundabansahu@ouat.ac.in

Fish soluble is often incorporated in aqua feed to reduce the incorporation level of fish meal and also to improve the protein quality of the feed by incorporating water soluble animal protein and an ‘unseen growth factor’. In this contest, a 90-day feeding trial was conducted to evaluate the effect of replacing fish soluble by fish waste silage and whole fish silage on growth performance, feed efficiency and nutrient retention efficiency parameters in Amur carp (*Cyprinus carpio hematopterus*) fry. All these experimental ingredients, being liquid in their consistency, were used to develop blended protein sources before incorporating in fish feed. Accordingly, four experimental diets were formulated by incorporating fish gut silage (T₁), fish gut silage + fish soluble (T₂), fish soluble (T₃), and whole fish silage (T₄) with GNOC and SBM in a 3:1:1 ratio. A control diet (T₀) with FM contributing 50% of total CP and a control blend (T₅) using GNOC and SBM in 1:1 ratio was used as reference. Diets were iso-nitrogenous (35% CP) and iso-caloric (323 kcal/100g). Growth performance was highest in T₀, where fish meal contributed 50% CP, with significantly (p<0.05) better weight gain (495.1%), SGR (1.98%), FCR (2.10), and PER (1.34). However, among the experimental diets, T₄, where whole fish silage based blended protein source served as the major protein source, achieved notable cost savings- 26.21% reduction in feed cost/kg and 15.80% per kg weight gain - without compromising fish body composition. Whole fish silage proved significantly (p<0.05) superior to fish soluble in terms of growth performance and feed as well as cost efficiency. Thus, whole fish silage can be a cost-effective alternative to fish soluble to reduce incorporation level of fish meal in Amur carp diets.

Keywords: Fish soluble, fish silage, fishmeal replacement, cost effective feed

Development of Rohu fish mince-based paneer-like product with enhanced whiteness, texture and sensory acceptability

Vijay Kumar Reddy Surasani*, Simran Kaur, Parmeet Kaur

Department of Fish Processing Technology, College of Fisheries, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab 141004

*vijaykumar@gadvasu.in

L. rohita (Rohu) minced meat was used to develop fish mince-based paneer-like product using different concentrations (0, 2.5, 5.0 and 10.0% of minced meat) of soybean flour (SF) and corn starch (CS). The developed product was evaluated for whiteness, texture, and sensory attributes. Washing with salt water and hydrogen peroxide solution has improved whiteness values of the mince from 21.98 ± 0.34 to 56.71 ± 0.11 , while the product with 5% CS showed highest whiteness value (56.78 ± 0.42) ($p < 0.05$). Texture profile analysis revealed that the product with CS at 10% CS, had the highest values for breaking strength (873.32 g. cm), hardness, chewiness, gumminess, springiness, resilience, and cohesiveness, while showing lowest value for adhesiveness ($p < 0.05$). Sensory analysis also confirmed that the product with CS at 5% and 10% level had the highest overall acceptability values (8.0-9.0).

Keywords: Rohu, fish mince, paneer, color, whiteness, texture, sensory

Development of Ready to Cook Fish Fingers from Croaker (*Johnius dussumieri*) and its Frozen Storage study

Geetanjali Jena^{1*}, Suryamani Patro², Brundaban Sahu³, Manoj Kumar Tripathy³
and Santosh Kumar Udgata³

¹PG Department of Zoology, Berhampur University, Bhanjabihar,
Berhampur - 7, Odisha

PG Department of Home Science, RD Women’s University, Vidyavihar,
Bhubaneswar

² College of Fisheries (OUAT), Rangailunda, Berhampur, Odisha – 760007

* geetanjali_jena78@yahoo.com

With the increase in the awareness on healthy animal protein, the demand for fish and fishery products is increasing day by day. Preference of present days consumer for ready-to-eat and ready-to-cook convenience products is being used to prepare such value-added product using low-cost fish. It is in this context, value addition of Croaker (*Johnius dussumieri*), a low-cost marine fish has been attempted in this study. Fish meat was hygienically separated from skin and bone of the fish and used for preparation of fish fingers. The fingers were then stored at -20⁰C for 180 days. The samples of fish fingers were taken out on 0, 30, 60 and 90th day and their biochemical parameters were analysed. Fingers were prepared for serving through frying and backing and their organoleptic quality was assessed through sensory evaluation. During frozen storage of the raw fingers, moisture content showed a gradual decrease. On the other hand, the total protein, lipid and ash contents were slightly increased with the length of the storage period. The levels of total volatile base nitrogen (TVBN), peroxide value (PV) and free fatty acid (FFA) were significantly increased in the raw fingers during the 180 days of frozen storage, but the value remained within the acceptable limit till 180 days of frozen storage. Both the fried and baked fish fingers were well within the acceptable range during the sensory evaluation till 90 days of storage, after which the sensory parameters decreased to less acceptable range. Based on the findings of this study, it may be inferred that that low-cost fish like Croaker (*Johnius dussumieri*) can be used for preparation of value-added products like ‘ready to cook fish fingers. However, the economic feasibility of its marketing through supermarkets following cold chain need to be studied.

Keywords: Value added product, fish fingers, baked fish product, croaker

Study on the Development and Frozen Stability of Ready to Cook Fish Fingers from Grass carp (*Ctenopharyngodon idella*)

Geetanjali Jena¹, Suryamani Patro^{2*}, Brundaban Sahu³, Manoj Kumar Tripathy³ and Dharitri Choudhury³

¹PG Department of Zoology, Berhampur University, Bhanjabihar, Berhampur - 7, Odisha

PG Department of Home Science, RD Women’s University, Vidyavihar, Bhubaneswar

² College of Fisheries (OUAT), Rangailunda, Berhampur, Odisha – 760007

* smpatro2007@gmail.com

The demand for fish and fishery products is increasing day by day with the increase in the preference of consumers for healthy animal protein. It is in this context, value addition of Grass carp (*Ctenopharyngodon idella*), a fast growing but low-cost fish has been attempted in this study. Fish meat was hygienically separated from skin and bone of the fish and used for preparation of fish fingers. The fingers were then stored at -20°C for 180 days. The samples of fish fingers were taken out on 0, 30, 60 and 90th day and their biochemical parameters were analysed. Fingers were prepared for serving through frying and baking and their organoleptic quality was assessed through sensory evaluation. During frozen storage of the raw fingers, moisture content showed a gradual decrease. On the other hand, the total protein, lipid and ash contents were slightly increased throughout the storage period. The levels of total volatile base nitrogen (TVBN), peroxide value (PV) and free fatty acid (FFA) were significantly increased in the raw fingers during the 180 days of frozen storage, the value remained within the acceptable limit till 180 days of frozen storage. Both the fried and baked fish fingers were well within the acceptable range during the sensory evaluation till 90 days of storage, after which the sensory parameters decreased to less acceptable range. Hence, it may be concluded that low-cost fish meat from grass carp can be used for preparation of value-added products like fish fingers and made available in the market in the ‘ready to cook’ form.

Keywords: Value added product, fish fingers, baked fish product, Grass carp

Alternative Fish Baits from Seafood Processing Wastes as an Artificial Fish Bait for Longline Fishing

S. Emiema*, T. Ravikumar., N. Neethiselvan., K. Elavarasan and F. Parthiban

Fisheries College and Research Institute, TNJFU, Thoothukudi. T. N.

*emiemarachel01@gmail.com

The use of natural baits in longline fishing evoked fishing pressure on the forage fishes, thereby promoting the development of alternative baits as an essential need for responsible longline fisheries. In this context, this research investigated the potential for formulating artificial fish bait using a surimi incorporated with attractants derived from processing wastes of shrimp, grouper, and tuna. Their fatty acid profiles were analysed using GC-MS, revealing the presence of 37 distinct fatty acids across the samples. Notably, the bioattractant sourced from grouper exhibited the highest proportion of unsaturated fatty acids (85.88%), followed by tuna (64.62%) and shrimp (62.35%). Four experimental bait formulations were developed: a control surimi gel bait (SGB), and three variants supplemented with grouper (SGB-GB), tuna (SGB-TB), and shrimp (SGB-SB) bioattractants at inclusion levels of 1%, 3%, and 5%. These baits were evaluated for key properties including gel strength (GS), water holding capacity (WHC), expressible moisture content (EMC), fat leaching (FL), seawater stability, and attractability, to determine the most effective fish bait. In terms of performance, the 5% SGB-GB bait outperformed others, showing superior fat leaching rate (86.34%), seawater stability (81.69%), attractability (28/30), gel strength (153.46 g/cm), lower EMC (13.52%), and high WHC (78%), identifying it as the most promising artificial fish bait for commercial fishing use.

Keywords: Artificial fish bait, bioattractants, fatty acid, stability, Attractability, forage fish

3D Food Printing from Design to Dish: A Novel Approach for Customizing Fish-Based Products

Bikash Kumar Pati*, Aditya Singh, Kumar Gaurav, Manoj Kumar Tripathy

Department of Fish Processing Technology, College of Fisheries, Central Agricultural University, Imphal, India

* bikashprocessing@gmail.com

3D food printing is an emerging technology that brings creativity, precision, and personalization to the food sector. This presentation highlights the journey of developing innovative fish-based food products using 3D printing—from digital design to the final edible construct. Unlike conventional cooking methods, 3D food printing allows layer-by-layer deposition of edible materials to create intricate shapes, textures, and nutritional profiles tailored to individual needs. The process begins with computer-aided design (CAD), followed by the selection of suitable food pastes like fish purees. Extrusion-based printing, using syringe, screw, or air-pressure systems, plays a central role in shaping the material. Various post-processing methods such as baking, microwave heating, drying, and frying are applied to enhance texture, appearance, and taste. Technologies like inkjet, binder jetting, and laser sintering are also discussed for their unique capabilities. The approach offers promising opportunities for product innovation, especially in seafood, where underutilized materials can be transformed into value-added, attractive, and functional foods. 3D food printing bridges the gap between digital design and culinary artistry, offering a sustainable and exciting path forward for food innovation.

Keywords: 3D food printing, fish-based product, extrusion, post-processing, food innovation

Impact of Including Small Fish Powder in Children's Diet Plans: A potential strategy for alleviating Assam's Dual Burden Malnutrition

Baishnaba Charan Ratha^{1*}, Baban Bayan, Neetha Shenoy¹, P. Arun Padiyar¹

¹WorldFish, Jalan Batu Maung, Batu Maung, 11960, Bayan Lepas, Penang, Malaysia,

²Assam Rural Infrastructure and Agricultural Services (ARIAS) under APART, Agriculture Complex, Khanapara, Guwahati-781022, Assam, India

³District Administration, Kamrup District, Kamrup– 757 001, Assam

*b.ratha@cgiar.org

India faces high malnutrition rates, especially among vulnerable groups like children under five, pregnant women, and marginalized communities, particularly in rural Assam, despite economic growth and healthcare improvements. The Government of Assam is implementing the Supplementary Nutrition Programme (SNP) to improve the health of children, pregnant women, and adolescent girls, including small fish powder, to reduce malnutrition among young children aged 3-10 years as a pilot basis. This entailed the blending of certified small fish powder in hot cooked and mid-day meals served to children aged 3 to 10 years of both Anganwadi and Lower primary schools. Based on a Government approved Standard Operating Procedure (SOP), the pilot was implemented in 55 Anganwadi Centers and 43 LP schools of Bongaon development block of Kamrup rural district for 6 months during September 2023 to February 2024. This is a groundbreaking and unique case of incorporating fish-based products in the government ICDS and School meal program (SNP) to address undernutrition challenges in the state. The findings showed statistically significant improvement in the severe stunting, underweight and severe underweight condition in the AWCs post intervention of the pilot initiative, and in lower primary schools also indicated an increase in BMI among the children with whom fish powder was introduced for a duration of six months. Thus, these results highlight the effectiveness of fish supplementation in government SNP for improving nutritional outcomes. Overall, based on the children, support staff and caregivers feedback, positive changes in anthropometric conditions and acceptance of small fish powder in SNP, as well as an enhanced understanding congregated from the pilot, we strongly advocate adoption of this nutrition-sensitive approach at the policy level in other Indian states and thus speedily scaled to ameliorate the rampant and humongous undernutrition challenge.

Keywords: Small fish powder, malnutrition, Supplementary Nutrition Programme, Stunting, Underweight, Wasting

Distribution of Key Melanin-Inducing Compounds (MICs) in Post-Harvest Melanosis of White Leg Shrimp (*Litopenaeus vannamei*)

Sushree Ratnamanjari Senapati ^{1*} and Amjad K. Balange ²

¹Department of Fisheries and Animal Resource Development, Govt. of Odisha, Bhubaneswar

²Division of Animal, Poultry and Fisheries Science, Indian Agricultural Research Institute (IARI), Dirpai Chapori, Gogamukh, Dhemaji District, Assam

*sushree.fishco22@gmail.com

The loss of shrimp's market value is mainly due to the formation of a black spot called melanosis, mediated by the enzyme polyphenol oxidase (PPO) during post-harvest handling and storage, which causes tremendous harm to the shrimp processing industry. The present study investigates the distribution of key melanin-inducing compounds (MICs) and their roles in various shrimp tissues - namely the liver, exoskeleton, hemolymph, hepatopancreas, and cephalothorax during chilled storage. Compounds such as L-tyrosine, copper, hemocyanin (Hc), protease, and tyrosinase were analysed for their potential to cause melanosis through PPO activity. In vitro assays demonstrated that hemocyanin could function as a MIC through hemocyanin phenol oxidase (HcPO) activity, especially in the presence of activators such as Sodium Dodecyl Sulfate (SDS), methanol, acetone, and urea. The specific activity of HcPO was highest in the presence of SDS, i.e., 51.54 U/mg. Furthermore, protease (from hepatopancreas) and tyrosinase (from liver) significantly elevated PPO activity, indicating their role in melanosis onset. Copper, an essential component of Hc, was also shown to act as a MIC at low concentrations. These findings provide insight into the biochemical pathways contributing to post-harvest melanosis in *L. vannamei* and offer a foundation for developing targeted interventions to preserve shrimp quality.

Keywords: Melanosis, Post-harvest, Polyphenol-oxidase, hemocyanin phenol oxidase

Evaluation of fish silage for replacement of fish meal in the diet of Magur (*Clarias batrachus*)

Debayan Rana, Goodly Samal*, Brundaban Sahu, Kedar Nath Mohanta
Abhinanda Jena and Manoj Kumar Tripathy

* goodlyouat28@gmail.com

The present experiment was conducted to find out the effect of silage based blended protein to replace fish meal protein on growth performance and feed efficiency of magur (*Clarias batrachus*) seed. Silage prepared by acid treatment of carp dressing waste was used to prepare a blended protein source by mixing fish silage (dry weight basis) ground nut oil cake (GNOC) and soybean meal (SBM) in 3:1:1 ratio. Five different iso-nitrogenous and iso-caloric experimental diets (viz., T₀, T₁, T₂, T₃ and T₄) containing 40% crude protein and 107 mg/kcal P:E ratio were formulated by replacing fish meal at 0%, 25%, 50%, 75% and 100% by fish silage based blended protein source. One hundred and fifty healthy fingerlings of uniform size were distributed into 5 experimental groups in triplicates. Each group of ten fish were then reared in 200 l FRP tank containing 120 l bore well water under continuous aeration. One part of water was replaced daily by siphoning to clean the tank water. The fish were fed with the respective diet at 4% of their body weight twice daily. After 90 days of feeding trial, treatment T₂ and T₃ with 50-75% fish meal replacement level were recorded significantly ($p < 0.05$) higher weight gain, weight gain percentage, specific growth rate, feed efficiency, protein efficiency ratio, protein productive value, lipid productive value and the lower feed conversion ratio. Though, there was no significant difference ($p > 0.05$) in the feed efficiency and growth parameters between T₃ & T₂, the values for T₃ remained the best always. Whole body carcass composition of all the treatments remained within the acceptable range of any food fish. On this context, it may be concluded that silage based blended protein source can replace fish meal upto 75% in the diet of magur (*Clarias batrachus*) to get significantly ($p < 0.05$) better growth performance and feed efficiency.

Keywords: Magur, *Clarias batrachus*, silage, blended protein source, fish meal replacement

Effect of shrimp shell chitosan spray on microbiological and sensory quality of pangas fillets during refrigerated storage

Siddhnath¹, Vijay Kumar Reddy Surasani¹, Ajeet Singh², Parmeet Kaur^{1*}

¹Department of Fish Processing Technology
College of Fisheries

Guru Angad Dev Veterinary and Animal Science University, Ludhiana
(Punjab) 141 004

²Department of Aquaculture,
College of Fisheries Science & Research Centre,
Chandrashekhar Azad University of Agriculture and Technology, Etawah,
Uttar Pradesh, India 208 002

*parmeetsaini75@gmail.com

Waste from *Litopenaeus vannamei* shells was valorized into chitosan, which was then evaluated for its potential as a natural preservative for seafood applications. Chitosan was extracted using chemical methods and its solubility in various acidic solutions was evaluated at different temperatures and concentrations. The antimicrobial efficacy of the extracted chitosan was tested against common foodborne pathogens, including *Aeromonas hydrophila*, *Vibrio alginolyticus*, *Morganella morganii* and *Vibrio parahaemolyticus*, with inhibition zones ranging from 9.5-29.8 mm depending on bacterial species and acid carrier. In addition, the application of chitosan was investigated in Pangas (*Pangasianodon hypophthalmus*) fish fillets stored at 2°C. Results demonstrated that 2% chitosan exhibited best solubility in a 1:1 mixture of acetic acid (5%) and citric acid (2%) and showed significant antimicrobial activity against the tested pathogens. It successfully inhibited microbial growth, maintained total bacterial counts below 6 log₁₀ CFU/g for up to 10 days and preserved sensory quality. These findings suggest that shrimp shell chitosan represents a promising eco-friendly approach for improving the safety and shelf life of fish products stored under refrigerated conditions, with significant potential for commercial food preservation applications in the sustainable seafood industry.

Keywords: Antimicrobial activity, Chitosan, Fillets, Solubility

Safety evaluation and risk assessment of edible seaweeds of Gulf of Mannar for Micropollutants

Shanmugam Sundhar^{a*}, Robinson Jeya Shakila^b, Rajendran Shalini^a, Balasubramanian Sivaraman^a, and Ulaganathan Arisekar^a and Karuppanan Iswarya^a

^a Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Department of Fish Quality Assurance and Management, Fisheries College and Research Institute, Thoothukudi 620 008, Tamil Nadu, India

^b Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Paraprofessional Institute of Fishing Technology, Pirappanvalasai, Ramanathapuram 623 516, Tamil Nadu, India

[*sundhar.fqm16@gmail.com](mailto:sundhar.fqm16@gmail.com)

The present study showed that edible seaweeds, such as *Kappaphycus alvarezii*, *Ulva lactuca*, and *Caulerpa racemosa*, collected from different locations in the Gulf of Mannar, among the seaweeds, *K. alvarezii* accumulated more PTEs, while other seaweeds accumulated PRs. Thermal processing makes seaweed more suitable for consumption. Thermal processing, such as boiling, steaming, and microwave cooking, significantly reduced PTEs and PRs from seaweed to levels of 100% and >85%, respectively. Bioaccessibility results indicated high bio-digestion (up to 95%) but lower bio-absorption (3–46%) of PTEs and PRs. Human health risk assessment (THQ, LCR) indicated that all seaweeds, except for those containing elevated Hg or endrin, are safe for consumption, especially after thermal processing. Socio-economically, this study helps policymakers to regulate seaweed harvesting and supports the promotion of safe seaweed consumption.

Keywords: Seaweeds, potentially toxic elements, Pesticide residues, Thermal Processing, Bioaccessibility, Safety

Extraction, purification and utilization of *Pangasius* visceral oil for functional fish product development

Brithisha K¹, Layana P*¹, Purva Saran, Dharani M¹, Binaya Bhusan Nayak¹,
Tincy Varghese²

¹Department of Fish Processing Technology, ICAR-Central Institute of
Fisheries Education,

Versova, Mumbai-400 061, Maharashtra, India

²Biochemistry and Nutrition Division, ICAR-Central Institute of Fisheries
Technology, Kochi-682 029, Kerala, India

*layanap@cife.edu.in

This study investigated the extraction and quality assessment of oil derived from *Pangasius* visceral fat using three different methods: Microwave (MW) extraction, rotary evaporation under vacuum (RO), and wet rendering (WR). Among the techniques, MW extraction yielded the better-quality oil with highest yield. Despite satisfactory extraction efficiency, the crude oils exhibited poor oxidative stability, hence, a three-step refining process, including degumming, neutralization, and bleaching, was carried out. A 25-day storage study was conducted to monitor oxidative stability, and refined oil was found to have 10 days' extension in shelf-life than crude oil. The refined oil (T2) and crude oil (T1) were then incorporated into fish sausage formulations by replacing 5% sunflower oil used in the control (C). A 25-day storage study of was conducted to evaluate the quality parameters, including biochemical indices, physical properties, microbial load and sensory attributes. Results showed that sausages formulated with refined *Pangasius* oil (T2) exhibited superior quality and stability compared to T1 and were comparable to the control. These findings highlight the potential of refined *Pangasius* visceral oil as a viable alternative to conventional oils in functional meat product development and enable to utilize the visceral waste effectively.

