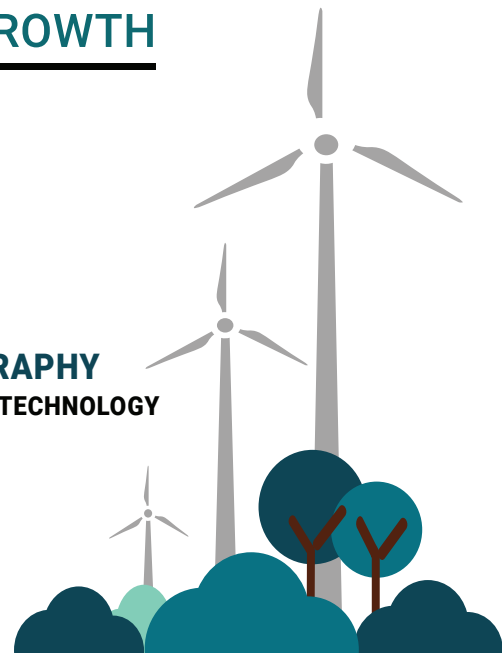# BOOK of ABSTRACTS
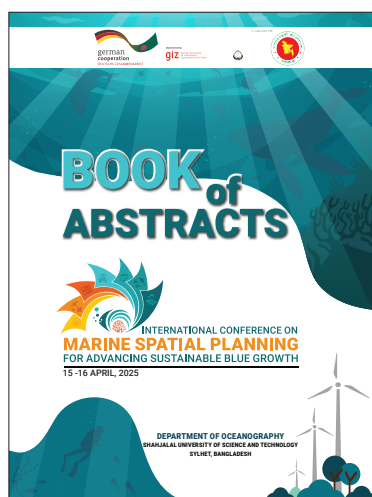
INTERNATIONAL CONFERENCE ON
MARINE SPATIAL PLANNING
FOR ADVANCING SUSTAINABLE BLUE GROWTH

15 -16 APRIL, 2025

DEPARTMENT OF OCEANOGRAPHY
SHAHJALAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
SYLHET, BANGLADESH

Editorial and Review Team

Dr. Subrata Sarker
Dr. Stefan Alfred Groenewold
Dr. Lilian A. Krug
Dr. Myriam Lacharité
Dr. Gawsia W. Chowdhury
Muhammad Mizanur Rahman
Saleh Md. Musa
Dorothea Theunissen
Md. Azizul Fazal

Formatting and Design

Md. Shabit Hossain

Published by

Department of Oceanography
Shahjalal University of Science and Technology
Sylhet 3114, Bangladesh

Editorial

It is with great enthusiasm that we welcome you to the International Conference on "MSP for Advancing Sustainable Blue Growth," hosted by the Department of Oceanography at Shahjalal University of Science and Technology (SUST), Sylhet, Bangladesh, from 15 to 16 April, 2025. This conference brings together a diverse group of experts, researchers, policymakers, and stakeholders dedicated to advancing marine spatial planning (MSP) as a critical tool for sustainable ocean governance and marine ecosystem conservation.

As the global community faces pressing challenges in marine resource management, sustainable blue growth, and climate resilience, MSP emerges as a vital approach to balancing economic, environmental, and social interests in ocean spaces. This conference serves as a platform to foster collaborative discussions, share cutting-edge research, and explore innovative solutions to enhance sustainable ocean use. By integrating scientific advancements, institutional frameworks, and participatory governance, we aim to contribute to a more resilient and inclusive blue economy.

Following a global call for abstracts, we received an overwhelming response with over 130 Abstract submissions. A rigorous review process conducted by the Editorial Team in consultation with the International Scientific Committee, carefully selected 82 abstracts for oral presentations and 42 abstracts for poster presentations.

The conference themes encompass a broad spectrum of critical topics, including capacity development for MSP, marine conservation, blue economy strategies, the role of science and technology in MSP, institutional governance, adaptive monitoring, and the utilization of open-source data. Through keynote presentations, technical sessions, and panel discussions, we anticipate meaningful exchanges that will shape the future of MSP practices globally.

This Book of Abstracts serves as a reflection of the wealth of knowledge and expertise contributed by participants from various disciplines and regions. We extend our sincere gratitude to all authors, reviewers, and organizers who have made this collection possible. We hope it will serve as a valuable resource for researchers, policymakers, and practitioners alike.