Keywords: *Pangasius* viscera, Microwave extraction, Refined fish oil, Oxidative stability, Fish sausage

Sub-Theme-VI
Aquafeed technology & Nutrigenomics applications
(ATNA)

**Assessment of growth pattern with probiotic-supplemented diet in
*Carassius auratus***

Manoj Kumar Tripathy*, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam, Bikash Kumar Pati and Santosh Kumar Udgata

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

A 90-day experiment was conducted and repeated in subsequent years under laboratory conditions in glass aquaria to study the effect of commercial probiotic Aqualact at different levels on the growth pattern of *Carassius auratus*. To elucidate the growth pattern, the length-weight relation, condition factor (Kn), and relative growth coefficient (b) among experimental fishes were recorded and calculated. The exponent “b” value in the treatments was estimated as 2.257, 2.302, 2.320, 2.357, 2.827, and 2.307 in T₀, T₁, T₂, T₃, T₄, and T₅, respectively. The highest “b” value was obtained from the aquarium treated with diet containing Aqualact @0.6 % (T₄), while the lowest value was in the untreated aquarium (T₀). The results indicate negative allometric growth of *Carassius auratus* in the control as well as treated aquariums, except T₄. The results of the Length-weight relationship indicated negative allometric growth in the control as well as treated aquariums, except T₄ during both years. The value of “b” in the length-weight relationships remained within the acceptable and expected range of 2.5 and 3.5, with the highest “b” value was obtained from the aquarium treated with diet containing Aqualact @ 0.6 % (T₄) while lowest value in the untreated aquarium (T₀) in both experimental years. The relative condition factor (Kn) was found to be 0.76, 0.79, 0.79, 0.84, 0.93, and 0.78 respectively in T₀, T₁, T₂, T₃, T₄ and T₅ during the first year, while it was 0.78, 0.79, 0.82, 0.81, 0.95 and 0.80 respectively in T₀, T₁, T₂, T₃, T₄ and T₅ during the second year. The Kn value varied between 0.76 and 0.93 during first year, while it varied between 0.78 and 0.95 second year. The positive correlation co-efficient was obtained between the length and relative condition factor indicating a degree of positive association.

Keywords: *Carassius auratus*, probiotics, growth pattern, length-weight relation, condition factor (Kn), relative growth co-efficient

ATNA-2

Assessment of different wet feeds on growth parameters and economics of mud crab *Scylla serrata* during fattening in field condition

S. S. Das*¹, D. Choudhury², S. K. Nath¹ and M. K. Tripathy²

¹ Krishi Vigyan Kendra, Ganjam-II, Golanthara, Berhampur, Ganjam, Odisha-761 008

² College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-760 007

*sidharthasdas@ouat.ac.in

The purpose of the current study was to evaluate the growth performance of *Scylla serrata* fed with various processed wet diets during fattening. There are about 510 ha brackish water areas covering 5 numbers of coastal blocks of Ganjam district, Odisha, where both the shrimp and crab cultivation is going on. Krishi Vigyan Kendra, Ganjam-II under OUAT, Bhubaneswar has carried out one On Farm Trial (OFT) in farmer’s field of Chikiti block of Ganjam district, Odisha. The trial was conducted in a total of 15 numbers pond of each 0.40 acre. Crabs weighing 250–300 g were stocked in individual HDPE crab box of 0.75 kg capacity (340×300×275mm) hanging in to the pond water through a floating raft system made up of with PVC pipes. The experiment was conducted with three different feed treatments including processed chicken intestine (TO₁-Technology Option 1), Oyster meat (TO₂-Technology Option 2) and the control feed (FP-Farmers Practice) was processed small-sized low-value cheap fish. From the period of fattening of 45-60 days, there was a significant difference ($P \leq 0.05$) in weight gain and yield observed between FP-TO₁ and FP-TO₂, though TO₁ and TO₂ were at par with respect to yield. The highest yield of 310^{bc}±2.55 kg/acre obtained in TO₁ followed by 280^b±2.62 kg/acre in TO₂ and 210^a±3.85 kg/acre in FP. Both the treatment TO₁ and TO₂ showed higher survivability ranging from 84-87% in comparison to FP of 68-72%. Highest net return to Rs. 228000/acre/cycle with BC ratio of 2.32 was achieved in TO₁, whereas the net return and BC ratio per acre per cycle of TO₂ was at Rs. 195000/acre/cycle and 2.05 and that of FP at Rs. 125000/acre/cycle and 1.78 respectively. The higher economic performance in TO₁ is due to the easy availability and low cost of chicken intestine. Of all the feeds, mud crabs that were fed with processed chicken intestine showed better performance, followed by oyster meat and low-value fish, hence can be practiced getting better yield without any detrimental effect to the pond ecosystem.

Keywords: Brackish water, Mud crab, Feed, fattening

Ameliorated linseed oil cake through solid state fermentation as improved feed ingredients in rohu fingerlings

D. Choudhury*, B. sahu, S. S. Das, M. K. Tripathy and S. K. Udgata
College of Fisheries (OUAT), Rangailunda, Berhampur, Ganjam, Odisha-
760007

*dharithrichowdhury@ouat.ac.in

The study was carried out to delineate the efficacy of solid-state fermentation on linseed oil cake (LSOC) on growth, final carcass composition and survivability of rohu fingerlings. To ameliorate the anti-nutritional factor, phytic acid present in raw LSOC solid state fermentation with bacteria and yeast was followed and 72hrs solid state fermentation of the raw LSOC with yeast was discovered to be most successful in terms of low phytic acid percentage (0.199 ± 0.002) and high crude protein content (32.56 ± 0.12). Four iso-nitrogenous and iso-caloric diets were prepared and fed to Rohu fingerlings for a period of 60 days. The different experimental diets were T₀: control diet without LSOC; T₁: diet in which 50% ground nut oil cake replaced with 72hrs solid state fermented LSOC; T₂: diet in which 75% ground nut oil cake replaced with 72 hrs solid state fermented LSOC; T₃: diet in which 100% ground nut oil cake replaced with solid state fermented LSOC. A significantly ($P < 0.05$) higher crude protein (68.967 ± 0.198) was found in the T₃ group where 100% ground nut oil cake is replaced by 72hrs solid state fermented LSOC which is followed by T₂ group (68.920 ± 0.090) in which 75% ground nut oil cake is replaced by 72hrs solid state fermented LSOC. A significantly higher body weight gain percentage (356.405 ± 5.450), DWG (0.201 ± 0.003) and SGR (2.586 ± 0.045) was found in T₃ group where 100% of groundnut oil cake is replaced by 72hrs solid state fermented LSOC, followed by T₂ and T₁ group where 75% and 50 % of groundnut oil cake is respectively replaced by 72 hrs solid state fermented LSOC. The feed quality parameters (FCR, PER, & PPV) were significantly better in T₃ group where 100% GNOC is replaced with fermented LSOC. The survivability was found to be 100% in all the experimental tanks indicating no deleterious effect of linseed oil cake on health of fish. Thus, based on the findings of current investigation this is suggested that replacement of ground nut oil cake at 100% level by solid state fermented LSOC could enhance growth in rohu fingerlings.

Keywords: Rohu fingerlings, linseed oil cake, phytic acid, solid state fermentation

Effect of dietary supplementation of vitamin-c and spirulina (*Arthrospira platensis*) on growth performance and haematology of rohu, *Labeo rohita* (Hamilton, 1822)

Ranjana Damle¹, Manoj Singh¹, Dushyant Kumar Damle² and Jham Lal²

¹Department of Zoology, Kalinga University, Naya Raipur, Chhattisgarh-492101, India

²Late Shri Punaram Nishad College of Fisheries, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh-491995, India

*roshanidk0702@gmail.com

An experiment was conducted for 60 days to evaluate the growth performance, feed utilization and haematological parameters of rohu, *Labeo rohita*, under different dietary treatments. The study comprised four experimental treatments with three replicates each, along with a control group. This study prepared 4 experimental feeds, which included Control (0), T₁ (10 g), T₂ (15 g) and T₃ (20 g) of spirulina powder-containing diet. The nutritional profile of experimental diets was observed, such as crude protein (30.36-30.73%), lipids (5.17-5.57%), moisture (8.26-8.64%), ash (15.17-15.87%), crude fibre (9.92-11.27%), and nitrogen-free extract (27.92-30.73%). The highest haematological parameters observed of Nile tilapia include red blood cells (6.83±0.013), white blood cells (62.36±0.80), haemoglobin (6.65±0.036), mean corpuscular volume (136.66±0.20), mean corpuscular haemoglobin (27.64±0.21), mean corpuscular haemoglobin concentration (23.55±0.25) and haematocrit (25.52±0.31) within the healthy physiological range. The highest growth performance such as length gain (9.26±0.057), weight gain (12.80±0.10), percentage weight gain (304.76±2.38), specific growth rate (0.67±0.002), protein efficiency ratio (2.43±0.014), hepatosomatic index (0.039±0.001), and intestinal somatic index (0.48±0.005) were observed in T₃, whereas the highest feed conversion ratio (1.67±0.028) was in the control group compared to the other treatment groups. The highest antioxidant activities including catalase (256.34±1.98), glutathione s-transferases (176.64±0.31) and superoxide dismutase (45.37±0.80) was observed in T₃ compared to the other treatment groups. The highest carcass composition was observed, including crude protein (16.64±0.049), crude lipid (6.35±0.036), moisture (70.46±0.088), ash (2.64±0.041), and NFE (6.50±0.14) compared to the other treatment groups. The acceptable range of water quality parameters was observed during the experiment. The results suggest that the specific dietary T₃ group enhanced the overall growth, feed utilization and haematological parameters of Nile tilapia.

Keywords: *Labeo rohita*, Spirulina, Growth performance, Haematology, Antioxidants, Carcass composition, Water quality

Tulsi Mediated Immunostimulation in Fish: A Promising Approach for Aquaculture

Chandan Kumar Sahoo*, Dikshya Mohanty, Santosh Kumar Udgata, Manoj Kumar Tripathy and Arpit Acharya

College of Fisheries, OUAT, Rangailunda, Berhampur-07

*sahoochandan977@gmail.com

The predominant cause of global morbidity and mortality is lifestyle related chronic diseases, many of which can be addressed through Ayurveda with its focus on healthy lifestyle practices and regular consumption of adaptogenic herbs. Of all the herbs used within Ayurveda, Tulsi (*Ocimum sanctum linn*) is pre-eminent, and scientific research is now confirming its beneficial effects. Tulsi (*Ocimum sanctum*) also known as holy basil, is a plant revered for its medicinal properties. Its immunostimulatory effects have collect attention in various fields, including aquaculture. Sacred basil is highly regarded for its restorative qualities in Ayurvedic and Siddha therapeutic system. In aquaculture, the trend is shifting towards using plant-derived alternatives that are abundant in phytochemicals as effective replacements for traditional antibiotics and synthetic feed additives to reduce antimicrobial resistance. The use of antibiotics and chemotherapeutics in aquaculture has faced significant criticism due to adverse effects, such as drug accumulation in tissues, the development of drug resistance, and immunosuppression. In response to these concerns, immunostimulants have emerged as preventive measure. By enhancing growth performance, feed conversion efficiency, and key hematological and biochemical parameters, Tulsi emerges as powerful natural supplement. It shows remarkable benefits in species such as Common carp, Rohu and Sea bream etc. Tulsi leaf extract reduced oxidative stress in the fish body because of its proper growth, and more body weight gain was observed. Tulsi-mediated Immunostimulation in fish presents a promising approach for sustainable aquaculture practices, offering a natural and eco-friendly solution to enhance fish health, reduce disease susceptibility.

Keywords: Tulsi (*Ocimum sanctum*), Antimicrobial resistance, Immunostimulant, Immunosuppression, Hematology

From Genes to Feed: Nutrigenomics for Sustainable Fish Production

Dikshya Mohanty*, Chandan Kumar Sahoo, Santosh Kumar Udgata, Manoj Kumar Tripathy and Arpit Acharya

College of Fisheries, OUAT, Rangailunda, Berhampur-07

*dikshyamohanty83@gmail.com

Aquaculture has lagged far behind medical research in applying genetics improvement techniques, but the scenario is changing rapidly. Nutrigenomics (also known as nutritional genomics) is broadly defined as the relationship between nutrients, diet, and gene expression. In addition to the effect of genes on the phenotype (i.e. the physical expression of genetic traits), genes can also respond to environmental influences – of which nutrition is one such influence. Fish feed is often the most expensive operational cost of fish farmers, typically accounting for 50-70% of total production expenses. Fish prefers to use protein as a source of energy. In the farming of these animals in an environment unlike their natural habitat, feeding of the stocked population with nutritionally balanced feed is utmost important. Nutrigenomic studies have immense application in the aquaculture sector as there is depletion in natural fish population due to overfishing, destruction of juveniles, etc., so there is high dependency on cultured species. Using new omics technologies, including transcriptomics (micro-array and RNA-seq) and proteomics, the impacts of nutrition on the immune system is becoming clearer. In India, nutrigenomics research is an up-and-coming field, especially the transcriptomics approach that can be applied to understand the gene expression profile of larvae and juveniles with respect to nutritional interventions. Nutrigenomics in fish nutrition offers several advantages, including the ability to optimize feed formulations for improved growth, health, and disease resistance as well as the potential to develop sustainable and personalized aquaculture practices.

Keywords: Nutrigenomics, Phenotype, Transcriptomics, Fish nutrition

Nutritional composition of thirteen commercially important fishes from the river Damodar, a major tributary of river Ganga

Satabdi Ganguly*, Basanta Kumar Das, Archisman Ray, Subhamoy Dutta, Suraj Chouhan, Sanatan Bera, Anjon Kumar Talukder, Mitali Maity, Raju Baitha

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120

*satabdiganguly19@gmail.com

Damodar river is a major tributary of the Ganga, flowing through the states of West Bengal and Jharkhand. Fish is highly nutritious food, rich in high-quality animal proteins, essential amino acids, and polyunsaturated fatty acids (PUFAs), particularly omega-3 PUFA, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). This study assessed the nutritional composition of thirteen commercially important fish species from the river Damodar, analysing their gross chemical composition, amino acid profiles, and fatty acid composition. The amino acid composition was analysed using UPLC (ACQUITY UPLC H-Class-AAA, Waters), and fatty acid composition analysis was done using GC/MS (ITQ900, Thermo Scientific). Thirteen fish species studied included *Ailia coila*, *Xenontodon cancila*, *Rasbora daniconius*, *Parambassis ranga*, *Sperata seenghala*, *Gudusia chapra*, *Barilius bendelisis*, *Labeo dyocheilus*, *Cirrhinus reba*, *Notopterus notopterus*, *Labeo bata*, *Chagunius chagunio* and *Puntius conconius*. These species exhibited diverse nutritional profiles. Species like *Xenontodon cancila* and *Labeo bata* were found to be protein-rich, whereas *Ailia coila* and *Puntius conconius* were rich in oil. Most species were rich in essential amino acids like glutamic acid and lysine, with aspartic acid as a common non-essential amino acid. Fatty acid analysis revealed dominance of omega-3 PUFA, DHA and monounsaturated fatty acid, MUFA oleic acid (C18:1), indicating high nutritional value across the studied species.

Keywords: Nutritional composition, Amino acid, Fatty acid, river Damodar, Fish nutrition

Dietary Supplementation of Folic Acid Enhanced Vitellogenesis in Soybean Meal-Fed Female *Cyprinus carpio*

Pallath Muhammed Nuzaiaba ^{1*}, Subodh Gupta², Tincy Varghese³, Narottam Prasad Sahu², Prem Prakash Srivastava⁴

¹ICAR-Indian Agricultural Research Institute, Gauriakarma, Hazaribagh, Jharkhand-825405

²ICAR-Central Institute of Fisheries Education, Mumbai-400061

³ICAR-Central Institute of Fisheries Technology, Kochi-682029

⁴Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar-848 125

Folic acid plays a pivotal role in fish reproduction, particularly in enhancing vitellogenesis, fecundity, and gonadal development. Soybean meal, a widely used plant-based protein in aquafeeds, contains phytoestrogens that may disrupt endocrine function in fish when included at high levels ($\geq 30\%$). This study evaluated the impact of dietary folic acid supplementation (4 mg/kg) on the reproductive health of adult female *Cyprinus carpio* fed diets containing graded levels of soybean meal (20%, 30%, and 40%). Following a 60-day feeding trial, reproductive biomarkers were assessed, including serum hormone profiles, vitellogenin concentration, gene expression of vitellogenin (*vtgB2*), aromatase enzymes (*cyp19a*, *cyp19b*), estrogen receptors (*era*, *erβ*), and ovarian histology. Folic acid supplementation significantly increased follicle-stimulating hormone (FSH) and estradiol levels, while decreasing thyroxine (T4) and testosterone concentrations compared to non-supplemented groups. Enhanced expression of *vtgB2* and *erβ*, elevated vitellogenin levels, and a higher number of vitellogenic oocytes were observed in the folic acid-supplemented groups. These results suggest that folic acid supplementation at 4 mg/kg effectively mitigates the adverse effects of high soybean meal inclusion on reproductive performance in female *Cyprinus carpio*. Therefore, folic acid enrichment is recommended in feeds containing more than 30% soybean meal to counteract the endocrine-disrupting potential of soy phytoestrogens.

Keywords: folic acid, phytoestrogen, soybean meal, estrogen receptor, vitellogenin, endocrine disruption.

Determination of Optimum Dietary Protein and Lipid level of Stinging Catfish, *Heteropneustes fossilis* fingerling

Satabdi Saibalini*¹., P. C. Das²., S. K. Udgata¹., Brundabana Sahu¹., N. K. Chandan²., S. N. Sethi²., G.K. Kund¹ and Kedar Nath Mohanta³

¹College of Fisheries (OUAT), Rangailunda, Berhampur (Odisha), India.

²ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, India.

³ICAR-Central Institute of Fisheries Education, Versova, Mumbai (Maharashtra), India.

[*dashsatabdi2@gmail.com](mailto:dashsatabdi2@gmail.com)

A 3×3 factorial experiment has been conducted to optimise the dietary protein and lipid requirement of stinging catfish (*Heteropneustes fossilis*). Nine semi-purified diets (D1, D2, D3, D4, D5, D6, D7, D8, and D9) were formulated with three different percentages of protein (35%, 40% and 45%) and lipid (4%, 8%, and 12%). Each type of diet was fed to a triplicate group of fish for 90 days. Fish having an initial weight of 5.76±0.02 g was distributed into twenty-seven numbers of FRP tanks (50 L) with fifteen numbers of fish in each of them. The result revealed that, the significantly higher (p<0.01) weight gain (WG), percentage weight gain (WG%), feed efficiency ratio (FER), specific growth rate (SGR) and protein efficiency ratio (PER) was recorded in the group of fish, fed with diet (D5) of 40% protein and 8% lipid. Significantly lower feed intake (FI) and feed conversion ratio (FCR) were recorded in the same dietary(D5) group. The hepatosomatic index (HIS) and viscera-somatic indices (VSI) were found to be significantly higher in the group of fish, had been fed with D2 (35% protein and 8% lipid) and D9 (45% protein and 12% lipid) respectively. In conclusion, the dietary protein and lipid requirements of *Heteropneustes fossilis* fingerling can be optimised to 40% and 8% respectively.

Keywords: Protein, Lipid, Diet, Nutrient, Growth, Stinging catfish, *Heteropneustes fossilis*

Investigating the Effects of *Terminalia Arjuna* Extracts on Growth, Immunity, and Disease Resistance in *Labeo Rohita*

D.K. Meena^{1*}, B.K. Das¹, A.K. Sahoo¹, N.P. Sahu², P. P. Srivastava², B.K. Behera¹

¹ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-

²ICAR-Central Institute of Fisheries Education, Mumbai-400 061

* dkmeenacifri@gmail.com

In the present study, three trials were conducted to evaluate the effects of *Terminalia arjuna* solvent extracts on growth, immune response, and disease resistance in *Labeo rohita*. Among the tested extracts, ethanolic bark extract showed broad-spectrum antimicrobial activity against 17 bacterial strains, the fungus *Aphanomyces invadans*, and the parasite *Argulus bengalensis*, followed by methanolic bark > acetone bark > methanolic fruit > ethanolic leaf extracts. Phytochemical analysis revealed gallic acid and ellagic acid as key antioxidants, while flavonoids such as myricetin and quercetin were common in bark and leaf extracts. In both indoor and outdoor feed trials, dietary supplementation with *T. arjuna* bark powder (TABP) at 10 g/kg feed significantly improved growth, immune response, and disease resistance. The intraperitoneal inoculation trial showed the best result at 120 µg/ml/fish. Maximum weight gains in the indoor (90 days) and pond (60 days) trials were 148.41±0.85% and 134.51±3.31%, respectively. In the hypodermal inoculation experiment, the highest gain occurred within the first 15 days. Gene expression studies revealed Mx as the most upregulated gene, followed by ISG15 and STAT1 across feed and inoculation trials, particularly post-infection. Digestive enzyme activity, oxidative stress enzymes, serum and hematobiochemical parameters aligned with TABP dosage and growth trends. Optimal dietary doses were 7.9 g/kg (indoor) and 8.5 g/kg (outdoor) trials. Histological analysis confirmed positive organ-level changes, and gut microbiome studies supported the normobiosis hypothesis, indicating beneficial modulation of gut flora. The findings suggest TABP is an effective feed additive for enhancing fish health and productivity. Additionally, ethanolic and methanolic bark extracts appear safe for hosts and hold potential for development as bio-pesticides against fish pathogens.

Keywords: *Terminalia arjuna*, Immunomodulation, Antimicrobial activity, Fish nutrition, Phytotherapy

Effect of dietary phytase on phosphorous excretion and growth performance of GIFT juveniles reared in Recirculatory Aquaculture System

Vijayakumar Sidramappa Mannur, Sikendra Kumar*, Tincy Verghese, Kedar Nath Mohanta and N.P. Sahu

ICAR-Central Institute of Fisheries Education, Versova, Mumbai

*sikendra@cife.edu.in

Recirculatory Aquaculture System (RAS) is an intensive, indoor tank-based aquaculture system that operates with re-use of culture water by mechanical, chemical, and biological filtration. Despite such advantages, one of the major problems in this high-density culture system is the accumulation of unutilized phosphorus in culture water, which further causes eutrophication when released into the natural waters. To solve this practical and very pertinent problem, a 60-day experiment was conducted to study the effect of inclusion of phytase in the diet of genetically improved farmed tilapia (*Oreochromis niloticus*) GIFT juveniles on phosphorus excretion and on the growth performance when reared in RAS. Six diets were formulated with gradually increasing levels of phytase enzyme, designated as Control (no phytase), P1 (750 FTU/kg), P2 (1000 FTU/kg), P3 (1250 FTU/kg), P4 (1500 FTU/kg), and P5 (1750 FTU/kg). To get 500 FTU of enzymatic activity, 100 mg of phytase enzyme was added to the aquafeeds. GIFT juveniles of initial size 7.0 ± 0.2 g were randomly stocked into eighteen experimental RAS tanks of 50 L capacity to meet the uniform stocking density of 6000 g/m³ (1200 fish/m³). The results showed that the phosphorus (PO₄³⁻) excretion has reduced significantly ($p < 0.05$) from P1 to P6 with increasing inclusion of phytase enzyme in the diets of GIFT juveniles reared in RAS. Additionally, the P4 group has demonstrated significantly ($p < 0.05$) higher weight gain (WG), specific growth rate (SGR) and feed conversion ratio (FCR) compared to other treatment groups, which indicates the inclusion of phytase above 1250 FTU/kg feed may have negative affect on the growth of fish. Hence, it can be concluded that the inclusion of 1250 FTU phytase enzyme in 1 kg of feed can help to utilize the phytate content by the GIFT, which further reduces the phosphorus excretion by the fish into the culture water, with enhanced production.

Keywords: Dietary intervention, Phytate, Phytase enzyme, Phosphorous excretion, Growth

Dietary Melatonin Boosts Reproduction and Growth Performance of Ornamental Fish Giant Danio (*Devario aequipinnatus*): A Transformative Approach for Scrapping Wild-Caught Fish Business

Khusbu Samal¹, Pradyut Biswas¹, Soibam Khogen Singh^{1,2}, Pronob Das³, Reshmi Debbarma¹, Suparna Deb¹, Dharmendra Kumar Meena⁴, and Simanku Borah³

¹College of Fisheries, Central Agricultural University, Lembucherra 799 210, Tripura West, India

²Krishi Vigyan Kendra, ICAR Research Complex NEH Region, Manipur Centre, Ukhrul 795 142, India

³ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati 781 006, Assam, India

⁴ICAR-Central Inland Fisheries Research Institute, Barrackpore 700 120, West Bengal, India

The current global trade in endemic ornamental fishes largely depends on wild-caught species, raising sustainability concerns. This study evaluated the impact of dietary melatonin on the reproductive and physiological performance of *Devario aequipinnatus* (giant danio). A control diet with 35% protein was supplemented with melatonin at 2 mg (M1), 10 mg (M2), 50 mg (M3), and 100 mg (M4) per 100 g of feed. Fish (1.13 ± 0.15 g) were stocked in triplicate (n=10) and fed 5% body weight twice daily for 60 days. Key reproductive parameters including gonadosomatic index (GSI), fecundity, egg diameter, and gonadal histology were analyzed. GSI peaked at 3.05% in the M3 group (p < 0.05), showing advanced oocyte and spermatid development. Egg diameter also increased with dosage up to M3. Vitellogenin and testosterone levels were significantly higher in M3 compared to control. Broken-line regression identified 63 mg/100 g as the optimal dose for growth. Melatonin enhanced haematological indices and antioxidant enzyme levels, with no adverse impact on glucose or cortisol levels. However, M4 showed reduced performance. Overall, melatonin at 50–63 mg/100 g improved reproductive and health parameters, supporting its role in captive breeding strategies for sustainable ornamental fish trade.

Keywords: *Devario aequipinnatus*; gonadosomatic index; melatonin; ovarian; physiological

Growth, antioxidant enzyme and immunological responses of *Pangasianodon hypophthalmus* Juveniles fed on diets supplemented with microalgae (*Nannochloropsis oceanica*)

Neha Swain^{1,2*}, K.C Das¹, Rakhi Kumari¹, Aradhana Mohanty¹, Satya Narayan Sahoo¹, S.K Udgata² and Dharitri Choudhury²

¹ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha-751 002, India

²College of Fisheries, OUAT, Rangailunda, Berhampur-760 007

*swainneha342@gmail.com

Microalgae like *Nannochloropsis oceanica* possesses probiotic, prebiotic, immunostimulant, antiviral and antibacterial properties which are rich in omega 3 fatty acids and high-quality protein. Considering the high potential of microalgae as feed additive, a 60-day feeding trial was conducted at ICAR-CIFA, Bhubaneswar and its effects were evaluated in terms of growth, digestive enzymes, antioxidant and immune responses in *Pangasianodon hypophthalmus*. Six iso-nitrogenous diets were formulated with 0, 0.25, 0.5, 1.0, 1.5, and 2.0% of *Nannochloropsis oceanica* biomass and fed twice daily at 3% of body weight. The growth parameters like percentage weight gain, specific growth rate, feed conversion ratio and protein efficiency ratio were significantly improved with inclusion level up to 1.0% with highest positive effects at 0.25% level. Antioxidant enzymes like superoxide dismutase, catalase and gut enzyme activity like lipase were elevated in all the groups supplemented with microalgae. Non-specific immune responses (lysozyme, myeloperoxidase, bacterial agglutination, and haemolytic activity) increased significantly up to 1.0% level with the most pronounced effects at 0.25% level of inclusion. Thus, dietary inclusion of microalgae up to 1 % level significantly improved growth, digestive activity, antioxidant defense, and immunity in *P. hypophthalmus* juveniles with highest positive effect at 0.25% level of inclusion.

Keywords: *Nannochloropsis oceanica*, *Pangasianodon hypophthalmus*, Growth, Enzyme activity, Immune responses

Recycling Agro-Waste in AQUAFEED: Growth Performance of Fish Fed Diets Containing Banana Peel Powder

Priyanka Acharya^{1*}, Saumyendra Nanda¹ and Bhagchand Chabba²

¹College of Fisheries (OUAT), Rangailunda, Berhampur - 7, India

²LSPN, College of Fisheries, Kawardha, Chattisgarh, 491 995

*prtifiscos@gmail.com

The high cost and environmental impact of conventional fish feed ingredients have prompted the search for sustainable and low-cost alternatives. Banana peel, an agro-industrial waste product, is rich in dietary fiber, carbohydrates, polyphenols, and essential minerals, making it a potential feed additive in aquaculture. This study evaluates the feasibility of incorporating banana peel powder (BPP) into formulated fish diets. Dried and milled banana peels were included in experimental diets at varying inclusion levels (0%, 5%, 10%, and 15%) and fed to *Oreochromis niloticus* (GIFT) juveniles for a period of 60 days. Growth performance, feed conversion ratio (FCR), protein efficiency ratio (PER), and survival rate were monitored. Results indicated that inclusion of up to 10% BPP did not negatively affect fish growth or feed utilization, while higher levels showed a slight decline in performance, possibly due to high fiber content. Additionally, fish fed with BPP-supplemented diets exhibited improved antioxidant activity and gut health. The findings suggest that banana peel powder can be utilized as a functional and eco-friendly ingredient in fish feed formulations, promoting circular bio-economy in aquaculture.

Keywords: Banana peel powder; *Oreochromis niloticus*; Fiber; Conventional feed.

Study on preformance of growth promotoeer for fry production in nursery pond of Balasore district

Swagatika Sahu*, Niroj Kumar Jena, Kamalakanta Behera, Amita Rani Patra, AmitJyotiMajhi and Pravamanjari Giri
Krishi Vigyan Kendra (OUAT), Balasore, Odisha-756023

*swagatikasahu@ouat.ac.in

Aquaculture plays a crucial role to meet the food requirement for poverty elevation, livelihood support, nutritional security, income generation and employment opportunity across the world. Quality seed and nutritious feed are the two major components which influence the aquaculture productivity and profitability. Besides healthy seed, survival percentage is also significant in nursery rearing phase. The present work was designed under On Farm Trial programme of Krishi Vigyan Kendra, Balasore during 2024-25. The study was carried out at nursery ponds of farmer’s field to evaluate the survival & growth performance of Rohu fry with two treatments i.e. T1: spawn fed with Manganous sulphate and Cobaltous chloride, each at a dose of 0.01mg per spawn per day incorporated with powdered feed, T2: Spawn fed commercially available yeast powder (*Saccharomyces cerevisiae*) at a dose of 0.05% of total powdered feed to be served daily. In control (T0): spawn fed with only powdered feed rice bran: GNOC 1:1 ratio. Seven farmers were selected each having 3 nos. of 5 decimal ponds. Pre-stocking Pond preparation was done followed by stocking of rohu spawn @75 lakhs/ha with formulated feeding practices. Water quality parameters such as pH, total alkalinity and hardness were recorded with pH varies from 7.8-8.4, total alkalinity 110- 140 mg/lit as CaCO₃, total hardness 95-110 mg/lit as CaCO₃. The survival percentage of fry were 38.42% in T1 and 35.86% in T2 with B:C ratio 2.58 and 2.51 respectively as compared to control, where survival percentage of fry was 30.60% and B:C ratio was 2.06. The net income of Rs 353200/- was found in T1 with Manganous sulphate and Cobaltous chloride and that of T2 commercially available yeast powder was Rs 323800/-, whereas in control net income was Rs 266600/- per ha. The findings suggested that use of Manganous sulphate and Cobaltous chloride effectively helps in higher survival & improved growth of fry in the nursery pond.

Keywords: Spawn, Growth promoter, survival rate, B:C ratio

Microplastic contamination pattern in dried seafood through environmental sources: Need for managerial action in coastal regions

K.A. Martin Xavier*, Aslam Mohamed, A.A. Zynudheen, George Ninan

ICAR Central Institute of Fisheries Technology, Matsyapuri P.O

Willingdon Island, Cochin, Kerala, India

*martinxavierkochery@gmail.com

Coastal regions in developed and densely populated urban areas face a significant challenge in the form of plastic pollution. This issue arises from the combination of marine litter and the discharge of municipal effluent into coastal waters, resulting in the generation of microplastics and associated contaminants. Microplastics, characterized as plastic materials or fragments within the size range of 1 μ m to 1000 μ m, are ubiquitous across various environments, particularly in oceans, where they substantially threaten marine ecosystems. The presence of microplastics in marine environments has raised concerns about their potential transfer to seafood, prompting questions about the implications for human health. Traditional fish preservation methods, such as drying and salting, are of particular interest due to their prevalence in the culinary practices of coastal communities in economically challenged countries. Solar salt, prepared from coastal waters, is a commonly used component in the fish salting process due to its cost-effectiveness and ready availability. During the salting procedure, microplastics are entrapped within the fish muscle due to the salting-in and salting-out mechanisms. Subsequently, as the fish undergoes the drying process, the microplastics and their associated contaminants accumulate within the salted fish. The contamination load increases through exposure to atmospheric deposition and the utilization of rudimentary processing techniques. The consumption of heavily contaminated seafood products gives rise to legitimate health safety concerns. With this background, this study investigates the contamination patterns, levels, and the corresponding management strategies related to locally produced salted fish samples.

Keywords: Microplastics, Litter, Contaminants of Emerging Concern, Hazard, Safety

Impact of Bisphenol A on Physiological Responses in the Freshwater Bivalve, *Parreysia corrugata* (O. F. Müller, 1774)

Shreya Roy*^{1,2}, Basanta Kumar Das¹, Debasmita Mohanty¹, Barsha Baisakhi¹, Anjon Talukdar¹, Pranaya Parida¹ and Kausik Mondal²

¹ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata 700 120, India

²Department of Zoology, University of Kalyani, Nadia 741235

*shreyatells@gmail.com

Bisphenol A (BPA), a well-known endocrine-disrupting compound widely used in industrial applications, has become a pervasive aquatic contaminant. This study investigates the toxicological effects of BPA on the freshwater bivalve *Parreysia corrugata*, native to the Ganges River system. Individuals were exposed to BPA at concentrations of 0.27 ppm, 1.32 ppm, and 2.66 ppm for 30 days, with samples collected at 10-day intervals. Significant alterations were observed in amino acid profiles and antioxidant enzyme activities. By Day 30, a concentration-dependent decline in amino acids followed the trend: histidine > glycine > glutamic acid > arginine > lysine > alanine. Superoxide dismutase (SOD) activity showed minimal change initially but increased significantly ($p < 0.05$) from Day 20 to Day 30, ranging from 1.23 ± 0.41 to 3.10 ± 0.79 U mg^{-1} protein. Catalase (CAT) activity exhibited a steady increase throughout the exposure period, rising from 1.99 ± 0.41 to 6.02 ± 1.03 U mg^{-1} protein by Day 30. These biochemical responses indicate oxidative stress and metabolic disruption in *P. corrugata* due to BPA exposure. The findings highlight the susceptibility of Gangetic bivalves to BPA-induced toxicity, emphasizing the need for further studies on the long-term ecological consequences of such contaminants in freshwater ecosystems.

Keywords: BPA, *Parreysia corrugata*, amino acids, antioxidants

Influence of probiotics on the relative condition factor and relative growth co-efficient of *Carassius auratus*

Manoj Kumar Tripathy*, Santosh Kumar Udgata, Brundaban Sahu, Dharitri Choudhury, Arpit Acharya, Abhinanda Jena, Md. Shadab Alam and Bikash Kumar Pati

College of Fisheries (OUAT), Rangailunda, Berhampur-7, Odisha, India

*mtripathy.ouat@gmail.com

The study was designed for a period of 90 days to evaluate the effect of probiotic Aqualact at different levels on the relative condition factor and relative growth coefficient of *Carassius auratus*. The results showed that the relative condition factor (K_n) and relative growth coefficient (b) in fishes that fed on diets containing probiotics were significantly (P<0.05) higher than in the control group. Further, the species attained isometric growth and good condition when fed diets containing probiotics at 0.6%, indicating the significant influence of the probiotic.

Keywords: *Carassius auratus*, probiotic, growth coefficient, relative condition factor

Evaluation of Growth Performance, Survivability and Biomass Production of Amur Carp *Cyprinus carpio haematopterus* Fingerlings in Cages in Sorada Reservoir, Odisha

Swapna Behera^{1*}, Sushanta Kumar Patra², Manoj Kumar Tripathy², Ganesh Chandra Kund², Saumyendra Nanda², Nabakishor Sial² and Satyajit Kumar Bhuyan²

¹Assistant Fisheries Officer, Govt. of Odisha, Koraput, Odisha

²College of Fisheries (OUAT), Berhampur-7, Odisha, India

*swapnasmart222@gmail.com

A 120 days cage culture trial was conducted to evaluate growth performance, survival rate and biomass production of Amur carp *Cyprinus carpio haematopterus* fingerlings in different stocking densities in cages suspended in Sorada reservoir in Odisha. Four stocking densities namely T1 (20 fingerlings/m³ cage), T2 (40 fingerlings/m³ cage), T3 (60 fingerlings/m³ cage) and T4 (80 fingerlings/m³ cage) in triplicate were selected for the present study. The cages of capacity 1m³ made in tender bamboo split fabricated locally were used for the study. The water quality measured at the cage site was ideal for fish culture. All the growth parameters reflected higher values in 20nos/m³ stocking density followed the values obtained in 40, 60 and 80 stocking densities. Maximum survivability (83%) was observed in 20nos/m³ cage stocking density followed by 40 nos/m³ (72%), 60 nos/m³ (63%) and 80 nos/m³ (59%). The highest production in terms of numbers (47 nos) and biomass (33.8 kg/m³ cage) was significantly ($p < 0.05$) higher in T4 with mean length and mean weight (16.1±2.63 cm and 72.0±3.42 gm). The study suggests that stocking density of 80nos/m³, produces maximum advanced fingerlings of > 100 mm size in 120 days in cages, found optimum stocking density.

Keywords: Cage culture, Amur carp, survival, stocking density, Fingerlings production

Fatty Acid Profiling of Selected Fish Species of Genus *Mystus* Collected from Manika Oxbow Lake, Bihar

Topsy Rojalin Mohanta*, Tanushri Ghorai and Prem Prakash Srivastava

College of Fisheries, Dholi, RPCAU, Pusa, Bihar

[*topsyrojalin@gmail.com](mailto:topsyrojalin@gmail.com)

In the present scenario, people are facing different health issues due to lack of healthy fatty acids in their diet. As a result, people are in search of getting balanced diet containing proper nutrients along with essential fatty acids and fish is the most appropriate option. Though marine fish are well known for their fatty acid composition, freshwater fish are also containing a good amount of fatty acids. Bihar is enriched with enough freshwater resources with predominance of indigenous freshwater fish especially catfishes. Feeding habit and the fatty acid profiling of catfishes namely *Mystus tengara*, *Mystus vittatus* and *Mystus cavasius* collected from Manika oxbow lake were determined. The present study showed that all the catfishes are omnivorous in nature. The fatty acid profiling showed that the amount of SFAs is higher (879.45 ± 78.23 to 942.48 ± 342.94 mg/100g) followed by MUFAs (510.54 ± 175.65 to 612.34 ± 210.45 mg/100g) and PUFAs (412.55 ± 49.81 to 496.27 ± 98.88 mg/100g). Among PUFA, highest value of EPA (27.56 ± 12.44 mg/100g) was found in *Mystus cavasius* and lowest in *Mystus tengara* (22.07 ± 8.15 mg/100g) and similar pattern was in case of DHA. *Mystus cavasius* was showing the highest amount of DHA (157.23 ± 42.21 mg/100g) and lowest in *Mystus tengara* (120.16 ± 52.09 mg/100g). The ω -3: ω -6 ratio was found to be 0.4893 ± 0.6646 in *Mystus cavasius* followed by 0.4509 ± 0.02578 in *Mystus vittatus* and 0.4363 ± 0.09026 in *Mystus tengara*. Results indicated that *Mystus* spp. are rich in PUFA considered to be beneficial for human health.

Keywords: Catfish, Manika oxbow lake, Fatty acid profile, Polyunsaturated fatty acids

Effects of fish waste silage and vitamin-C supplementation diet on growth and haematological parameters of Nile tilapia, *Oreochromis niloticus* (Linnaeus, 1758) fingerlings

Jham Lal¹, Dushyant Kumar Damle*¹, Harshavarthini M.¹, Basant Singh¹, Manish kumar¹, Indrani Tekam¹, Kamini Siwana¹, Meenu Chandravanshi¹ and Ranjana Damle²

¹Late Shri Punaram Nishad College of Fisheries, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh-491995, India

²Kalinga University, Naya Raipur, Chhattisgarh-492101, India

* dushyant.damle@dsvckvdurg.ac.in

An experiment was conducted for 60 days to evaluate the growth performance, feed utilization and haematological parameters of Nile tilapia, *Oreochromis niloticus*, under different dietary treatments. The nutritional profile of experimental feeds was observed includes crude protein (25-25.75%), lipid (8.46-8.96%), moisture (10.64-11.16%), ash (14.05-14.87%), crude fibre (4.07-4.32), and nitrogen-free extract (35.69-37). The haematological parameters were observed of Nile tilapia such as red blood cells (37.06±0.037), white blood cells (52.93±0.020), haemoglobin (10.93±0.020), mean corpuscular volume (918.87±0.020), mean corpuscular haemoglobin concentration (35.65±0.020) and haematocrit (28.66±0.025) within the healthy physiological range. The highest growth performance included length gain (7.06±0.057), weight gain (9.73±0.15), percentage weight gain (229.97±6.28), specific growth rate (0.86±0.013), feed conversion ratio (1.67±0.028), protein efficiency ratio (2.92±0.024), hepatosomatic index (1.72±0.049), and intestinal somatic index (0.0089±0.00021) were observed compared to the other treatment groups. The carcass composition of the fish body was observed to include the highest crude protein (59.95±0.020), crude lipid (14.86±0.015), moisture (9.83±0.015), ash (11.87±0.020), and NFE (6.72±0.0057) compared to other treatment groups. The results suggest that the dietary T3 treatments significantly enhanced overall growth performance, feed utilization and haematological parameters of Nile tilapia, indicating potential benefits for aquaculture nutrition strategies.

Keywords: Nile tilapia, Silage, Growth performance, Haematology, Carcass composition, Water quality.

Efficiency of seaweed in the reduction of methane emission: a global perspective

Sushanta Kumar Patra
College of Fisheries (OUAT), Berhampur, Odisha, India

*skpatra1972@yahoo.com

Seaweeds not only act as source of food, medicine, agar, algin, carrageenin, fodder and fertilizers but also understood about their ability in methane emission reduction. 25% of global methane emission is by enteric fermentation. Red seaweeds are having the special focus in this aspect as they are rich in bromoform content than brown and green seaweeds. Many bioactive compounds, other than the bromoform, also perform the reduction of methane emission. However their harmful effects are not yet understood fully, so the bromoform remain as the best choice even today. Bromoform in red seaweed *Asparagopsis taxiformis* (AT) reduce enteric methane production, up to 98%, with inclusion of 0.2% freeze-dried AT in the diet in 90 days, in livestock and may reduce global warming and improve climate change and also increase growth upto 52% and no hamper to milk-yield and milk-quality. *Asparagopsis taxiformis* confirmed the best in bromoform content among 21-seaweeds tested *in vitro* so demanding large-scale farming of the species. On importance of the species, the author attempted the standardization of nitrogen and phosphorus dose on growth performance of Tetrasporophyte (TS) stage of AT during his training program on nutrient dynamics research at Flinders University, Adelaide, Australia.