On behalf of the organizing committee, we welcome you to Sylhet, Bangladesh, and look forward to a successful and engaging conference that will inspire future collaborations and impactful research in the realm of Marine Spatial Planning.

Editorial Team

Acknowledgement

We extend our deepest gratitude to the German Federal Ministry for Economic Cooperation and Development (BMZ) through the Integrated Management of the Sundarbans Mangroves and the Marine Protected Area of Swatch of No Ground in Bangladesh (SoNG) project, implemented by GIZ Bangladesh, for the generous support and collaboration in organizing the International Conference on "MSP for Advancing Sustainable Blue Growth." GIZ's unwavering commitment to sustainable ocean governance and marine conservation has been instrumental in making this conference a reality.

We would also like to express our sincere appreciation to all the researchers and professionals who submitted their abstracts for presentation at this conference. Their contributions form the foundation of this Book of Abstracts, showcasing innovative ideas and critical insights into Marine Spatial Planning (MSP) and sustainable blue growth.

A special acknowledgment goes to our esteemed keynote speakers for sharing their expertise and thought-provoking perspectives. Their invaluable contributions will enrich the discussions and inspire future research and policy development in the field of MSP.

We extend our heartfelt thanks to all participants representing various organizations, including government agencies, academic institutions, industry representatives, NGOs, artisanal fishers/community representatives, and civil society groups. Their active engagement and collaboration are essential in advancing the discourse on sustainable ocean governance.

Our gratitude also goes to the faculty members of the Department of Oceanography at Shahjalal University of Science and Technology (SUST) for their dedication and support in organizing this conference. We would like to recognize and appreciate the efforts of all students from the Department of Oceanography at SUST. Their enthusiasm, assistance, and participation have greatly contributed to the smooth execution of this conference.

A special note of thanks is extended to the Honorable Vice-Chancellor of SUST, the Pro-Vice Chancellor, the Treasurer, and the Dean of the School of Physical Sciences, SUST. Their guidance, encouragement, and unwavering support have been invaluable in bringing this conference to fruition.

Finally, we are grateful to all individuals and institutions that have contributed to the success of this conference. We hope this Book of Abstracts serves as a valuable resource for continued research, collaboration, and policy advancement in Marine Spatial Planning.

About the Conference

Marine Spatial Planning (MSP) is a strategic and science-based process that organizes human activities in marine environments to achieve ecological, economic, and social objectives. It ensures the sustainable use of marine resources while minimizing conflicts among various sectors, such as fisheries, shipping, energy production, tourism, and conservation. MSP integrates ecosystem-based management, stakeholder participation, and spatial data analysis to promote sustainable ocean governance.

As global ocean resources face increasing pressure from human activities and climate change, MSP plays a vital role in balancing economic growth with environmental conservation. By providing a structured approach to decision-making, MSP helps prevent resource conflicts, protect marine biodiversity, and promote resilient coastal communities. It also supports national and international commitments to sustainable development, climate adaptation, and blue economy growth.

The International Conference on "MSP for Advancing Sustainable Blue Growth" aims to facilitate knowledge exchange on MSP approaches, best practices, and success stories from around the world. It seeks to assess the current status of MSP-related data, governance structures, and institutional arrangements in Bangladesh. By promoting interdisciplinary collaboration among researchers, policymakers, industry stakeholders, and local communities, the conference will strengthen the role of MSP in shaping sustainable blue economy policies for Bangladesh and beyond. Furthermore, it aims to provide recommendations for developing an integrated MSP framework tailored to Bangladesh's maritime sector.

Based on the submitted abstracts, the conference will focus on key themes, including capacity development for MSP, marine conservation, the role of MSP in blue economy development, the application of science and technology in MSP, institutional governance frameworks, monitoring and adaptive management strategies, and the use of open-source data to support evidence-based decision-making. These themes reflect the diverse aspects of MSP and its potential to enhance sustainable ocean management.

The conference will bring together a diverse group of stakeholders, including government officials and policymakers, researchers and academics from national and international institutions, industry representatives from fisheries, maritime transport, energy, and tourism, as well as NGOs, civil society groups, and local community leaders with traditional marine knowledge. Early-career professionals and students will also have the opportunity to engage in discussions and network with experts in the field.

The event will feature seven keynote speeches by leading experts in MSP and ocean governance, along with seven thematic sessions covering critical aspects of MSP. In addition, there will be one side event focusing on citizen science based coastal ecosystem monitoring. The conference will host 82 oral presentations showcasing research findings, case studies, and innovative solutions, as well as 42 poster presentations highlighting emerging research and practical applications of MSP.