Keywords: *Asparagopsis taxiformis*, bromoform, methane emission, Nutrient dynamics

Effect of Fermented Lemna (*Lemna minor*) Powder on Growth, Survival and Immune Response of *Oreochromis niloticus* Fry Against *Streptococcus agalactiae*

Md Shadab Alam*, S. I. Yusufzai, V. M. Chavda, H. V. Parmar, P. V. Parmar, Patel Poojan and Smruthi Hareendran

* Shadab4u98@gmail.com

The present experiment was conducted for 60 days to investigate the effect of fermented Lemna (*Lemna minor*) powder on the growth, survival, and immune response of *Oreochromis niloticus* fry against *Streptococcus agalactiae*. This research was conducted in the Department of Aquaculture, College of Fisheries Science, Veraval from 10th December 2022 to 10th February 2023. The fish were divided into five treatment groups with different inclusion levels of Fermented Lemna Powder (FLP) in their diet: T0 (0 %), T1 (3% FLP), T2 (6% FLP), T3 (9% FLP), and T4 (12% FLP). They were fed twice a day at a rate of approximately 10% of their body weight for a period of 60 days. The protein level in all the diets was consistently maintained at around 30%. *O. niloticus* fry with an average weight of 0.34 ± 0.01 grams were stocked at a density of 10 individuals per tank in all tanks. The results of the study demonstrated that the T1 treatment (3% FLP) exhibited significantly higher mean weight gain, mean weight gain (%), specific growth rate (SGR), feed conversion ratio (FCR), feed conversion efficiency (FCE), and survival rate compared to other treatments. Moreover, the T1 treatment also showed a significantly lower FCR. After the 60-day feeding trial, the immune response of *O. niloticus* fry was assessed. The immune response of *O. niloticus* fry was evaluated using the zone of inhibition test, and the T1 treatment (3% FLP) exhibited the highest zone of inhibition, measuring 2.4 ± 0.18 cm. The study findings indicated that the inclusion of fermented lemna powder in the diet of *O. niloticus* fry had significant effects on parameters such as weight gain, growth rate, feed efficiency, and immune response. However, no significant difference was observed in the survival rate among the treatments ($p>0.05$). Overall, the results suggest that the T1 (3% FLP) feed yielded the best outcomes for *O. niloticus* fry in the experiment. Keywords: *Lemna minor*, *Streptococcus agalactiae*, *Oreochromis niloticus*, survival, immune response, growth.

Keywords: Fermented lemna, growth, *Oreochromis niloticus*

Optimizing Nursery Nutrition: The Role of Moringa Leaf Meal in Enhancing Rohu Fry Growth and Survival

Puneet Kumar Patel¹, Shashank Singh¹, Priyanka Acharya^{2*}, Dinesh Kumar¹, Brundaban Sahu², C.P. Singh¹, S.K. Verma¹.

¹College fo Fisheries, ANDUA&T, Kumarganj, Ayodhya, Uttar Pradesh.

²College of Fisheries, OUAT, Rangeilunda, Berhampur, Odisha.

* priyankaacharya20111993@gmail.com

This study evaluated the potential of *Moringa oleifera* leaf meal (MLM) as a substitute for fish meal in the nursery diet of rohu (*Labeo rohita*) fry, focusing on growth performance, survival, and feed utilization. The 20-day trial was conducted in 1 m³ glass tank nurseries using iso-nitrogenous (35% crude protein) and iso-calorific diets with graded levels of MLM replacing fish meal at 20% (T1), 40% (T2), 60% (T3), and 80% (T4), compared against a control (T0) containing 100% fish meal. Each treatment was run in triplicate, and hatchery-reared spawn were stocked at a density equivalent to 10 million/ha. Survival rates ranged from 48.01–52.71% in T0 to 53.03–56.65% in T4, with no significant differences among treatments (P>0.05). Mean fry lengths ranged from 17.6–18.1 mm (T0) to 22.5–22.9 mm (T4), while feed conversion ratios (FCR) varied from 1.23–1.31 (T0) to 1.73–1.87 (T4), also without significant variation (P>0.05). Despite the lack of statistical significance, T4 (80% MLM) showed comparatively improved growth and survival trends. These findings suggest that up to 80% of fish meal can be effectively replaced by moringa leaf meal in nursery diets of *L. rohita* fry without compromising performance.

Keywords: Moringa leaf meal, fry nutrition, *Labeo rohita*, nursery rearing, survival

Adaptive responses of *Salmonella Montevideo* to pH and temperature variations in shrimp culture systems linked to antibiotic resistance emergence

Karuppannan Iswarya^{a*}, Robinson Jeya Shakila^{b*}, Rajendran Shalini^a, Muralidharan Nagarajan^c, Balasubramanian Sivaraman^a, Shanmugam Sundhar^a, and Ulaganathan Arisekar^a

^aFisheries College and Research Institute, Thoothukudi, TNJFU 620 008, Tamil Nadu, India

^bParaprofessional Institute of Fishing Technology, TNJFU, Ramanathapuram 623 516, Tamil Nadu, India

^cFisheries College and Research Institute, Ponneri, TNJFU 601 204, Tamil Nadu, India

^dICAR-Central Institute of Fisheries Education (CIFE), Mumbai 400061, India

*iswarya292000@gmail.com

The environmental variation insisting the stress circumstance for pathogens and, indirectly rises the antibiotic resistance. The researchers (Patel et al., 2020 and Surya et a., 2020) notified that *Salmonella enterica* serovar *Montevideo* has first superbug of Indian water particular of shrimp culture system and high prevalence in seafood associated environment. The present study has investigated the influence of climatic change in resistance profile of *Salmonella Montevideo*, which have been the emergent pathogen in aquatic environment. These bacterial strains survived up to the extreme condition of pH (5.0 & 10.0) and temperature (20 and 45 °C), then have exposed to synergistic effect of six stress effect could be developed the major antibiotic resistance against chloramphenicol and sulphafurazole. The specified evolutionary mechanisms of *Salmonella Montevideo* at hazard condition (pH 5.0 and 40 °C) investigated through *de novo* analysis. At transcriptome sequencing observed 4073 Differentially expressed genes are upregulated and 277 DEGs were downregulated. The most significant pathways were carbon metabolism, RNA polymerase and neuroactive ligand receptor interaction. Therefore, the study highlights the complex interplay between pH, high temperature stress and antibiotic resistance mechanisms in the *S. Montevideo* strains.

Keywords: *Salmonella Montevideo*, antibiotic resistance, pH stress, temperature stress, Differentially expressed genes

Smart Pond Feeder: An IoT-Enabled Solar-Powered Feeding System for Sustainable Aquaculture

S. Ferosekhan¹, S. K. Swain, P. C. Das, H. S. Swain*, R. N. Sahoo² and P.K. Sahoo

ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, India-751002

¹Nofima, Sunndalsøra, Norway

²ICAR - Indian Agricultural Research Institute, New Delhi, India-110012

*himanshufishco@gmail.com

As the demand for fish products has increased, the aquaculture sector has experienced phenomenal expansion in recent years. Efficient feed management is an important part of sustainable aquaculture because feed costs make up around 60% of the costs of running an operation. The Smart Pond Feeder, developed by ICAR-CIFA represents a significant technological breakthrough in automated feeding systems for aquaculture. This solar-powered, IoT-enabled smart device optimizes feeding schedules, reduces feed waste, and lowers labour costs by providing feed at programmable intervals based on specific pond conditions. The feeder is integrated with the CIFA AquaSmart mobile application (Android and iOS), allowing for remote scheduling and monitoring. Important parts include a programmable dispenser with a high-torque DC motor, an IP camera for monitoring fish behaviour and feed consumption in real time, a solar energy system for off-grid operation, and a 5G router for fast communication. Data is maintained through a centralized console, allowing farmers to view performance metrics and make data-driven decisions. This innovation is a pivotal step toward precision aquaculture and future ready farm management systems.

Keywords: Smart feeder, IoT, solar-powered automation

Transport Stress in Hilsa (*Tenualosa ilisha*); Evaluating Haematological and Biochemical Responses Under Different Transport Conditions

Arghya Kunui*^{1,2}, Basanta Kumar Das¹, Shreya Roy¹, Saurav Kumar Nandy¹, Karmveer Singh¹, Mitesh H. Ramteke¹, Manoj Kumar Pati², Archisman Ray¹

¹ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata
700 120, India

²Department of Fishery Sciences, Vidyasagar University, Midnapore-
721 102, India

*arghya1992i@gmail.com

The present research evaluated the impacts on oxygen requirement, hematological alterations, and serum biochemical changes in sub-adult Hilsa (*Tenualosa ilisha*) during three different transportation systems. The experiment included three setups: a closed transport system, an open transport system, and a control with continuous aeration and water circulation. Five Hilsa (85.85 ± 2.36 g each) were evenly placed in each setup. The entire experiment was conducted over a 5-hour period using mainly filtered Ganga River water. Initially, each system contained a dissolved oxygen level of 7.4 ± 0.14 mg/L. The results indicated that dissolved oxygen level sharply decreased from the initial level by 11.8% in the control setup, while 17.39% in the open system and above 29.16% in the closed process. The WBC count showed an increase of 1.9% in open and 8% in closed systems. Subsequently, a rise of RBC of 7.5% in the open system and 18% in the closed system was noticed. The haemoglobin counts also showed a slight decrease of 0.06% in open and peaked around 13.8% in the closed system compared to the control. Serum biochemical parameters like SGPT, SGOT, glucose, and cortisol levels increased significantly in both open and closed transport systems compared to the control, indicating liver stress and tissue damage due to low oxygen. These results highlight the importance of gentle handling during sub-adult Hilsa transport to reduce stress, improve survival, and find the best way to transport safely.

Keywords: *Tenualosa ilisha*, Live transportation, Haematology, Stress

Unlocking the Multifaceted Benefits of Prebiotics: Enhancing Growth, Gut Health and Immune Resilience in *Labeo rohita*

Madhulika^{1*}, Subodh Gupta¹, Tincy Varghese², N. P. Sahu¹

¹ICAR-Central Institute of Fisheries Education, Mumbai-400 061,
Maharashtra, India

²ICAR-Central Institute of Fisheries Technology, Kochi-682 029, Kerala,
India

*Madhulika.Tripathi1010@gmail.com

Prebiotics have emerged as promising functional feed additives in aquaculture, offering multiple health and growth benefits. This study evaluated the effects of three prebiotics mannan oligosaccharide (MOS), fructo-oligosaccharide (FOS), and xylo-oligosaccharide (XOS) supplemented individually at 0.5% and 1%, as well as in combination, in the diet of *Labeo rohita*. Growth performance was assessed through weight gain percentage, specific growth rate (SGR) and feed conversion ratio (FCR), while digestive enzyme activities (amylase, protease, lipase) were analysed to evaluate gut functionality. Among the treatments, the group fed with 0.5% MOS + 0.5% XOS mixture exhibited significantly higher weight gain percentage, SGR and lower FCR, indicating superior growth efficiency. Furthermore, compared to the control, prebiotic-supplemented groups demonstrated enhanced digestive enzyme activities. A challenge test with *Aeromonas veronii* was conducted to assess disease resistance. The prebiotics increased survival following pathogen challenge, reflecting improved gut health and immune resilience. These findings highlight the synergistic and multifactorial benefits of prebiotics in improving growth performance, digestive physiology, and disease resistance, offering valuable insights for sustainable aquaculture of *Labeo rohita*.

Keywords: Disease resistance, Growth performance, Gut health, Sustainable aquaculture

Differential Responses to Insect Meal in Growth and Reproduction of Wild and Selectively Bred *Clarias magur*

Saiprasad Bhusare¹, Shamna N^{1,2*}, Chandan G. M¹., Parimal Sardar^{1,3}, Narottam Prasad Sahu¹, Muralidhar P. Ande⁴, and Kedar Nath Mohanta¹,

¹ICAR-Central Institute of Fisheries Education, Versova, Mumbai, Maharashtra, India

²FWFF, Balabhadrapuram, Kakinada Centre, ICAR-Central Institute of Fisheries Education, Kakinada, India

³ICAR-CIFE Kolkata Centre, Sector V, Salt Lake, Kolkata 700091, India

⁴Kakinada Centre, ICAR-Central Institute of Fisheries Education, Kakinada, India

*shamna@cife.edu.in

A sustainable approach to improving growth performance, popularity and production efficiency from Indian walking catfish (Desi Magur), *Clarias magur* aquaculture systems has been the pursuit of genetic selection in *Clarias magur*. However, selective breeding may also change physiological pathways, such as those connected to nutrient utilization and endocrine control of growth and reproduction. To optimize diet formulations, such as the use of alternative proteins like insect meal, more research into genotype–nutrition interactions is necessary. The effects of Black Soldier Fly Larvae (BSFL) meal on gonadal development, reproductive performance, and gene expression were assessed in two populations of *Clarias magur*: the genetically selected stock (GS), Maha Magur, and the natural stock (NS), over a 120-day feeding trial. In a 2×2 factorial design, two diets were used: FM (14.65% fishmeal) and IM (20% BSFL, 0% fishmeal). On a satiation basis, 168 brooders were fed their various diets. Growth and nutrition consumption (final weight, weight gain percentage, SGR, and PER) were considerably better in GS than in NS.

Unravelling Stress Response Mechanisms to Arsenic, Ammonia, and High Temperature in *Pangasianodon hypophthalmus*

Neeraj Kumar^{a*}, Paritosh Kumar^a, SA Kochewad^a, Kotha Sammi Reddy^a

^aICAR-National Institute of Abiotic Stress Management, Baramati, Pune-413115, India

*neeraj_journal@live.in

This study investigates the molecular mechanisms of ammonia, arsenic, and high-temperature stress in *Pangasianodon hypophthalmus*, a topic rarely explored. Fish were exposed for 105 days to low doses of ammonia (2.0 mg L⁻¹) and arsenic (2.68 mg L⁻¹) 1/10th LC₅₀ and high temperature (34 °C) under six treatment groups: control, arsenic (As), ammonia (NH₃), ammonia+arsenic (NH₃+As), ammonia+temperature (NH₃+T), and ammonia+arsenic+ temperature (NH₃+As+T). Cortisol levels were elevated in all stressed groups *HSP 70*, *iNOS*, and *MT* genes were noticeably upregulated by 122-210, 98-122, and 64-238 % respectively compared to control. Neurotransmitter enzyme AChE was markedly inhibited, especially under combined NH₃+As+T exposure. Apoptotic (*Caspase 3a*, *3b*) and detoxification (*CYP450*) pathways were severely impacted, alongside pronounced modulation of immune (*Ig*, *TNF-α*, *IL*) and growth-related genes (*GH*, *GHR1*, *GHRβ*, *MYST*, *SMT*). Growth parameters, feed utilization indices, and hematological profiles (RBC, WBC, Hb) were significantly compromised under stress. Serum proteins (albumin, total protein, globulin, A:G ratio) and MPO activity were also altered. Genotoxicity, indicated by DNA damage, was highest in NH₃+As+T (89%), followed by NH₃+T (78%), NH₃ (73%), NH₃+As (71%), and As (68%). Arsenic bioaccumulation was substantial in liver and kidney tissues. This study provides critical insights into the molecular and physiological toxicity mechanisms of ammonia and arsenic, individually and in combination with heat stress in *P. hypophthalmus*.

Keywords: Inorganic contaminates; gene regulation; genotoxicity; multiple stress; fish

Amelioration of Anti-Nutritional Factors of Moringa Leaves Using Microbial Fermentation for utilization as a fish Feed Ingredient

Priyanka Acharya^{1*}, Saumyendra Nanda ¹, Brundaban Sahu ¹, Himansu Sekhar Swain², Bhagchand Chabba ³, Kedar Nath Mohanta ⁴

¹College of Fisheries (OUAT), Rangailunda, Berhampur - 7, India

²ICAR- Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar-2, India

³LSPN, College of Fisheries, Kawardha, Chattisgarh,491995

⁴Central Institute of Fisheries Education-ICAR, 400061

*pritifiscos@gmail.com

Drumstick (*Moringa oleifera*) is a wonder plant with numerous medicinal and nutritional values which can be used as an alternative to the conventional synthetic drugs and chemicals, to obtain the desired traits in a safe and sustainable manner. However, the presence of various anti nutritional factors (ANFs) is restricting its use in bulk quantities in fish feed. Under this backdrop, the present study was undertaken to determine the effect of various processing methods to ameliorate the ANFs present and their influence on the nutritional quality of the leaves. Based on the findings of this study, it can be concluded that moringa is a good source of nutrients. The leaves are rich in proteins (23.12 ± 0.03 %), minerals (Ca, K, Fe, Zn and P) and other essential phytochemicals and anti-nutrients like saponins, phytic acid, tannins, alkaloid and flavonoids, etc. Decrease in crude fibre content vis-à-vis increase in mineral and NFE content along with maintenance of other nutrients after its fermentation (SSF) makes moringa leaves a better source of nutrients for fish feed formulation. Significant reduction in ANFs content due to 48 h SSF by a commercial probiotic ‘Aqualact TM ’ makes moringa leaf one of the best ingredients for incorporation in fish feeding for getting dual benefit of growth and health. However, SSF using other similar commercial probiotic and fish feeding trial studies using SSF moringa leaf are required to validate the findings of this study.

Keywords: *Moringa oleifera*, Phyto-chemical nutrients, Anti-nutrients, Solid state fermentation, SSF

Dietary Inclusion of Black Soldier Fly Larval Protein Concentrate in *Penaeus vannamei* Juvenile Feeds: Effects on Growth and Immunity

Simon Sandey¹, Shamna N^{1,2*}, Sai Prasad Bhusare¹, Chandan G.M¹., Parimal Sardar³, Manish Jayant¹, Muralidhar P. Ande⁴, K. Syamala⁴, Kedar Nath Mahanta¹ and Narottam Prasad Sahu¹

¹ICAR-Central Institute of Fisheries Education, Versova, Mumbai, Maharashtra, India

²FWWF, Balabhadrapuram, ICAR-Central Institute of Fisheries Education, Kakinada, India

³ICAR-CIFE Kolkata Centre, Sector V, Salt Lake, Kolkata 700091, India

⁴Kakinada Centre, ICAR-Central Institute of Fisheries Education, Kakinada, India

*shamna@cife.edu.in

A 45-day feeding trial was conducted to evaluate the effect of black soldier fly protein concentrate (BPC) as a fishmeal replacer in the diet of *Penaeus vannamei* juveniles. BPC was prepared using isoelectric precipitation (pH 12/4), at a substrate-to-solvent ratio of 1:20 and 40 °C heat treatment, yielding 66% crude protein and 95% digestibility. Five iso-nitrogenous (36% CP), iso-energetic (371.8 Kcal/100g), and iso-lipidic (6% EE) diets were formulated: Control (20% fishmeal, no BPC), and BPC at 5%, 10%, 15%, and 20% inclusion levels (with BPC20% having 0% fishmeal). Juvenile shrimp (0.812 ± 0.018 g) were reared in brackish water (7–10 ppt) and fed to satiation four times daily. Shrimps fed BPC20% showed significantly higher final weight and weight gain, with specific growth rate (SGR), thermal growth co-efficient (TGC), daily weight gain (DWG), feed conversion ratio (FCR), and protein efficiency ratio (PER) similar to control, except in the BPC5% group. Digestive enzyme activity and immune gene expressions improved notably at higher BPC levels, particularly in BPC15% and BPC20%. Serum cholesterol levels declined with increasing BPC, while triglycerides remained higher in control. The study concludes that BPC can fully replace fishmeal at 15–20% inclusion, supporting optimal growth and immune responses in *P. vannamei*.

Keywords: Immunity, Functional Feed Ingredient, Gut Health, HSP gene expression, crustin expression

Evaluation of the nutraceutical value of tasar pupae meal, displaying its potential for animal diet

Rahul Das*, Dharmendra Kumar Meena and Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore

*rahuldascifri2022@gmail.com

A silkworm pupa, *Antheraea mylitta* (Drury), is one of the important byproducts of the sericulture industry. It has attracted many researchers due to its potential nutritional status. During the present study, several nutrients, including water-soluble and fat-soluble vitamins, were investigated in its pupae meal. A desirable amount of macro-micro minerals, along with a list of anti-nutritional factors, namely oxalate, saponin, tannin, and phytic acid were also recorded. Among the bioactive compound profile, total 15 flavonoids, including the highest level of catechin, followed by naringenin, epicatechin, quercetin, and myricetin were registered, whereas among 18 phenolic acid compounds, mainly ferulic acid followed by gentisic acid and 2,4-dihydroxybenzoic acid were detected. Moreover, the bioactive properties of the pupae were also assessed during the study. Its protein, lipid, vitamin-mineral, anti-nutritional factors, or bioactive compounds have revealed a great deal of further investigation to isolate and harness its nutraceutically important compounds, potentially useful in the fish or other animal diets as a non-conventional feed ingredient.

Keywords: Nutraceutical, pupae, diets

Determination of optimum protein requirement of Amur carp (*Cyprinus carpio haematopterus*) in biofloc culture system

Sambid Mohanty, Brundaban Sahu*, Manoj Kumar Tripathy, Kedar Nath Mohanta and Dharitri Choudhury
*brundabansahu@ouat.ac.in

The study was conducted to determine the optimum protein requirement of Amur carp (*Cyprinus carpio haematopterus*) fry when reared in biofloc culture system and fed with experimental diets with graded levels of crude protein (CP) content. The experiment started with formulation of four practical diets having different CP content viz., T₁ (36% CP), T₂ (32% CP), T₃ (28% CP) and T₄ (24% CP). Three hundred and sixty Amur carp fry, with an average body weight of 0.22 ± 0.01 g, were randomly stocked in twelve numbers of 200 L capacity tri-stand FRP tanks containing bioflocs at a density of 30 fry per tank and reared for 90 days. During the culture period the fishes were fed with the experimental diet at about 2% of the biomass and reared under vigorous aeration. Water quality parameters were monitored every fortnight. At the end of the feeding trial, the treatment T₁ fed with 36% CP showed the-highest weight gain (0.934 ± 0.018 g), weight gain (%) (426.17 ± 18.41), DWG (0.0104 ± 0.002 g), SGR (%) (18.435 ± 0.39), FER (0.875 ± 0.01), and lowest FCR (1.102 ± 0.02) and PER (0.097 ± 0.002). These growth performance, feed efficiency and nutrient retention parameters values were significantly (p<0.05) better than the treatments T₃ and T₄. However, no significant (p>0.05) difference was observed in these values among T₁ and T₂. From this study it can be concluded that 32 % crude protein level is sufficient for optimum growth of Amur carp (*Cyprinus carpio haematopterus*) fry in biofloc culture system.

Keywords: Amur carp, biofloc, microbial protein, protein requirement, nutrient requirement

Effect of Shrimp Head Meal as a Feed Attractant on Feed Intake and Growth of GIFT tilapia (*Oreochromis niloticus*)”

Paramesh Prasad Lenka*, Gobinda Prasad Pradhan, Nabakishore Sial, Brundaban Sahu, Santosh Kumar Udgata and Manoj Kumar tripathy

College of Fisheries, OUAT, Rangailunda, Berhampur-07

* pplenka077@gmail.com

Feeding fish accounts for over fifty percent of total operational cost in any aquaculture operation. Hence, for optimization of feeding cost, reduction of feed wastage by use of feed attractants is a promising method. In this context, the present study explored the use of shrimp head meal (SHM), a protein-rich byproduct of the shrimp industry, as a natural feed attractant in the diet of Genetically Improved Farmed Tilapia (GIFT). SHM is known for its high protein content, essential fatty acids, and glycine betaine, a potent feed attractant. A 90-day feeding trial was conducted using four iso-nitrogenous diets, comprising of a control and three experimental diets incorporating SHM at 1%, 3%, and 5% levels. Results indicated that SHM enhanced feed palatability and growth performance, with the 5% inclusion level showing the most significant improvement in feed intake, weight gain, and feed utilization efficiency. The findings support that SHM not only enhances fish performance but also contributes to waste utilization and environmental sustainability. Therefore, incorporating 5% SHM in tilapia feed is recommended as a cost-effective strategy for improving aquaculture productivity while reducing reliance on conventional fish meal and managing seafood processing waste.

Keywords: GIFT tilapia, shrimp head meal, feed attractant, growth performance

ATNA-36

Evaluation of oxytetracycline medicated diets against *Aeromonas veronii* infection in *Labeo rohita* fingerlings

T Sarmista Patro^{1*}, Nityananda Das¹, Arpit Acharya¹, Manoj Kumar Tripathy¹, Brundaban Sahu¹ and Santosh Kumar Udgata¹

¹College of Fisheries, OUAT, Rangeilunda, Berhampur, Odisha

* sarmistapatro34@gmail.com

An experiment was conducted to evaluate the therapeutic efficacy of oxytetracycline (OTC)-incorporated medicated diets against *Aeromonas veronii* infection in *Labeo rohita* fingerlings. The trial was carried out over 45 days in six treatment groups (T1 to T6), each in triplicate, using 200-liter tripod circular FRP tanks. The median lethal dose (LD₅₀) of *A. veronii* for *L. rohita* fingerlings was determined to be 2×10^9 CFU/mL. Fish in T1, T2, T3, T4, and the positive control (T5) groups were artificially infected with *A. veronii* via intraperitoneal injection at the LD₅₀ dose and the negative control (T6) was injected with only PBS. The infected groups T1 to T4 were fed with medicated diets containing varying levels of OTC (40, 60, 80, and 100 mg/kg body weight/day, respectively) for 10 days, following FDA guidelines and then were fed with a standard diet for the remaining 35 days. The T5 and T6 groups received a basal diet at 3% of body weight twice daily throughout the experiment. Sampling was conducted on 0, 3, 7, 15, 30, and 45 days interval to assess haematological, immunological and biochemical response. The survivability was also monitored during the experimental trial. Results indicated that the T3 and T4 diet groups (80 and 100 mg/kg BW) elicited the most effective therapeutic response in infected fish with a better survival rate.

Keywords: Oxytetracycline; *Labeo rohita*; *Aeromonas veronii*; Medicated feed; Haematology

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

Sub-Theme-VII
Emerging Trends in Fish Genetics & Biotechnology
(ETGB)

Innovative spherical-shaped gel electrophoresis apparatuses for scientific demonstrations to high school students

Praveen Maurye*, Kavita Kumari, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal, INDIA. 700120.

*maurye_p@yahoo.com.

Gel electrophoresis (GE) is the most routinely applied technique for detecting, identifying, and characterizing biomolecules. All GE instruments are based on established principles but differ in operational features. Implementing the GE technique for education and research is considered simple due to the procedure, result interpretation, and cost-effectiveness. Published literature showed that educators are always interested in providing practical experiences to biochemistry students for polyacrylamide/agarose-related GE techniques. Modern GE instruments are sometimes considered challenging due to critical operating steps and maintenance expenses. We have developed two spherical-shaped apparatuses for vertical and horizontal GE techniques, equipped with cost-effective modern features and easily available parts/components to eliminate laborious and time-consuming steps. Both apparatuses provide easy set-up, safe operation, and hassle-free operation. High school students verified the performance of our apparatuses in a short-term training program with positive outcomes. Comparisons with standard apparatuses revealed that our apparatuses are fast, user-friendly, and applicable for young researchers.

Keywords: Gel electrophoresis apparatuses, nucleic acids, proteins, practical exercise.

Metagenomic analysis of riverine microbiomes to monitor fish health

Ayushman Gadnayak*, Hirak Jyoti Chakraborty, Smruti Priyambada Pradhan, Vikash Kumar, Pranay Kumar Parida, Dhruvajyoti Sarkar, Basanta Kumar Das

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata – 700120, India

* ayush.gadnayak@gmail.com

The health of fish populations is intricately linked to the composition and dynamics of surrounding microbial communities. In both aquaculture and natural riverine systems, microbiomes play a critical role in nutrient cycling, immune system modulation, and pathogen resistance. Metagenomic analysis, which involves the direct sequencing of genetic material from environmental samples, has emerged as a transformative approach to study these complex microbial ecosystems. This culture-independent method enables the identification of microbial taxa and their functional genes, providing a comprehensive view of microbial diversity and activity in water bodies and host-associated environments. This study explores on the application of metagenomic tools to monitor fish health by analysing riverine microbiomes. In water, sediment, and fish-associated niches (such as skin, gill, and gut microbiota), we can detect early signs of microbial imbalance or the emergence of pathogenic species. These microbial shifts often precede visible symptoms of disease, offering a valuable window for early intervention and management. Furthermore, we investigate how metagenomics can be employed to track antimicrobial resistance genes and virulence factors, which are critical for understanding and controlling disease outbreaks in aquaculture systems. By integrating metagenomic data with environmental and physiological parameters, the study aims to develop predictive models that support real-time monitoring and health forecasting in aquaculture. Metagenomic surveillance offers a non-invasive, sensitive, and high-resolution tool for improving fish health management, ensuring sustainable aquaculture practices, and maintaining ecological balance in riverine ecosystems.

Keywords: Metagenomics, riverine microbiome, Fish health, Pathogen detection, antimicrobial resistance, Aquaculture monitoring

Molecular traces of invasion: eDNA-based high-resolution mapping of Nile tilapia (*Oreochromis niloticus*) across eastern India’s freshwater habitats

Biswajit Mandal*, Basanta Kumar Das, Vikash Kumar, Suvra Roy, Snehasis Dalal and Srikanta Samanta

ICAR-CIFRI, Barrackpore, West Bengal

*biswajitmandal.edu@gmail.com

This study employed environmental DNA (eDNA) analysis to assess the distribution of *O. niloticus* across multiple aquatic habitats, leveraging species-specific primers enabled high-resolution detection. eDNA signatures were successfully amplified from sediment and direct tissue samples collected from wetland ecosystems across West Bengal, India, including eight ecologically significant sites: Sardar Bheri Wetland, Kolaghat, Moyna, Kakdwip, Akaipur, Beri Bour, Khalsi and Culture Pond, with sequences submitted to NCBI (PQ810007, PQ810734, PQ814753, PQ814801, PQ821106), confirming the widespread presence of species. Spatial heterogeneity in physicochemical parameters influenced eDNA persistence and detection efficiency. Temperature ranged from 24°C to 32.5°C, pH from 7.49 to 8.91, and sediment composition played crucial roles. Sand-dominated substrates facilitated rapid DNA percolation and loss, whereas finer sediments enhanced retention. PCR validation demonstrated high specificity, with no cross-reactivity with non-target species, confirming the robustness of the primer design. Despite successful amplification in lentic environments, the absence of *O. niloticus* eDNA in Kolaghat, Akaipur, and Ganga River sediments suggests either low species abundance or rapid degradation in high-flow systems. These findings underscore the influence of hydrodynamic conditions on eDNA stability and emphasizing the need for habitat-specific sampling strategies. This study establishes eDNA as a powerful, non-invasive tool for invasive species monitoring, bridging molecular ecology and fisheries ecosystem. The study highlights the potential eDNA approaches to monitor *O. niloticus* populations and provides critical insight towards developing global invasive species management frameworks.

Keywords: Environmental DNA, Species Surveillance, *Oreochromis niloticus*, Fisheries Management, Biodiversity Assessment

Genetic and morphometric structuring of *Mystus cavasius* populations across Indian river systems

V. L. Ramya^{1*}, Suvra Roy², Pranaya Kumar Parida², Dibakar Bhakta², Basanta Kumar Das², Behera B. K.³, Vijaykumar M. E.¹, Asim Jana²

¹Regional Centre of ICAR-Central Inland Fisheries Research Institute, Bangalore, India

²Aquatic Environmental Biotechnology Division, ICAR-CIFRI, Barrackpore, India

³National Fisheries Development Board, Hyderabad, India

*ramya.kumar.bfsc@gmail.com

The study of genetic structure and diversity in riverine fish populations plays an essential role in understanding species' migration patterns, adaptability, evolutionary relationships, and the effects of mutations on populations. The present explores genetic and phenotypic diversity in *Mystus cavasius* across five major Indian river systems (Ganga, Brahmaputra, Mahanadi, Cauvery, and Krishna) and a hatchery population using mitochondrial cytochrome b gene sequences and morphometric approaches. Principal Component Analysis (PCA) and Discriminant Function Analysis (DFA) of truss and geometric morphometric data revealed significant shape variations, particularly in head, trunk, and caudal regions, without clear population clustering. Genetic analysis revealed high haplotype diversity in riverine populations, particularly in the Ganga and Cauvery, which contrasted with the genetically homogenous hatchery stock. Hierarchical AMOVA and neutrality tests pointed to historical bottlenecks followed by population expansions, influenced by geographical and ecological factors. Phylogenetic and haplotype network analyses confirmed the presence of multiple genetic lineages. The findings emphasize the ecological influence on phenotypic traits and the value of morphometrics in assessing intra-specific diversity. The study advocates for conserving distinct riverine stocks and improving hatchery practices to prevent genetic homogenization and support sustainable fishery management.

Keywords: molecular marker, morphometric, population, riverine ecosystem

Identification of Quantitative Trait Loci in *Macrobrachium rosenbergii*: An essential genomics resource for genetic improvements of economic traits

Sthitaprangya Chand, Swikruti Sonali Kar and Lakshman Sahoo*

ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga,
Bhubaneswar-751002, Odisha, India

*lakshmansahoo@gmail.com

The freshwater prawn, *Macrobrachium rosenbergii* is a commercially important freshwater prawn species popularly known as giant freshwater prawn (GFP) or scampi. It is one of the most important cultivable species in freshwater systems attributed to its high price, large size, rapid body growth, good taste and high economic demand. The most important trait of commercial interest in aquaculture species is growth rate, a quantitative trait of polygenic in nature. In addition to this disease resistance is another important trait in this commercially important species. In order to improve the growth rate of *M. rosenbergii*, ICAR-CIFA in collaboration with World Fish centre, Malaysia started selective breeding programme in 2007. Integration of genomic tools in traditional selective breeding program enhances the speed and accuracy of selection and thereby achieving high genetic gain. Identification of Quantitative Trait Loci (QTL) responsible for phenotypic variation of commercially important traits is of immense importance as markers linked to QTL can be incorporated into genetic improvement program through marker assisted selection (MAS). In addition to conventional linkage based QTL mapping, genome-wide association study (GWAS) is commonly used in association between genetic markers and variation in trait of interest. QTLs explaining variation in growth rate have been identified in several aquatic species. Further, markers linked to body harvest weight have been successfully incorporated in several aquaculture genetic improvement programs. Identification of QTLs in *M. rosenbergii* for economically important traits has enormous potential to enhance aquaculture production of this species.

Keywords: QTL; *Macrobrachium rosenbergii*; Genetic improvement; MAS; GS; Linkage

Fishonix - NextGEN Longlining

Gresha Armstrong*, Sahaya Preethi S, Nandhana Lal R

TNJFU-Dr. MGR Fisheries College and Research Institute, Ponneri campus
– 601 204

*greshaamstrong@gmail.com

Longline fishing is a low-impact and sustainable method of fishing, compared to other fishing methods. This method efficiently targets specific fish populations however, it is not efficient in reducing the bycatch of non-targeted populations like sharks, seabirds, turtles, etc, and it also relies on guesswork that is time-consuming and not economical. NextGEN longlining emerges as a revolutionary advancement in a sustainable way by reducing time consumption, bycatch, and labour, which includes smart sensors and automation. It is a fishing technology that was developed using the Arduino platform. This system has vibration sensors, ultrasonic, LEDs, a buzzer system, and an LCD. This method of fishing replaces manual checks by detecting the vibrations underwater, hence the fishers benefit by not depending on the guesswork and reducing the hauling time, which is cost-efficient. This also minimizes the bycatch by scaring away birds, thereby benefiting the ecosystem. Therefore, an innovative NextGEN longlining method would reduce the bycatch by precise targeting, which could increase the profit for fisherman.

Keywords: Longlining, Arduino, Bycatch, Sensor.

Microbial Community-Based Index of Biotic Integrity (MC-IBI) –an assessment tool in aquatic environment management.

Tanuja Abdulla*, Deepa Sudheesan, and Thankam Theresa Paul

ICAR-Central Inland Fisheries Research Institute

*thankamtheresa@gmail.com

The Index of Biotic Integrity (IBI) is a scientific tool used to assess the health of aquatic ecosystems such as rivers, lakes, streams, and wetlands. It evaluates the biological condition of these ecosystems based on the structure and function of their biological communities, particularly fish, macroinvertebrates, plant populations, and microbes. The Microbial Community-Based Index of Biotic Integrity (MC-IBI) is an advanced ecological tool designed to assess environmental health using microbial communities as bioindicators. This approach leverages the sensitivity of microbial communities to environmental changes, such as pollution, habitat alterations, and nutrient loading. Microbial taxa (bacteria, fungi, archaea, or protozoa) are identified and analyzed using modern techniques such as 16S/18S rRNA sequencing using metagenomics and High-throughput sequencing technologies. Sensitive and tolerant taxa are identified to reflect environmental conditions. Metrics are derived from microbial data, like those used in traditional IBIs but tailored for microorganisms. Microbial metrics are scored based on their deviation from reference or expected conditions in a healthy ecosystem. Scores are aggregated into a composite MC-IBI score. Higher scores indicate better ecological health, while lower scores suggest degradation. MC-IBI can be used as a tool in making decisions for conservation and restoration efforts in ecosystem management as an additional measure of ecosystem health.

Keywords: Microbial composition, Metagenomics, Index of Biotic Integrity

Detection and Molecular Characterization of *Isoparorchis hypselobagri* in Wild-Caught *Sperata seenghala* from Hirakud Reservoir

Ramesh Chandra Malick, Basanta Kumar Das, Satish Koushlesh, Pranab Gogoi, Canciyal Johnson, Ratul Chakraborty and Sobhagya Nayak

ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata, India

*malick.ramesh5@gmail.com

An investigation was conducted to assess parasitic infestation in wild-caught *Sperata seenghala* from the Hirakud Reservoir, Odisha, as part of routine fish health monitoring. During the examination of a single specimen, a total of 16 trematodes were recovered from the swim bladder. Morphological analysis under a light microscope revealed the parasites to be large, fleshy, unsegmented digenean trematodes consistent with the genus *Isoparorchis*. The parasites exhibited characteristic features of *Isoparorchis hypselobagri*, including a well-developed oral sucker, a posteriorly located ventral sucker, and thick tegument. To confirm species-level identification, molecular characterization was performed by amplifying and sequencing the mitochondrial cytochrome c oxidase subunit I (COI) gene. The obtained sequences matched with *Isoparorchis hypselobagri* reference sequences in GenBank, with over 99% similarity. This marks a confirmed case of *I. hypselobagri* infestation in *S. seenghala* from Hirakud, supported by both morphological and molecular evidence. Such parasitic infections may lead to severe swim bladder damage, negatively impacting fish buoyancy, health, and survival. The study proves the necessity of routine parasitological surveillance in reservoir ecosystems to detect and manage emerging parasitic threats. These findings contribute valuable insights into fish parasitology in Indian inland waters and support the development of targeted management strategies for sustainable fisheries.

Keywords: *Isoparorchis hypselobagri*, *Sperata seenghala*, Hirakud Reservoir, COI gene sequencing, Parasitological surveillance

Genetic Diversity of *Systemus sarana* in Different River Systems of India

Tadasa Priyadarshini^{1*}, Janmejay Parhi² and Sagar C. Mandal¹

¹College of Fisheries, Lembucherra, Tripura – 799 210, Central Agricultural University, Imphal, India

²ICAR-CIFA, Kausalyaganga, Bhubaneswar

* tadasa0907@gmail.com

Olive barb is one of the largest barbs available, widely distributed in different regions of the Indian subcontinent. It is one of the most popular freshwater minor carp and a favourite food fish among the barb species due to its good nutritional value. It has been declared as an endangered or vulnerable species as per the CAMP report in India and a critically endangered species in Bangladesh. The present study aims to study the genetic composition of wild populations of *Systemus sarana* collected from different river systems using mitochondrial markers and decipher the percentage of genetic heterogeneity among them. The haplotype diversity is highest for Tripura than that of the others, thus indicating that the genetic variation within the population is highest for it. The F_{st} value between Tripura and Assam is the lowest, suggesting low gene flow between the populations. The Tripura and Assam populations have a high genetic differentiation from that of Odisha and West Bengal, as depicted by the high F_{st} values, thus concluding that the genetic diversity in the NE river system is differentiated from that of the mainland India river system.

Keywords: Mitochondrial markers, genetic heterogeneity, sustainable management, captive breeding

Molecular Diagnostics and Epidemiology of Shrimp Diseases in Ganjam District of Odisha

Udgata, S.K., Pasupalaka, N.C.*, Sahu, B., Tripathy, M.K. and Acharya, A.
College of Fisheries (OUAT), Rangailunda, Berhampur-760007, Odisha,
India

*nrusinghacharan@gmail.com

Disease out-break has been a significant challenge in the shrimp aquaculture industry. Infections due to pathogens like *Enterocytozoon hepatopenaei* (EHP) and white Spot Syndrome Virus (WSSV) have been emerged out as the major causes of economic losses due to mass mortalities in Indian shrimp farms. It was in this context, the present investigations were conducted in shrimp (*Litopenaeus vannamei*) farms of Ganjam district, Odisha as a part of regular screening under NSPAAD project. Our aim was to find out the causative pathogens and also the co-infecting bacteria, if any. Shrimp samples with symptoms of disease were brought to the lab and subjected to nested-PCR and microbiological analysis to screen for WSSV, EHP and AHPND and opportunistic *Vibrio sp.* co-infection based on the protocol recommended by World Organization for Animal health (WOAH). Water samples from the affected farms were also analyzed simultaneously, so as to establish correlations between important physico-chemical parameters and disease prevalence, if any. In total of 23 shrimp farms and hatcheries of Ganjam district, Odisha were screened regularly through 34 visits during 2024-25. The findings revealed the absence of AHPND in the study area. Whereas, one shrimp farm was found to be WSSV positive, two farms were EHP positive and one farm was found to be both WSSV and EHP positive. Coincidentally, the affected farms were having certain adverse water quality parameters and were found to have adopted poor biosecurity measures.

Keywords: Shrimp farm, disease incidence, WSSV, EHP, AHPND, biosecurity, epidemiology

Genetic Improvement Program of Carps in India: An Update

Khuntia Murmu*, Avinash Rasal, Madhulita Patnaik, Anirban Paul, Lakshman Sahoo, Jitendra Kumar Sundaray and Kanta Das Mahapatra

ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga,
Bhubaneswar-751002
*murmucife@gmail.com

The Indian major carps (IMCs), namely catla (*Labeo catla*), rohu (*Labeo rohita*), and mrigal (*Cirrhinus mrigala*), constitute over 87% of India's freshwater aquaculture production, playing a vital role in nutritional security due to their high growth potential, adaptability, and consumer preference. To enhance productivity, sustainability, and resilience, ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar, has implemented pioneering selective breeding programs for genetic improvement of rohu and catla. The improved rohu program, launched in 1992, marked India's first family-based selective breeding initiative in aquaculture with six founder populations, resulting in a genetically improved strain (Jayanti) exhibiting average genetic gain of 18% per generation after eight generations of selection and 40-60% higher growth in farmers field. Later in 2004, disease resistance against *Aeromonas hydrophila*, an opportunistic bacterial pathogen, was added as a second trait, showing 58% higher survival in the resistant line over the susceptible line in the challenge tests and a positive significant correlation among the growth and disease-resistance traits. Building on this success, a selective breeding program for catla was initiated with a base population of nine strains, leading to the development of the CIFA-Amrit catla strain, which demonstrates 30% faster growth and 15% average genetic gain per generation after two generations of selection. These programs, driven by advanced genetic tools and rigorous performance evaluation, have significantly improved seed quality, boosted farm-level productivity, and strengthened the sustainability of freshwater aquaculture in India.