This conference is expected to contribute significantly to policy development and knowledge generation by providing actionable recommendations for integrating MSP into national and regional maritime policies. It will strengthen institutional capacity and multi-stakeholder collaboration for MSP implementation in Bangladesh while showcasing successful MSP models from other countries. The discussions will encourage data-driven decision-making through the use of spatial planning tools, open data, and technology. Moreover, the conference will foster research partnerships and interdisciplinary dialogue to advance scientific contributions to MSP. By bringing together experts, policymakers, and practitioners, the conference will lay the groundwork for a comprehensive and inclusive MSP framework, helping Bangladesh and other coastal nations achieve sustainable ocean governance.

Session Plan and Presentation Schedule

Day - 1

Registration (15 April 2025; Time: 08:00 to 09:00; Venue: Central Auditorium, SUST)
Inauguration of the Conference (15 April 2025; Time: 09:00 to 10:30; Venue: Central Auditorium, SUST)

Session 1 (15 April 2025; Time: 11:00 to 13:00); Venue: Central Auditorium, SUST
Session Chair: Professor Dr. Mohammad Mahmudul Islam (Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh)

Time	Speaker	Affiliation	Title of the talk
11:15-11:30	Keynote - 01 Myriam Lacharité	Institute for Marine and Antarctic Studies, University of Tasmania, Australia	Past, Present, and Future: Taking Stock on Marine Spatial Planning as a Mechanism for the Blue Economy
11:30-11:40	Md Asaduzzaman	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Site suitability Mapping for Different Seaweed Cultivation Systems Along the Coastal and Marine Waters of Bangladesh: A Generalized Additive Modelling Approach for Prediction
11:40-11:50	Masiat Alam Zubair	Department of Oceanography, University of Dhaka, Bangladesh	Utilizing Tagging and Mark-recapture study to Inform Marine Spatial Planning for the Conservation of Critically Endangered Widenose Guitarfish in the Sonadia and Bakkhali River Estuary, Bangladesh
11:50-12:00	Gawsia Wahidunnessa Chowdhury	Department of Zoology, University of Dhaka, Bangladesh	Balancing Maritime Trade and Biodiversity Conservation: The Necessity of Strategic Spatial Planning for Shipping Routes in Bangladesh
12:00-12:10	Abdullah-Al Mamun	Department of Fisheries and Marine Science, Noakhali Science and Technology University, Bangladesh	Leveraging Indigenous Knowledge in Marine Spatial Planning for Mud Crab Aquaculture in the Coastal Landscapes of Bangladesh
12:10-12:20	Alifa Bintha Haque	Department of Zoology, University of Dhaka, Bangladesh	Fishers' as Mappers: 3D mapping of Critically Endangered Shark and Ray Overlap with Fisheries in the Bay of Bengal
12:20-12:30	Wijesundara W. A. A. P	Department of Oceanography, Ocean University of Sri Lanka	Approach for Implementing Marine Spatial Planning in Coastal Zone Management and Conflict Resolution; A Case study in Gulf of Mannar Area in Sri Lanka
12:30-12:40	Mohammad Zakirul Alam	Deputy General Manager, Bangladesh Submarine Cables PLC (BSCPLC)	Submarine Cable Infrastructure and Digital Connectivity: Implication for Marine Spatial Planning
12:40-12:50	Mohammad Saydul Islam Sarkar	Department of Oceanography, University of Chittagong, Bangladesh	Strategic Development to Resolve Conflicts among Multiple Uses of Similar Location Using Marine Spatial Planning in the Western Coastal Zone of Bangladesh
12:50-13:00	Muhammad Abdur Rouf	Fisheries and Marine Resource Technology Discipline, Khulna University, Bangladesh	Coastal resources management issues and possible adaptation of marine spatial planning in Bangladesh
13:00-2:30	Lunch		

Session 2 (15 April 2025; Time: 14:30 to 17:00); Venue: IICT Building (Second Floor - Virtual Classroom)
Session Chair: Dr. M Shah Nawaz Chowdhury (Insitute of Marine Sciences, University of Chittagong, Bangladesh)