Keywords: Selective breeding, *Labeo catla*, *Labeo rohita*, Jayanti Rohu, CIFA-Amrit catla

Transcriptome Insights into Key Genes Regulating Lipid metabolism and Meat Quality in *Systemus sarana*

Janmejy Parhi* and J. K. Sundaray

ICAR-Central Institute of Freshwater aquaculture

* jjparhi@gmail.com

Resveratrol, a natural polyphenolic compound found in different plants, has beneficial properties like antioxidant and cardioprotective effects. The present study explores the impact of resveratrol supplementation on the meat quality and omega-3 fatty acid content in *Systemus sarana*. By comparing the transcriptomic profiles of Sarana Control (CS) and Sarana Treated (TS) groups, the research aims to uncover the molecular effects of resveratrol on gene expression in relation to these traits. The RNA sequencing was done with Illumina NextSeq 500 using 2x150 bp chemistry for three replicates per group and on an average 3Gb of data per sample was obtained. A total of 1,82,651 transcripts were obtained for the combined data along with 64,259 pooled CDS. The differential gene expression analysis revealed that a total of 559 and 325 genes were upregulated and downregulated, respectively in CS vs TS. From the transcriptome data it was found that resveratrol supplementation in *S. sarana* resulted in the upregulation of several genes associated with muscle integrity, fatty acid metabolism, and stress response. Notably, genes involved in muscle contraction (*Titin*, *Muskelin*) and fatty acid metabolism (*Fatty acid-binding protein*, *Phospholipase A2*) were significantly upregulated in the TS. In addition to this the KEGG pathway analysis of CS vs TS revealed upregulation in fatty acid and amino acid metabolic pathways, supporting the positive effects of resveratrol on muscle quality and omega-3 fatty acid retention. These molecular changes suggest that resveratrol may improve muscle quality and omega-3 fatty acid retention, contributing to enhanced meat quality and nutritional value. Future research could further investigate the long-term effects of resveratrol supplementation on muscle development and omega-3 retention in commercially important fish species for aquaculture in human nutrition.

Keywords: Transcriptomics, Lipid metabolism, Meat quality, Resveratrol

Dynamics of antibiotic resistance, heavy metal tolerance, bioremediation, and plastic degradation in the microbiome of constructed wetlands

Suvra Roy, Vikash Kumar, Bijay Kumar Behera, Tanushree Bera, Chayna Jana, and Basanta Kumar Das*

ICAR-Central Inland Fisheries Research Institute, Barrackpore-700 120, West Bengal, India

*suvrar6@gmail.com

The microbiome plays a vital role in decomposing organic matter, recycling nutrients, and breaking down environmental contaminants. This study performed a whole genome metagenomic analysis of EKWs as a model ecosystem to explore microbial diversity, antibiotic-resistance genes, heavy metal resistance genes, bioremediation capabilities, plastic-xenobiotic degrading enzymes, and the functionality of constructed wetlands that handle urban wastewater. Taxonomic analysis identified Pseudomonadota as the dominant bacterial phylum. Functional annotation revealed over 60% of metabolism-related genes, including those associated with xenobiotic degradation. EKW exhibited 85 subtypes of antibiotic-resistance genes across 16 ARG types, 43 genes for heavy metal resistance, 57 bioremediation-potential strains, 71 potentially plastic-degrading strains, and several identified enzymes. This metagenomic study has greatly improved our understanding of the biological systems present in the EKW wastewater treatment ecosystem by highlighting the occurrence of resistance genes and remediation microbes. By leveraging effective pollutant-degrading microbes from EKWs, a microbial consortium could be developed to tackle plastic waste and other contaminants. The findings will contribute to the sustainable management of the EKW ecosystem.

Keywords: Microbiome, metagenomics, constructed wetland, bioremediation, antibiotic resistance, heavy metal resistance, plastic-degradation

Characterisation and Expression of *IGFBP-1* in *Labeo rohita* (Hamilton, 1822) under Iron Induced Stress

Sumit Mallick*, Janmejy Parhi, Lopamudra Sahoo and Sagar C. Mandal

College of Fisheries, Lembucherra, Tripura – 799 210, Central Agricultural University, Imphal, India

Insulin-like growth factor binding proteins (*IGFBP-1a* and *IGFBP-1b*) play crucial roles in regulating growth in fish. This study aimed to characterize *IGFBP-1a* and *IGFBP-1b* genes in *L. rohita* and analyze their expression under various physiological conditions. The full sequences of *IGFBP-1a* and *IGFBP-1b* were characterized from liver tissue. Expression analysis revealed highest levels in the liver across all conditions, with elevated expression in captive environments. The *IGF-1/IGFBP-1* ratio, an indicator of *IGF-1* bioavailability and growth, was assessed alongside weight gain percentage. Natural, T2L, and T3L conditions showed the highest ratios, while control and T1L conditions exhibited significantly lower ratios and weight gain. These findings suggest that *IGFBP-1a* and *IGFBP-1b* are involved in both negative and positive feedback regulation of growth in *L. rohita*, potentially through autocrine and paracrine mechanisms. Their strong expression in the liver implies a critical function in growth regulation. However, the precise roles and mechanisms of *IGFBP-1a* and *IGFBP-1b* remain unclear, warranting further investigation to fully understand their contributions to fish growth and potential applications in aquaculture.

Keywords: IGF, IGFBP-1, Iron, *Labeo rohita*, *Wolffia globosa*

Development of a High-Resolution Multiplex SSR Panel for Genetic Characterization of Indian White Shrimp (*Penaeus indicus*)

Manu Jena*, Sivamani B, Vinay Kumar Katneni, Akshaya Panigrahi and Kuldeep K Lal.

ICAR- Central Institute of Brackishwater Aquaculture, Chennai

*mjena195@gmail.com

The Indian white shrimp (*Penaeus indicus*) is a key aquaculture species in the Indo-Pacific, contributing significantly to food security and the shrimp export economy. Effective genetic improvement and management programs rely on the availability of informative molecular markers that are both cost-effective and amenable to routine use in laboratories with moderate technical capacity. In this study, we developed a high-resolution multiplex SSR (simple sequence repeat) panel for assessing genetic diversity and heterogeneity in *P. indicus* populations. Using genome-wide mining of a publicly available *P. indicus* genome, we screened tri-, tetra-, penta-, and hexa-nucleotide repeat motifs. From over a million SSRs identified, 352 primer pairs were designed, selecting eight loci per scaffold from 44 major scaffolds. After in-silico validation, 48 SSRs showing specific PCR amplification were shortlisted. From these, 14 polymorphic loci were grouped into four multiplex sets. Capillary electrophoresis of 36 individuals from three coastal regions (Sirkazhi, Kanyakumari, and Kollam) revealed a high degree of polymorphism: the number of alleles per locus ranged from 6 to 37 (mean = 22.64), with PIC values from 0.786 to 0.966. Observed heterozygosity was 1.0, and expected heterozygosity ranged from 0.929 to 1.0. As all markers exceeded thresholds for PIC (>0.5), heterozygosity (>0.7), and allele count (>4), this multiplex SSR panel is well suited for breeding programs, genetic diversity assessment, and population structure analysis in *P. indicus*.

Keywords: *Penaeus indicus*, SSR, Multiplex, Heterozygosity, Capillary electrophoresis,

A semi-automated kit with improved solution exchange mechanisms for an efficient acid-soluble collagen extraction method

Praveen Maurye^{1*}, Kavita Kumari¹, Amrita Mohanty²

^aAquatic Environmental Biotechnology Division, ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal, INDIA. 700120.

^bFish Biotechnology Division, ICAR-Central Institute of Fisheries Education, Mumbai, Maharashtra, INDIA. 400061.

*maurye_p@yahoo.com

Many researchers often spend significant time extracting collagen from animal by-products in the laboratory. We present a simple, inexpensive, and newly modified collagen extraction kit, constructed with off-the-shelf components, assembled within ~10 min., requires no specialized skills, and costs ~US\$10.0 for semi-automation involving solution/liquid exchange to minimize time, risk, and efforts. The raw fish skin is securely guarded throughout the extraction process, avoiding contamination, folding, or loss. Time-consuming solution exchange steps are controlled by mobile phone-operated solenoids integrated with a timer. The retention or removal of filtrate, dialysate, or centrifuge product is performed conveniently by modified centrifuge tubes integrated with a separatory funnel or filtration unit. We demonstrated the efficiency and reproducibility of the novel setup (or newly modified kit) and compared its performance with the traditional setups (or routine lab materials) for the extraction of acid-soluble fish skin collagen using the classical C-ASC extraction method.

Keywords: Newly modified kit, fish skin, collagen extraction, SDS-PAGE.

Advances in fish genetics and cell- based fish meat

Jampana Nandini*, Akhilesh Ratre, Pabitra Barik

L.S.P.N College of Fisheries, Kawardha-491995, Chhattisgarh, India.

*nandinijampana9@gmail.com

The field of fish biotechnology is rapidly evolving, with cell-based fish meat production emerging as a revolutionary solution to environmental, ethical, and sustainability challenges in aquaculture. Unlike conventional fish farming or wild capture, this technology involves cultivating fish muscle tissue in vitro using stem cells derived from fish species such as tuna, salmon, or tilapia. These cells are grown in nutrient-rich bioreactors, forming edible fish fillets without the need for slaughtering or marine harvesting. Leading companies such as BlueNalu, Finless Foods, and Wildtype have successfully produced cultured seafood prototypes that replicate the taste, texture, and nutritional profile of traditional fish. Cell-based fish offers several key benefits: it eliminates overfishing, reduces greenhouse gas emissions, prevents ocean pollution, and avoids the use of antibiotics or harmful additives. Moreover, it provides a controlled production environment, free from microplastic contamination and aquatic diseases. This innovation aligns with the goals of sustainable development and food security in the face of rising global protein demand. While gene therapy and gene editing continue to support genetic improvements in farmed fish, cell-based technology stands apart as a next-generation food production platform. Its future success will depend on cost-efficiency, regulatory approval, consumer acceptance, and scalable infrastructure.

Keywords: Cell -based fish meat, fish biotechnology, gene therapy, gene editing

Species Identification and Genetic Diversity of Electric Rays (Pisces: Torpediniformes) from Indian waters

Ravali Vallangi^{1*}, V. A. Iswarya Deepti², K. Sujatha²

¹ICAR – Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal – 700 120

²Department of Marine Living Resources, Andhra University, Visakhapatnam, Andhra Pradesh – 530 003

*ravali.au19@gmail.com

Electric rays of the Order Torpediniformes are bottom-dwelling species with limited distribution and low reproductive potential, making them highly susceptible to overexploitation, particularly as by-catch in trawl and artisanal fisheries. Despite their ecological importance, these rays remain poorly studied in Indian waters, and many are listed by the IUCN as Data Deficient, Vulnerable, or Near Threatened due to limited taxonomic and biological data. This study investigates the alpha taxonomy and molecular identification of 20 electric ray species from the coastal waters off Visakhapatnam, with a focus on three families - Torpedinidae, Narcinidae, and Narkidae. Specimens were collected biweekly between July 2015 and March 2018 from shrimp trawl and artisanal catches. Morphological features and fresh coloration were recorded, followed by DNA barcoding using a 655 bp fragment of the mitochondrial COI gene. A total of 26 sequences representing 13 species were generated and submitted to GenBank. Phylogenetic analysis using Neighbor-Joining trees revealed eight distinct clades, confirming species-level resolution and uncovering cryptic diversity. First-time barcode data were produced for eight species, including *Torpedo polleni*, *Narcine vermiculata*, and *Narke impennis*, with several species reported for the first time from Indian or east coast waters. The study emphasizes the necessity of integrating morphological and molecular data to resolve taxonomic ambiguities, monitor by-catch, and inform conservation strategies.

Keywords: Taxonomy, DNA barcoding, By-catch, Visakhapatnam

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

Young Fisheries Talent Award (YFTA)

Lustre Tiles from Mussel Shell

Ajmi Sabu*, Thasni AC and Suhana A

College of Fisheries Payyanur

*ajmisabu2004@gmail.com

The coastal stretch of Kerala, from Thiruvananthapuram to Kasaragod, is renowned for its mussel fisheries. According to the annual report of the Kerala Fisheries Department for 2021–22, total production stood at 4,155 metric tonnes. Of this, the meat yield ranged from 15% to 52%, while shell waste accounted for 75% to 85% which poses serious environmental concerns, including sanitation issues and obstruction of natural drainage systems. The present innovation offers a sustainable solution to the issue of mussel shell waste by repurposing it into high-quality, lustrous wall tiles. A key challenge in this process arises from the irregular shape of mussel shells, making tile production labour-intensive. This innovation overcomes the constraint through a process involving controlled heating, rapid cooling, bleaching and subsequent flattening of the shells. By transforming a low-value waste material into a value-added product, the innovation facilitates effective shell valorisation. In line with circular economy principles and the Sustainable Development Goals (SDGs), this approach not only mitigates environmental impact but also fosters farm-level valorisation, thereby enhancing the economic resilience of mussel farmers.

Keywords: Green Mussel, aquaculture, valorisation, circular economy

Instant Seaweed Soup Capsule

Athulya Babu*, Adarsh Anil and Jagan C J

College of Fisheries Payyanur

*418athulyababu@gmail.com

Seaweeds are nutrient-dense marine resources, rich in essential minerals, vitamins, dietary fibre, proteins, essential amino acids, and polyphenols with notable antioxidant and anti-inflammatory properties. Valued for its rich nutritional bounty, seaweed is gracefully weaving its way into the daily diets of those navigating fast-paced, modern lives. Terms such as ready-to-eat, instant, and concentrated nutrition have gained prominence, reflecting consumer preference driven by busy lifestyles and increasing dietary awareness. In response to the demands of modern busy lifestyles, nutritional needs, and the growing preference for instant dietary solutions, we introduce an Instant seaweed soup capsule. As the name suggests, it offers a convenient method to prepare a nutrient-rich seaweed soup by simply adding one or two capsules to boiled water. The soup mixture comprises chopped and freeze-dried vegetables, grains, legumes, and concentrated seaweed powder (Sargassum/ Ulva/ Gracilaria) and permitted preservatives. The capsule itself is formulated using carrageenan extracted from *Kappaphycus alvarezii*, making it edible while also enhancing the consistency and texture of the soup. This innovation addresses the limitations of raw and powdered seaweed—namely undesirable taste and inconsistent nutrient dosing. By ensuring standardized composition, ease of use, and rapid preparation, the capsule supports precise nutrient delivery and preserves nutritional integrity, making it a convenient and nutritionally balanced functional food solution for time-constrained, health-conscious individuals.

Keywords: Seaweed polysaccharide, capsule, Instant seaweed soup

AquaZen Transit Tech

Anshuman Routray*, Adyasha Parija, Sthiti Prangya Das

College Of Fisheries, OUAT, Berhampur-07, Ganjam

* adyashaparija2018@gmail.com

Traditional live fish transport faces significant challenges including stress, disease, and mortality due to poor water quality. This project proposes a novel synergistic eco-biofilm of sodium alginate and gelatin, infused with beneficial probiotic strains & anti-stress herbal extracts. This film acts as a controlled-release system, diffusing probiotics and herbal bioactives into the water, reducing fish stress biomarkers along with algal pad system that acts as a sustainable, dual-action innovation to overcome these limitations. The system integrates a carefully cultivated eco-biofilm, rich in beneficial nitrifying and denitrifying bacteria, with an algal pad composed of microalgae species actively degrading harmful ammonia and nitrite, maintaining pristine water conditions, while the algal pad provides continuous oxygenation through photosynthesis and further adsorbs dissolved pollutants. This combined approach minimizes stress on fish, reduces pathogen proliferation, and significantly enhances survival rates during transit. Preliminary studies indicate this integrated bio-system offers a cost-effective, environmentally friendly, and highly efficient solution for improved live fish transport, contributing to sustainable aquaculture practices.

Keywords: Biofilm, Transportation, affordable, eco friendly, sustainable.

Herb-Enhanced Canned Tilapia: Boosting Shelf Life, Flavor, and Nutrition

Omm Anubhab Mohanty*, Bishnu Prasad Naik, Preetidipan Mendili

College of Fisheries, OUAT, Berhampur, Odisha – 760 007

[*sudhirnaik97442@gmail.com](mailto:sudhirnaik97442@gmail.com)

Tilapia (*Oreochromis* spp.) is one of the most widely farmed freshwater fishes globally, valued for its mild flavor and high protein content. Tilapia fish is quite sensitive to the deterioration due to the high activity of water and, especially to a near pH of the neutrality. The canning of tilapia fish, a widely consumed aquatic species, presents an opportunity to enhance its nutritional and preservative qualities through the incorporation of natural immunosuppressants such as ginger, garlic, and mint leaves. Ginger, known for its anti-inflammatory and antioxidant properties, garlic with its potent antimicrobial effects, and mint leaves, which contribute to flavor and potential health benefits, were evaluated for their efficacy in preserving the quality of canned tilapia. Canned tilapia samples were prepared with varying concentrations of ginger, garlic, and mint, and subjected to sensory evaluation, nutritional analysis, and microbial testing over a storage period. Results indicated that the incorporation of these herbs not only improved the flavor profile and consumer acceptability but also enhanced the shelf life of the product by inhibiting microbial growth. Nutritional analysis revealed a significant retention of essential nutrients, including omega-3 fatty acids and proteins, in the presence of these natural additives. This research highlights the potential of using ginger, garlic, and mint as natural preservatives in the canning process of tilapia fish, promoting both food safety and health benefits. The findings suggest that the integration of these immunosuppressants can lead to the development of a value-added product that meets consumer demands for healthier and more sustainable food options. Further studies are recommended to explore the optimal concentrations and combinations of these herbs for maximizing the benefits in canned fish products.

Keywords: Protein content, immunosuppressant, essential nutrients, consumer acceptability

Resource Optimization through Pond-Based Multiple Integrated Farming System (PMIFS)

Subhalaxmi Pradhan*, Chinmayee Rauta, Amresh Chandra Majhi

College of Fisheries, OUAT, Berhampur, Odisha-760 007

*chinmayeerauta2004@gmail.com

The Pond-Based Multiple Integrated Farming System (PMIFS) is a holistic and sustainable farming model designed to address key challenges faced by small and marginal farmers, including underutilization of resources, reliance on monocropping, limited access to technology, and vulnerability to climatic fluctuations. In this model, use of Spent mushroom substrate is used for cattle feed and fertilization and bio aeration of pond. This system integrates aquaculture with poultry, duckery, livestock, hatchery operations, mushroom cultivation, vermicomposting, biogas production, and olericulture—all within a compact farm layout centered around a fishpond. By recycling waste products from one subsystem into another, PMIFS reduces input costs, enhances resource use efficiency, and minimizes environmental impact. It ensures diversified income streams, improves soil health, conserves water, and promotes food and livelihood security. The model offers a practical, replicable approach for maximizing farm productivity while advancing the goals of sustainable aquaculture and Blue Transformation in Indian fisheries and agriculture.

Keywords: Resource optimization, integrated farming

Preparation of frozen fish cutlet using freshwater fish surimi

Manasa Manaswini Devi*, Sthiti pragnya Pradhan, Rajeshree Behera

College of Fisheries, OUAT, Berhampur-07, Ganjam

* sthitipradhan74@gmail.com

This study developed a novel frozen fish cutlet using freshwater fish surimi, addressing consumer preference and marine fish allergy concerns. Traditional cutlets rely on marine fish, which can cause allergies. To overcome this, freshwater fish surimi was prepared via standard processing: heading, gutting, washing, mincing, and cryoprotectant addition for optimal gel properties and stability. This surimi was then formulated into cutlets with binders, spices, and vegetables, shaped, breaded, and rapidly frozen. We evaluated proximate composition, textural properties, sensory attributes, and microbial quality of both fresh and frozen cutlets. Preliminary results show the freshwater fish surimi yielded a product with comparable or superior textural characteristics and acceptable sensory appeal. This innovative approach offers a valuable, allergen-friendly alternative for consumers, contributing to food diversification. Future research will optimize formulation and processing for enhanced acceptance and commercial viability.

Keywords: Frozen cutlet, Freshwater fish, ready to eat, Marine environmentsustainability, cost effective, Anti allergic

पञ्चसौधि मत्स्याहारः” (PañchasaudhiMatsyāhārah)- Leaf to Life: Herbal Fish Nutrition

Bibhas Ranjan Das*, Roshan Gouda, Preetidipan Mendili,

College of fisheries, OUAT, Berhampur-07, Ganjam.

*dasbibhasranjan55@gmail.com

In aquaculture, feed constitutes around 60% of total production costs, making its quality crucial for optimal fish growth. Disease remains a major challenge, causing economic losses and threatening sustainability. While chemotherapeutic agents have been used for disease control, concerns over antibiotic resistance, residue accumulation, and environmental damage have limited their application. As a safer alternative, herbal feed additives offer promising benefits, including improved health, growth, and disease resistance in aquatic species. These plant-based ingredients are cost-effective, biodegradable, and easy to prepare. Specific leaves provide unique advantages: lemon (*Citrus limon*) offers antimicrobial and antioxidant effects; neem (*Azadirachta indica*) provides broad-spectrum antiparasitic action; moringa (*Moringa oleifera*) contributes high nutrition and immune support; bela (*Aegle marmelos*) aids digestion and reduces inflammation; and amla (*Phyllanthus emblica*) enhances immunity with strong antioxidants. Combined, these ingredients exert synergistic effects that improve feed efficiency, reduce stress, and enhance survival rates. Their use supports sustainable aquaculture by integrating traditional knowledge with modern practices, reducing reliance on harmful chemicals, and promoting environmental balance.

Keywords: Nutrient Profile, Chemotherapeutic agent, antibiotic resistance, Herbal feed additives, Disease resistance, antioxidant

***IchiBites*– From Tide to Table**

Muni Soham Bhuyan*, Satyajeet Rout, Mrutyunjaya Das

College of Fisheries, OUAT, Berhampur, Odisha – 760 007

*smrutyun@gmail.com

IchiBites is a revolutionary take on the classic nacho-infused with the richness of the ocean and the authenticity of traditional coastal preservation methods. Crafted from minced shrimp or fish, these savory bites begin their journey inspired by taco-style preparation, where seafood is seasoned and marinated using indigenous spice profiles. Instead of the typical taco wrap or shell, the mixture is carefully shaped into thin, crispable portions and dried—either under the natural sun or in a controlled dryer-preserving flavor and enhancing shelf life. This base is then bifurcated into two product lines: Roasted Sea Nachos, offering a healthy, guilt-free snack option, and Fried Sea Nachos, delivering bold flavor and crunch for indulgent cravings. Perfect as a standalone snack or a gourmet base for toppings and dips, *Coastal Crunch* aims to bridge tradition, taste, and sustainability-bringing the soul of the sea to modern snacking. Ideal for seafood lovers, fitness-conscious snackers, and culinary adventurers alike.

Keywords: Nachos, Seafood, Snacks

AQUA-VERMIN-CORE: Hidden Alchemy of Fish Waste

Abhilash Jena*, Preetidipan mendili, Aditya prasad Gouda

College of Fisheries, OUAT, Berhampur-07, Ganjam

* Preetidipanmendili512@gmail.com

The rising production of fisheries waste (FW) presents major environmental issues because of its substantial organic composition and decomposable characteristics. Conventional disposal techniques frequently result in pollution and health risks, highlighting the need for sustainable waste management strategies. The waste from fisheries primarily consists of aquatic plants and pond mud from aquaculture, along with various fish parts that are generally thrown away during harvesting or processing, including heads, bones, organs, skin, scales, and fins from fish processing facilities. Vermicomposting fisheries waste by using pond mud as a substrate provides a sustainable method for managing waste in aquaculture. Pond mud, frequently overlooked, supplies a stable micro-ecological environment with advantageous microbial communities that improve the vermi degradation process. This method entails the breakdown of organic substances, such as fish processing byproducts and aquatic plants, by earthworms, notably *Pheretima posthuma*. The produced vermicompost acts as a premium bio-fertilizer, enhancing soil vitality and fostering plant growth. Also, the liquid wash generate by this method can be used as liquid fertilizer in horticultural crop. This integrated approach offers a promising waste-to-resource model for sustainable aquaculture and agricultural practices.

Keywords: Fisheries waste, pond mud, vermicomposting, microbial community, vermi degradation, environmental sustainability.

Fish scales to green energy transformation

Anshuman Jha*, Garv sarva, Pabitra barik

Nowadays, fish scales are treated as a waste product in the local fish market, but these fish scales have many different properties that can be utilized in a specific way to ensure environmental sustainability and to increase the income of the fishermen. Fish scales are primarily used as a source of collagen, or it is treated as a waste product. It can be more easily used to produce green energy as the fish scales possess a piezoelectric effect. Biotransformation of the fish scales can be used to generate green electricity through the following procedures. At first, we must wash and dry the scales. After that, we must demineralize the scale by immersing it in an EDTA or HCL solution. The demineralized scale is then grinded or fabricated into a copper plate, which generates electricity due to mechanical stress or vibration. The copper plate is then connected to the electrodes, which can light a bulb or can be stored in nanogenerators. By utilizing this process, fish scales can be converted into bioelectric torches. This process is simple and can be utilized by the family members of the fishermen to increase their income by selling these bioelectric torches.

Keywords: Piezoelectric effect, Biotransformation, bioelectric torches

Beyond the Target: Advancing Gear Selectivity and Bycatch Mitigation for Responsible Fisheries

Kensina Borang* and Pabitra Barik

LSPN College Of Fisheries, Kawardha, Chhattisgarh, 491995, India

[*Bkensina@gmail.com](mailto:Bkensina@gmail.com)

Sustainability in the fisheries sector constitutes a fundamental pillar. The key aim of responsible fishing is to minimise ecological damage while maximising resource efficiency. Among the most significant challenges is bycatch, the unintentional capture of marine species while fishing for target species. As unsustainable practices contribute to habitat degradation and biodiversity loss, the transformative role of gear selectivity in mitigating bycatch and promoting responsible fisheries fulfils an important need. Incorporating Bycatch reduction devices (BRDs) and Turtle excluder devices (TEDs) in fishing gears has shown promising results in reducing ecological harm without compromising economic needs. These innovations, in addition to reducing bycatch, also improve catch quality, furthermore, supporting both biodiversity and the livelihood of coastal areas. Implementing such selective fishing technologies can significantly strengthen conservation practices. Equally important is to boost awareness among fishing communities to adopt these innovations. As nations aim to secure food resources and conserve the ecosystem, adopting these gear strategies becomes necessary. This balanced approach is highly relevant in the Indian context, as India has a rich marine biodiversity and depends on fisheries as a source of livelihood. By actively promoting these selective fishing technologies, it paves the way for a sustainable coastal ecosystem.

Keywords: Responsible fisheries, bycatch, marine biodiversity, gear selectivity

Guiding Turtles to Safety: LED Light-Based Bycatch Reduction in Trawlers

P. Sharma* and S. Bharti

West Bengal University of Animal & Fishery Sciences

*prashanabhsharma2003@gmail.com

Bycatch of vulnerable species like the Olive Ridley sea turtle remains a major issue in Indian trawling. While Turtle Excluder Devices (TEDs) face adoption and enforcement challenges, LED lights on nets offer a low-cost, conservation-friendly solution by enhancing visibility for turtles without reducing target catch. Vision and behavioral modeling confirm the effectiveness of light-based deterrence, aligning with turtles' natural vision. This approach mitigates ecological harm and economic losses for fishermen, such as gear damage and fines. This study informed the development of a waterproof, solar-powered UV LED device designed for easy integration into existing nets, highlighting LED lights as a scalable innovation for sustainable fisheries in India that balances conservation and livelihood goals.

Keywords: Bycatch, UV LED, Sustainable fishing, Marine conservation

Re-inventing Cigarettes from whole marine Seaweed

Adyasha Maharana*, Srusti Samarpita Beriha, Santosh Kumar Udgata,
Nityananda Das, Manoj Kumar Tripathy and Abhinanda Jena

College Of Fisheries, OUAT, Berhampur-07, Ganjam

*srustiberiha@gmail.com

This project aims in reinventing addictive cigarettes into a detoxifying healthy alternative. Point of focus are the cigarette filters and main filler content that would replace nicotine. Study upon seaweed polysaccharides and seaweeds as a whole is done to know the best possible way to turn the vision into reality. The main purpose is De-addiction and making the disposal of cigarettes eco friendly with objective to use untapped seaweed resources. Youth is the main target group, given the current rise of e-vapes, cigarettes and drug abuse. Impact on Marine Environment due to non biodegradable cigarettes butts is also kept in mind. Protoyping the idea and extraction of polysaccharides has been conducted. The project incorporates the health benefits of Seaweed components i.e. polysaccharides and algin fibres. This ready-to-use product will reappraise the current vapor addiction scenario and result in a fully biodegradable product with a combined social and environmental impact.

Keywords: De-addiction, Reinventing, Healthy alternative, Biodegradable, Ready-to-use.

Umami Tide Dumplings

Manasa Manaswini Devi, Sthiti Pragnya Pradhan*, Rajashree Behera,
Santosh Kumar Udgata, Nityananda Das and Abhinanda Jena

College Of Fisheries, OUAT, Berhampur-07, Ganjam

[*Sthitipradhan74@gmail.com](mailto:Sthitipradhan74@gmail.com)

This introduces an innovative, health-conscious take on the beloved momo, catering to the growing demand for gluten-free and nutrient-rich cuisine. Moving beyond traditional Maida, our "Umami Tide Dumplings" utilize a custom wrapper crafted from a blend of gluten-free flour and kelp powder. This unique combination not only eliminates gluten but also infuses each bite with a distinctive, savory umami depth. The filling features fresh, local freshwater fish, ensuring sustainability and a delicate flavor profile that harmonizes perfectly with the sea-derived wrapper. The outer layer is further enhanced with a seaweed coating, lending a vibrant emerald hue and an irresistible textural contrast. This novel approach transforms the classic momo into a truly precise, interesting, and healthful culinary experience. We are using freshwater fish in this, so anyone can consume it without hesitation due to a marine allergen.

Keyword: Gluten free, sustainable, cost-effective, healthy, umami flavour

Fin-e-Feast – A Fish Based Protein Bar

Aniket Swain, Shan Sambhab Parida*, Santosh Kumar Udgata, Nityananda Das, Manoj Kumar Tripathy, Brundaban Sahu, Abhinanda Jena

College of Fisheries, OUAT, Berhampur, Odisha - 760007

*verzshan@gmail.com

The recent inclination of the human population towards being the healthier versions of themselves and being increasingly health conscious has led to an exponential increase in the demand of protein-rich diets and dietary supplements. A lot of protein-based supplements are available in the market, however, the fish protein, being a high quality, easily digestible and low-fat protein, is a boon for all the protein lovers, who are looking for a healthier and better protein source. Fin-e-feast is the mouth-watering protein bar that is bound to tantalize the taste buds and healthify the snacking habits of the masses by making the fish protein available to them in a unique and wholesome form. It is a protein power-house containing a healthy combination of wholesome grains with no added sugar and is sure to provide a perfect blend of nuts and fish protein.

Keywords: Protein-rich, fish protein, low-carb, snack

Automated Water Quality Management System

Aleena Joji*, Sreechand. B, Adithya.T

*aleenajoji30@gmail.com

Water quality management is essential for the success of aquaculture operations, as even minor changes in critical parameters can adversely impact fish health and farm productivity, often resulting in substantial economic losses for farmers. However, relying solely on manual interventions is often inadequate in large-scale aquaculture systems, especially when precise adjustments are required. Labour-intensive management not only drives up operational costs but also increases the risk of human error, which can lead to significant losses. The present innovation is an *Automated Water Quality Management System* designed to sense, analyse, and maintain optimal water quality through appropriate management interventions. It targets key parameters such as pH, dissolved oxygen, and ammonia which are critical for the effective functioning of intensive aquaculture systems. The system consists of dedicated sensors placed within the culture tank to collect real-time data, a control unit that processes this information and issues commands to the management module, and a human-machine interface for user interaction. This intelligent water quality management system not only reduces dependence on manual intervention but also provides operators with real-time operational insights. Moreover, the system supports species-specific customisation of water quality thresholds, providing a scalable solution well-suited to diverse aquaculture systems, particularly intensive operations such as hatcheries and precision aquaculture.

Keywords: Aquaculture, automation, water quality management, precision aquaculture

AquaBioenergy: Remodeling Fish Waste into Energy

Raushan Kumar* and Juhi Bharti

College of Fisheries, Kishanganj, Bihar Animal Sciences University

* raushanydv2003@gmail.com

In an innovative approach to converting biological waste into valuable energy, this study presents the construction of a rechargeable protein battery from mixed waste—specifically fish scales and chicken feathers, enriched in collagen and keratin respectively. These protein-rich wastes were hydrolyzed using 0.75 M sodium hydroxide, which also served as the electrolyte. The battery system utilized a waved-thread cotton wick as a salt bridge, forming stable redox half-cells. Key parameters such as NaOH concentration, salt bridge type, charging voltage, charging time, and optimal waste ratios (fish scale: chicken feather = 4:5) were systematically optimized. The battery was charged with a 12V charger for several hours, resulting in a terminal voltage of 2.04V and the battery is capable of lighting up LED bulbs. This silent yet functional illumination symbolizes the effective transformation of waste into a clean, low-cost energy resource. The developed bio-battery shows potential for powering small electronic or lighting devices in rural or off-grid areas, serving as a teaching tool in green technology and bio-electrochemistry, and inspiring eco-friendly innovations in waste management and energy storage. This work exemplifies the "Waste to Wealth" philosophy, turning otherwise discarded fish waste into practical, eco-conscious energy solutions.

Keywords: Waste-to-energy, Bio-battery, Green technology, Waste management

EcoFlame: Innovation in Light, Responsibility in Life

Juhi Bharti* and Raushan Kumar

College of Fisheries, Kishanganj, Bihar Animal Sciences University

* juhi98bharti@gmail.com

The present project elucidates a sustainable, functional, and aesthetic method for producing mosquito-repellent candles from fatty fish, *Pangasius pangasius*, waste. The protocol combined principles of waste valorisation, oil purification, and essential oil blending to transform fish by-products into eco-friendly, value-added product. Fish fat was rendered at low heat to extract oil, followed by deodorization using activated charcoal to eliminate odour and impurities. The purified oil was blended with soy wax at an optimal ratio (70:30), and natural mosquito-repellent agents namely neem, and lemongrass oils were added to enhance its functional utility. Aesthetic value was added through the incorporation of decorative herbs, dried flowers and aquatic motifs. The final product offers a stable burn, low odour, and effective mosquito repellence for around 2 to 3 hours. Safety precautions, performance parameters, and optional enhancements such as, camphor and marine themes, were taken into consideration while preparing the repellent candle. This innovation replacing 30 % wax with 70 % fish oil can bridge environmental sustainability and public health, demonstrating how low-cost, natural resources can be upcycled into high-value lifestyle and vector-control products.

Keywords: Mosquito-repellent candle, Pangas waste, Waste valorisation, Eco-friendly, Sustainability

BoneBeads: Turning Fish Bones into BioCeramic Balls

Vachas Vadini Mani* and Shweta Suman

College of fisheries, Kishanganj, Bihar Animal Sciences University

*vmanijk09@gmail.com

The development of fish bone bio-ceramic balls offers a sustainable solution for valorizing fish processing waste while reducing reliance on conventional ceramic raw materials. Fish bones, rich in bio-apatite, hydroxyapatite can be transformed into functional, eco-friendly bioceramic balls through a controlled process. The idea involves systematic collection and thorough cleaning of fresh fish bones, followed by drying and calcination at around 900°C to remove organic matter. The resulting bio-ceramic powder is finely grounded and mixed with natural binders like Kaolinite, Silica, binders to create a moldable paste. Shaped the paste into balls and these are carefully dried and then sintered at high temperature, enhancing strength and durability. The objective is to produce bio-ceramic balls that utilize waste, conserve natural resources, and provide a low-cost, biodegradable alternative for decorative and architectural applications. This method not only addresses the problem of fish waste disposal but also adds economic value, aligning with principles of circular economy and sustainable design. The final bioceramic balls after finishing and optional glazing and desirable coating, demonstrate satisfactory mechanical properties and aesthetic appeal, showcasing the practical potential of fish bone-derived ceramics in modern material science and green manufacturing.

Keywords: BioCeramics, Green manufacturing, Sustainability, Valorization

BioShield: Tempered glass rooted in fish waste

Shweta Suman* and Vachas Vadini Mani

College of fisheries, Kishanganj, Bihar Animal Sciences University

*28shwetасuman@gmail.com

Existing commercial bio-glass often relies on costly raw materials and energy-intensive processes, limiting its affordability and sustainability. Moreover, it mainly uses synthetic minerals, while natural waste resources remain underutilized. To address this, the presented approach focuses on producing bio-glass from fish waste, specifically fish bones, which are rich in calcium and phosphates ideal for glass formation. The process began with thorough cleaning and defatting of fish bones, followed by calcination at 850°C to remove organic matter and obtain hydroxyapatite, the base for matrix preparation for providing calcium and phosphorus. This powder was then mixed with silica, sodium carbonate, and orthophosphoric acid to form the glass matrix. Afterwards, the mixture was kept in a drying oven to facilitate the release of CO₂, followed by placing the mixture in a muffle furnace for melting at high temperature. Rapid quenching yielded the final glass, which can be annealed for improved properties. This method offers an eco-friendly and cost-effective alternative to conventional bio-glass by recycling seafood industry by-products into a base for premium material as tempered glass. The process not only reduces waste but also aligns with circular economy principles, making bioglass more accessible for applications like biomedical implants, bone grafts, and even specialty glass products.

Keywords: Tempered glass, Bioglass matrix, Hydroxyapatite, Sustainability, Circular economy

Kadukka360: “From Seed to Sale – All in One Shell”

Krishnaveni K B* and Jazeera Sajith H

College of Fisheries, Payyanur

*krishnavenibiju318@gmail.com

Green mussel (*Perna viridis*) farming in northern Kerala, especially in Padanna, has experienced substantial growth owing to the region’s favourable estuarine conditions in Kavvayi lake and consistent spat availability in the marine environment. Approximately 15,000 farmers, primarily women, engage in seasonal mussel farming from November to May as a key livelihood activity. Despite increased production, farmers’ income has not shown proportional growth. A field study identified key challenges including exploitation by intermediaries in both spat procurement and harvest marketing. Farmers often pay 60–70% more for spat and incur opportunity losses of 150–200% during marketing the harvested mussel. To address these constraints, *Kadukka360*, an android-based mobile application, was developed to provide a direct digital platform linking spat suppliers, mussel farmers, and consumers. The app supports multilingual interfaces and offers services such as spat quality assurance, online procurement, order tracking and direct marketing of harvested mussels. By reducing intermediary involvement, ensuring fair pricing and expanding market access, *Kadukka360* promotes sustainable trade practices and empowers farming communities with the potential to double their income. The innovation represents a transformative step toward empowering mussel farmers, improving their economic resilience and aligning with Sustainability Development Goals framework.

Keywords: Green mussel, aquaculture, e-marketing, fair trade, farmers’ income

Integrated Solar Mussel Shell Processing Unit

Nandana S Nair* and Chinmaya Santhosh

College of Fisheries Payyanur

*nandunandanasnair@gmail.com

The bivalve mollusc *Perna viridis* (Green mussel) recorded a remarkable 198% production growth in the Malabar region of peninsular India during 2023–24. With only 25–30% of the mussel used as meat, the remaining shell biomass poses serious environmental concerns, including sanitation issues and obstruction of natural drainage systems. While bivalve shells are commonly utilized for calcium carbonate (CaCO₃) extraction, mussel shells present inherent processing challenges due to their relatively lower thermal stability primarily attributed to high aragonite content. Structural degradation and phase transformation begin at 400–500 °C, necessitating precisely controlled, low-temperature processing to prevent premature decomposition into calcium oxide (CaO). The present innovation, an *Integrated Solar Mussel Shell Processing Unit*, addresses the challenges of shell waste management by offering an eco-friendly and energy-efficient solution. The system seamlessly integrates shell cleaning, drying, controlled heating, powdering, sieving, and packaging into a single, streamlined process. It ensures mineral quality, reduces emissions and enables valorisation of mussel shell into products like fertilizers, soil conditioners, construction materials etc. By promoting circular economy principles and aligning with SDGs, this innovation not only minimises waste but also enhances farm-level value addition, potentially doubling mussel farmer income and strengthening sustainable coastal aquaculture.

Keywords: Green Mussel, aquaculture, valorisation, circular economy

Aqua guide: Digitalizing Fisheries Extension through Mobile-Enabled Service Delivery and Real-Time Support”

Harshavardhanan T S*, Colin Christopher, Lohith C

College of Fisheries, Payyanur

* harshantamv@gmail.com

Kerala, with a 590 km coastline, is a leading fish-producing state in both marine and inland sectors, providing livelihoods to over 10 lakh fishers. Government policies, welfare programmes, development initiatives, and associated services often fail to effectively reach the stakeholders, including fishers, farmers, processors, traders etc. A major constraint lies in the existing communication channels and outreach strategies, which are frequently neither timely nor tailored to the geographically specific needs of these diverse stakeholder groups. The android-based mobile application *Aqua Guide* addresses these challenges by incorporating local language support, thereby enhancing accessibility and ensuring inclusivity for all stakeholders across the fisheries sector. The app allows users to specify their needs or select desired services, and based on their geographic location, it identifies and displays the nearest relevant agency along with corresponding contact details. The application also features a comprehensive dashboard that highlights key central and state government offices, institutions, and agencies involved in the fisheries sector, along with the service framework available to stakeholders. As a scalable digital innovation, it can be seamlessly integrated with e-extension and e-governance systems, thereby strengthening the fisheries sector by empowering stakeholders, enhancing livelihoods, and promoting sustainable development.

Keywords: Fisheries, aquaculture, e-extension, e-governance

Low Fat Cutlet

Sushree Monali Priyadarshini*, Pranita Nayak, Kiran Panda, Santosh Kumar Udgata, Nityananda Dasa and Abhinanda Jena

College Of Fisheries, OUAT, Berhampur-07, Ganjam

*nayakpranita72@gmail.com

Excessive oil absorption during deep-fat frying is a critical nutritional and technological challenge in the development of ready-to-eat fish-based products. This study investigates the effect of incorporating xanthan gum and oat fiber into fish cutlet batter as a strategy to minimize oil uptake while maintaining desirable physicochemical and sensory qualities. Fish cutlets were prepared using batter formulations with varying concentrations of xanthan gum and oat fiber. Following deep frying under standardized conditions, samples were analyzed for oil content, moisture retention, texture profile, structural integrity, and sensory acceptability. The results revealed a statistically significant reduction in oil absorption in cutlets treated with xanthan gum and oat fiber compared to control samples. The observed reduction is attributed to the enhanced water-binding capacity and the formation of a cohesive and viscous surface barrier by the hydrocolloid-fiber matrix, which effectively restricted oil penetration during frying. Furthermore, treated samples exhibited improved textural properties, including greater firmness and reduced greasiness, while retaining adequate moisture content. The microstructural analysis also supported the hypothesis that the xanthan-oat fiber combination contributed to a denser crust, acting as a physical barrier to oil ingress. In conclusion, the incorporation of xanthan gum and oat fiber into fish cutlet batter presents a promising approach for formulating healthier fried seafood products

Keywords: Hydrocolloids, dietary fiber, low fat food, moisture retention, edible coating, healthy seafood, fat reduction

Weed to Wonder: Transforming Invasive Weeds into Sustainable Art

Aradhana Kumari and Suraj Raj

College of Fisheries, Kishanganj, Bihar Animal Sciences University

* sonamjha2508@gmail.com

Water hyacinth, a rapidly growing invasive weed, harms aquatic ecosystems and local economies by depleting oxygen and clogging waterways. Its widespread impact calls for eco-friendly repurposing strategies rather than traditional, costly removal methods. *Weed to Wonder* highlights a unique blend of environmental conservation, rural craftsmanship, and artistic innovation—turning an invasive plant into purposeful products that integrates sustainability and creativity. The present project explores a transformative pathway: repurposing water hyacinth as a renewable cellulose-rich feedstock to develop eco-friendly materials. Through sustainable extraction and minimal processing, high-yield cellulose is derived to formulate water-based paints—offering a biodegradable, low-VOC alternative to synthetic binders. The cellulose is further reimaged into artistic and utilitarian applications such as compostable seedling pots, natural exfoliant-infused face scrubs, and biodegradable slow-release nutrient pellets for agriculture. These innovations embody a circular economic approach by turning ecological burden into bio-beneficial resources. The project not only addresses invasive plant management but also contributes to reducing microplastic waste, improving soil health, and fostering eco-conscious art and agricultural practices.

Keywords: water hyacinth, water-based paint, biodegradable art, compost pots, natural exfoliants, circular economy.

AquaSwasthya – A Low-Cost, Offline Water Quality Monitoring Device for Small Aquaculture Farms

Kensina Borang*, Md Shadab Alam

LSPN College of Fisheries, Kawardha, Chhattisgarh, 491995, India.

COF, OUAT, Rangeilunda-760007, Odisha, India.

[*Bkensina@gmail.com](mailto:Bkensina@gmail.com)

Small-scale fish and shrimp farmers in India often suffer significant crop losses due to undetected fluctuations in water quality, particularly in dissolved oxygen (DO), pH, and ammonia levels. Existing water monitoring solutions are either prohibitively expensive, require continuous internet connectivity, or are too complex for rural deployment. To bridge this critical gap, we present **AquaSwasthya** – an affordable, solar-powered, offline water quality monitoring system tailored for small aquaculture farms. The device integrates three key sensors: a galvanic DO sensor, a pH electrode, and a colorimetric ammonia sensing chamber. An embedded microcontroller processes reading in real time and communicates water health status through RGB LED indicators and optional voice alerts in local languages. The system functions completely offline, requiring no Wi-Fi or smartphones, making it ideal for remote, low-tech environments. It operates continuously via solar energy with battery backup, providing consistent monitoring even during power outages. Unlike conventional IoT-based models, AquaSwasthya offers ammonia detection, voice-enabled alerts, and user-centric simplicity at a fraction of the cost (~₹6,000). This innovation enables early response to deteriorating water conditions, thereby improving fish survival rates, reducing feed waste, and enhancing overall farm profitability for resource-constrained farmers.

Keywords: DO, pH, ammonia, AquaSwasthya, IoT

Matsya Sanrakshak – A demand based Automatic feeder

Sudhanshu Kumar

UG 2nd year student (2023-27 batch), College of Fisheries, Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, 284003, India

*roysudh800@gmail.com

India, a global leader in shrimp production, contributes nearly 1 million metric tonnes of white leg shrimp annually and is a top exporter to the U.S. Despite this, shrimp farming faces critical challenges in feed management and water quality control, which are traditionally reliant on manual processes. These practices often result in overfeeding or underfeeding, poor water conditions, and significant economic losses. To address these inefficiencies, we present “Matsya Sanrakshak”, an innovative, AI-powered, demand-based aquaculture solution. This advanced system uses acoustic sensors to detect shrimp hunger by identifying gut movement sounds, enabling precise, need-based feed dispensing. Integrated biosensors continuously monitor vital water quality parameters, with real-time data stored in the cloud and relayed to farm managers via mobile alerts. The mobile floating platform, equipped with a solar panel for sustainable power, traverses the pond to ensure even feed distribution and round-the-clock monitoring. By automating both feeding and water quality management, Matsya Sanrakshak minimizes feed wastage, enhances shrimp growth, and reduces environmental risks. This smart aquaculture technology promises to revolutionize the shrimp industry by improving productivity, ensuring sustainability, and securing farmer livelihoods through precision and data-driven decision-making. It sets a new benchmark for efficiency and innovation in modern aquafarming.

Convolutional Neural Network (CNN) for intelligent disease detection in Aquaculture

Eldho Saji

West Bengal University of Animal and Fishery Sciences

*eldhosaji0114@gmail.com

The expansion of aquaculture practices has made fish being open to disease outbreaks, which is a significant threat to their health, farm productivity and long-term sustainability. Effective disease identification is crucial in aquaculture because infectious outbreaks can quickly spread across fish populations, resulting in considerable economic losses and compromising animal welfare. Traditional diagnostic approaches, on the other hand, are labour-intensive and time-consuming, and relying on farmer’s particular knowledge can lead to biased and inconsistent diagnoses. This study investigates the application of Convolutional Neural Networks (CNNs) for identification of fish diseases. CNN is an efficient and automated way to find fish diseases, with high precision enabling timely interventions and reducing economic losses. The CNNs model incorporates convolutional layers for feature extraction, max-pooling for down-sampling, dense layers for classification, and dropout for regularisation. Integrating CNN-based technologies into aquaculture can improve sustainability by reducing antibiotic use, enhancing animal wellbeing, and maximising resource utilization.

Aqua V-Cell: Turning Seafood Waste into Eco-Friendly Batteries

Bishal Mandal

UG 2nd year student, College of Fisheries, Rani Lakshmi Bai Central
Agricultural University, Jhansi, Uttar Pradesh, 284003, India

[*bishalmandal3629@gmail.com](mailto:bishalmandal3629@gmail.com)

The growing volume of trash from seafood processing poses a significant environmental challenge as well as a lost chance to recover resources. In addition to harmful, non-biodegradable components that endanger human health and the environment, conventional batteries rely on imported resources like cobalt and lithium. The first entirely environmentally friendly battery produced from seafood waste is presented by Aqua V-Cell. This low-cost, biodegradable invention reduces e-waste, gets rid of heavy metals, and turns post-harvest leftovers into useful resources by using chitosan-based biopolymers made from crustacean shells. Developed for low-power electronics and rural energy requirements, Aqua V-Cell satisfies the rising market for environmentally friendly battery substitutes. It empowers communities who depend on fisheries, encourages a circular bioeconomy, and aids India's shift to renewable energy. This effort, which is motivated by Mission 3E—Environment, Economy, and Energy—showcases how waste may be converted into innovative solutions that have a significant impact. This work paves the way for more ecologically conscious and sustainable battery solutions by tying renewable energy storage to seafood waste management.

Keywords: Ecofriendly batteries, seafood waste, bio-based energy storage, circular economy, green technology.

Enclosure based IMTA in Reservoir: A natural way to balance ecosystem

Subhalaxmi Pradhan*, Chinmayee Rauta, Amresh Chandra Majhi

College of fisheries, OUAT, Berhampur, odisha-760 007

*chinmayeerauta2004@gmail.com

RE-IMTA is an advanced holistic and sustainable aquaculture model, established mainly in reservoirs to minimize waste and maximize use of available resources present at different trophic levels. It is a natural way to balance ecosystem with scientific management practices. By mimicking nature, the model is helpful for improving productivity of Reservoir. Here, organic and inorganic wastes produced by one species serve as nutritional input for other species. Cultured species includes fed species, extractive organic with extractive inorganic species at different trophic levels. At the same time, the fine suspended particles are filtered out by filter feeding bivalves. The excess nutrients are utilised by cutime, on of plants like Trapa and Makhana on floating rafts over coco pit bed. In this method different species are cultivated in a same area. The model may help to utilise the large and medium size Reservoir with a better scientific management system and increase productivity of large and medium Reservoirs.

2nd Indian Fisheries Outlook 2025 on “Envisaging Blue Transformation in Indian Fisheries and Aquaculture”, July 12-14, 2025, at CoF, OUAT

Precision Farming, ICT, Sensors, GIS, Robotics in Fisheries (ICT)

Development of low-cost water flow meter with GPS module

Swarup Dasgupta¹, Basanta Kumar Das¹, Pranaya Parida¹, Chayna Jana¹, S. Samanta¹, Nirnoy Haldar¹

¹ ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, India

*swarupdasgupta43@gmail.com

Water flow in lotic system is crucial for healthy fish populations and sustainable fisheries. It affects fish migration, spawning, habitat availability, and overall ecosystem health. Therefore, measurement of water flow in aquatic system is one of the important aspects for monitoring the health of the aquatic system. In general, the existing water flow meter is costly and lacks location information which sometimes requires for further spatial analysis. Therefore, the study has developed a user-friendly low-cost water flow meter which measures water flow of the water bodies using a rotor-based flow sensor. The device employs ESP32 (Microcontroller), GPS module, hall effect technology-based sensor and a rotor with blades angled to rotate when water flows through it. By measuring the speed of the rotor's rotation, the velocity of the water flow is determined. The important feature of the device is its embedded GPS module which provides location information with GPS time and date. The flow value with spatial information is displayed in the device interface and also in mobile via local Wi-Fi. The developed system provides a low-cost and convenient solution for real-time measurement of water flow rates in natural and man-made water bodies such as rivers, canals, and streams.

Keywords: Flow meter, GPS module, Microcontroller, ESP32, Flow sensor, Hall sensor

Drone based imaging for estimation of macrophyte coverage in inland open waters

Chayna Jana¹, Basanta Kumar Das¹, P. Parida¹, R. N. Sahoo², S. Samanta¹, Swarup Dasgupta¹, Kausik Mondal¹, Nirnoy Halder¹

¹ ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, India

² ICAR-Indian Agricultural Research Institute, Pusa, New Delhi-110012, India

[*pranaya.parida.fish@gmail.com](mailto:pranaya.parida.fish@gmail.com)

Macrophytes play a vital role in maintaining healthy ecosystems but, excessive growth can lead to a range of issues, including nutrient imbalances, oxygen depletion, and disruptions to aquatic life. Therefore, monitoring and management of macrophyte infestation is very important aspects to reduce its negative impacts on the ecosystem and support fish production. Recently, drone technologies have been increasingly used in environmental monitoring and management for its high flexibility in using, high spatial resolution and ability to reach to the area with poor accessibility. The study focuses on the estimation of macrophyte coverage area of wetlands using aerial drone with RGB camera. Several wetlands of West Bengal were surveyed and captured the images of the water area using aerial drone mounted with RGB camera. The macrophytes area were then delineated based on visual interpretation in GIS software. Analysis shows that Akaipur, Chamardaha, Chamta, Khalsi and Beledanga wetlands were infested with 0%, 12.2%, 52.2%, 18% and 26.67% of macrophytes in 2022 respectively. Therefore, it revealed that Akaipur wetland was the cleanest wetland whereas Chamta was heavily covered with macrophytes. The application may serve as an affordable solution to monitor the real-time macrophytes area in large open waterbodies and plan the probable management strategies in effective manner.

Keywords: Macrophyte, RGB, drone, imaging, wetland, monitoring

IoT system for real-time monitoring and management of Dissolved Oxygen in culture fishery

Basanta Kumar Das¹, S. Samanta¹, Chayna Jana¹, Pranaya Parida¹, Swarup Dasgupta¹, Nirnoy Halidar¹

¹ ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, India

In fishery system, timely management of water quality is vital for maintaining congenial water quality for better fish survival and attaining its production potentials. Because, the growth and survival of aqua products are very much dependent on the ambient environment. In culture fishery, fluctuations of Dissolved Oxygen (DO) level may severely impact the survival of the aquatic life, sometimes leads to high level of mortality. The stress situation can occur very rapidly and at any time which may be critical for sensitive fishes specially, where fish stocking levels are high. The present study has developed an IoT based system which acts as a smart system to monitor DO level of the waterbody, identify stress situation and automatically starts aerator system to control the situation. The system is embedded with cloud based monitoring system accessed via internet. It automatically manages the DO level based on threshold value which subsequently reduces the power consumption due to on-demand aerator operation, manpower requirement and most importantly high fish mortality induced by DO deficiency. The technology has been deployed at different shrimp farms, RAS system etc. The system is suitable for any cultured fisheries system which maintains the optimum DO level for better fish survival.

Keywords: IoT, DO, culture fishery, aerator, automatic system

Integrating Drone Technology in Inland Fisheries: Innovations in Fish Health Management

Aryasnata Roy¹, Basanta Kumar Das¹, Chayna Jana¹, Swarup Dasgupta¹,
Kausik Mondal¹, Souvik Nayak¹

¹ ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, India

*aryasnataray@gmail.com

Fishery sector plays a crucial role for food security, contributes significantly to livelihoods and income generation for millions. But, it confronts with various challenges like disease management, environmental degradation, water quality monitoring, and resource optimization. In recent times, advanced technologies like drones [Unmanned Aerial Vehicles (UAVs)] are being integrated into the allied sectors of inland fisheries to improve productivity and address disease management issues. The technology provides real-time monitoring of large areas quickly, promotes efficient use of input application, reduce chemical overuse, and lower labour costs. Various antifungal, anti-parasitic, anti-bacterial medicines and disinfects like Fluconazole, Cifax, Ornacur, Potassium permanganate, Oxytetracycline, Benzalkonium chloride, salt, turmeric etc. can be efficiently sprayed or dispensed using sprayer and broadcaster drone. ICAR–CIFRI, Barrackpore has initiated research on exploring this potential of drone technology for nutrition, therapeutic and husbandry practice in efficient manner. Various awareness programs were conducted and dronebased application of CIFRI’s developed medicines like *Kumbhakarna*, *Danav* and *Tandav* have been demonstrated in different wetlands of West Bengal viz. *Khalsi*, *Chamta*, *Sindrani*, *Akaipur* etc. This innovative approach aims to mitigate the constraints of water quality and disease management of large fish farm in a smart and effective way, leading to healthier and better production.

Keywords: Broadcaster drone, Fish growth, Health management, Inland fisheries, Sprayer drone, Sustainability

User-friendly Mobile App for real-time DO monitoring for Aquatic Ecosystem Management

Nirnoy Haldar¹, Basanta Kumar Das¹, Chayna Jana¹, P. Parida¹, S. Samanta¹, Swarup Dasgupta¹

¹ ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, India

*nirnoy.dutta@gmail.com

Maintaining optimal Dissolved Oxygen (DO) level in aquatic environment is essential for ensuring fish survival, health and optimizing production. Sometimes, changes in DO level can happen very quickly and at any time, so monitoring DO in real-time can help not to miss any particular event which may be critical for commercially valued fishes. In response to the need for real-time monitoring, a user-friendly mobile app has been developed to monitor the DO level of the waterbody in real-time. The app integrates with the sensor based IoT system to receive data from DO sensor and display live data of DO, temperature and aerator status in app dashboard. Developed in ThingSpeak IoT platform, the app offers dynamic graphical visualizations, historical data access of specific periods in CSV format. A key feature of the app is its intelligent color-coded DO value (red, yellow, green) display that allows users to quickly interpret water quality conditions which is determined by DO threshold values. Red color (DO < lower threshold value) indicates critical level requiring immediate attention. Orange color specifies DO lies between lower and upper threshold value, indicating caution and green color ((DO > upper threshold value)) indicates safe DO level. This real-time app enhances situational awareness for fish farmers to take immediate management strategies and reduce fish mortality.

Keywords: Dissolved Oxygen, IoT, DO Monitoring App, Aquaculture

Potential Acceptance of Bone Char for Heavy Metal Removal in Aquaculture Using the Technology Acceptance Model Among Fisheries Professionals

Nishant Kumar, Vidyashree Bharti, Martin Xavier, S.N. Ojha, Anshu Surin, Shubam Soni, Swadesh Prakash, V.K. Yadav, Udita Das and Arpita Sharma
ICAR-Central Institute of Fisheries Education, Panch Marg, Yari Road, Andheri (W), Mumbai, India

[*arpitasharma@cife.edu.in](mailto:arpitasharma@cife.edu.in), arpita_sharma@yahoo.com

In this study experiments were done to assess adsorption of heavy metals using fish and chicken bone char which showed encouraging results. As it is a new technology, its acceptance among fisheries professionals is required to be studied and this was the objective of the study for which modified Technology Acceptance Model (TAM) was used. Fisheries professionals were the respondents as they play an important role in shaping the adoption and recommendation of technologies due to their expertise, practical experience, and direct engagement. Their recommendations can influence decisions among fish farmers. Understanding their acceptance using TAM can ensure informed decision making and addressing concerns if any. The TAM included five constructs: Attitude, Perceived Usefulness, Perceived Ease of Use, Behavioural Intention, and External Factors. Expert consultation guided the development of construct-specific statements, each rated on a 5-point scale of acceptance. The instrument was pilot tested with ten fisheries professionals and then administered to fifty-eight postgraduate and doctoral fisheries professionals specializing in Fisheries Social Science and Aquatic Environment Management. After data normalization, scores were categorized into five levels of acceptance: very low (0.00–0.20), low (0.21–0.40), moderate (0.41–0.60), high (0.61–0.80), and very high (0.81–1.00). Descriptive statistics and the Mann-Whitney U test were used to assess acceptance levels and demographic differences. The overall acceptance score was 0.65, indicating high acceptance. Among TAM constructs, attitude (0.75) and behavioural intention (0.66) scored the highest, reflecting high positive perceptions and willingness to adopt bone char. Perceived usefulness (0.64) and perceived ease of use (0.63) also reflected high acceptance, suggesting recognition of both the benefits and feasibility of the technology. External factors scored 0.61, still in the high range, but indicating moderate concern regarding social, cultural, and religious influences. No statistically significant differences were found based on gender, education level, or specialisation, except for some variation in perceptions of water quality benefits and cultural acceptability between Social Science and Aquatic Environment Management groups. The modified TAM framework effectively captured user perceptions and can guide future strategies for technology adoption.

Keywords: Bone Char, Heavy Metal Removal, Aquaculture, Technology Acceptance Model

Captive Breeding and Larval Rearing of Moustached Danio (*Danio dangila*) – A Successful Initiate Towards Propagation of Economically Important Indigenous Ornamental Fish

S. K. Swain, C.K. Mishra*, M.K. Bairwa, P. Das, S. Banchhod, D.J. Nayak and S. Behera

ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, India-751 002

ckmisra7@gmail.com

Moustached danio (*Danio dangila*) (Hamilton, 1822), an endemic hill-stream cyprinid of India, is a species of high ornamental value owing to its attractive traits. Declining wild populations due to habitat degradation and anthropogenic pressures necessitates mass seed production of this economical important ornamental fish species. This study was undertaken to standardize captive breeding and larval rearing protocols of *D. dangila*, supporting propagation of indigenous ornamental fish. Live adult specimens of *D. dangila* were sourced from Assam (Northeast India) and brood stock were raised in cemented tanks at ICAR-CIFA, Bhubaneswar. A hormone-induced breeding trial (Experiment 1) was then conducted using Ovatide at three dosage levels in females (0.4, 0.5, 0.6 ml/kg) and males (0.2, 0.3, 0.4 ml/kg) designated as treatments T1, T2, and T3, respectively. Breeding pairs (2M:1F) were maintained in hapas with two replicates per treatment. The optimal spawning response and fertilization rate were achieved in T2. In Experiment 2, larval rearing was conducted in FRP tanks under three stocking densities: 10 (D1), 20 (D2), and 50 (D3) larvae/L over 60 days. D1 recorded the highest survival and growth, followed by D2 and D3. Specific growth rate (SGR) decreased with increasing larval density. The study successfully established viable captive breeding and larval rearing protocols for *D. dangila*, laying a foundation for its mass seed production and future commercialization in the ornamental fish trade.

Keywords: *Danio dangila*, captive breeding, hormone induction, larval rearing, stocking density, Indigenous ornamental fish

IoT-Enabled Smart Feeders for Precision Feeding in Recirculating Aquaculture Systems and Aquariums: Innovations from ICAR-CIFA

S. Ferosekhan¹, S. K. Swain, C.K. Mishra*, P. C. Das, R. N. Sahoo² and P.K. Sahoo

ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar;

¹Nofima, Sunndalsøra, Norway

²ICAR - Indian Agricultural Research Institute, New Delhi, India-110 012

ckmisra7@gmail.com

Feed management is crucial for optimizing feeding efficiency, improving fish growth and health, and reduction of operational costs in aquaculture systems. ICAR-CIFA has developed two IoT-enabled automated feeders under ICAR-NePPA project for indoor based fish farming. The feeders are CIFA Smart-RASFeeder for RAS and ornamental fish production systems, and the CIFA Smart Aquarium Feeder for home and commercial aquariums. These feeders enhance feed efficiency, reduce labour costs, and enable precision feeding in aquaculture. The CIFA Smart-RASFeeder features an auger-based feed dispensing mechanism compatible with feed sizes from 0.5 mm to 2.5 mm, holding up to 5 kg of feed. This feeder is designed to dispense feeding up to 24 customizable feeding cycles per day. The feeder components are a microcontroller, inbuilt 5G internet, real-time clock, stepper motor and rechargeable battery backup. The feeder is operated fully through a mobile app CIFA AquaSmart (Android and iOS) through cloud server, allowing for remote monitoring and control of the feeder. The system has higher level of precision feeding and has complete remote operation of the feeder. The CIFA Smart Aquarium Feeder developed for aquarium setups, offers a holding capacity upto 100 g feed and it features precise feed dispensing through a compact motorized unit, inbuilt 5G internet, real-time clock, rechargeable battery backup, etc. The feeder is fully controlled via CIFA AquaSMART mobile app, it provides remote feed scheduling, control over the feed dispensing rate. This aquarium feeder is highly suitable for vacation feeding, like feeding of aquarium fishes during travel time. Both feeders support synchronized operation across multiple units through cloud-connected IoT integration. These innovations provide customizable, energy-efficient, and remote-controlled feeding in aquaculture that significantly improve feed utilization, reduce manual feeding, labour cost, and ensure precision feeding to the fishes.

Keywords: Smart Feeder, IoT feeder, Automation, CIFA AquaSMART, Precision Aquaculture.