Time	Speaker	Affiliation	Title of the talk
14:30-15:00	Keynote - 02 Nimit Kumar	Marine Policy and Regional Coordination Section, Intergovernmental Oceanographic Commission (IOC)-UNESCO	Marine Spatial planning for Sustainable Ocean Planning and Management: The Indian Ocean Context
15:00-15:10	Raida Kadir	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	Application of Hydrodynamic and Bio-Physio-Chemical Models to support Marine Spatial Planning in Bangladesh
15:10-15:20	Shohanur Rahman	Center for Participatory Research and Development (CPRD), Dhaka, Bangladesh	Finfish Mariculture in Coastal Bangladesh: Exploring Scopes, Addressing Challenges, and Developing Management Frameworks for Achieving Sustainable Blue Economic Growth
15:20-15:30	Tania Sultana	Eutech Systems Limited, Dhaka, Bangladesh	Hydrodynamical Characterization to Support MSP for Mariculture Development in the central coast of Bangladesh
15:30-15:50	Tea Break		
15:50-16:00	Aisharja Barua Chowdhury	Institute of Marine Sciences, University of Chittagong, Bangladesh	Seagrass Ecosystem Conservation amidst Seasonal Variability of Halophila beccarii Meadows under Coastal Morphological Changes
16:00-16:10	Mahmuda Akter Popy	Institute of Marine Sciences, University of Chittagong, Bangladesh	Taxonomic and Biochemical Investigation of Siliceous Sand Sponges (Family: Tetillidae) from the Southeast Bangladesh Coast: Implications for Marine Spatial Planning (MSP)
16:10-16:20	Md Rashed Ul Alam	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	Towards Green and Secure Energy: Mapping Offshore Wind Potential to Drive Sustainable Development in Bangladesh
16:20-16:30	Mohammad Saifur Rahman	Bangladesh Maritime University	Comparative Study of Monthly and Seasonal Variability of Sea Surface Height (SSH) and Sea Surface Temperature (SST) over Bay of Bengal and Arabian Sea
16:30-16:40	Nushrat Jahan	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Comparative Performance of Different Farming Systems and Associated Influence of Ecological Factors on *Gracilaria sp.* seaweed at the South-east coast of Bay of Bengal, Bangladesh
16:40-16:50	Sayeda Afrin Busra Esha	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Interconnected Relationships Among Eco-physiological Factors, Seasonal Plankton Variations, and Selective Feeding Behaviors of Green Mussels (*Perna viridis*) Along the Southeast Coast of the Bay of Bengal
16:50-17:00	Shaibal Bhattacharjee	Institute of Marine Sciences, University of Chittagong, Bangladesh	Spatiotemporal dynamics of physicochemical properties in the Matamuhuri River catchment of southern Bangladesh: Implications for environmental sustainability and management practices

Session 3 (15 April 2025; Time: 14:30 to 17:10); Venue: IICT Building (Ground Floor - Gallery 1)
Session Chair: Professor Dr. Md Asaduzzaman (Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University)

Time	Speaker	Affiliation	Title of the talk
14:30-15:00	**Keynote - 03** **Pierre Failler**	**Centre for Blue Governance, Faculty of Business and Law, Richmond Building, Portsmouth, United Kingdom**	**MSP and Blue Economy**
15:00-15:10	M. Gulam Hussain	Feed the Future Innovation Lab for Fish, Mississippi State University, USA	Potentials for the Development of Blue Economy: Prospects and Challenges of Mariculture in Bangladesh
15:10-15:20	Mrityunjoy Kunda	Faculty of Fisheries, Sylhet Agricultural University	Mariculture: Advancement, Challenges and opportunities
15:20-15:30	D. Inbakandan	Centre for Ocean Research, MoES - National Facility for Coastal and Marine Research, Sathyabama Institute of Science and Technology, Tamilnadu	Innovation and Sustainability in Marine Biofouling Management
15:30-15:50		Tea Break	
15:50-16:00	K M Azam Chowdhury	Department of Oceanography, University of Dhaka	Identification of Upwelling Zones, Oxygen Minimum Zones, and Potential Fishing Zones for Sustainable Resource Management in the Northern Bay of Bengal: A Baseline Study for Sustainable Marine Spatial Planning
16:00-16:10	Zahidul Islam	Bangladesh Fisheries Research Institute, Marine Fisheries and Technology Station, Bangladesh	Development of a Portable Photobioreactor for Microalgae Culture: Sustainable Shrimp Hatchery Solutions of Bangladesh
16:10-16:20	Mohammad Saydul Islam Sarkar	Department of Oceanography, University of Chittagong, Bangladesh	Marine Spatial Planning for Analyzing Existing Conflicts in the Eastern Coastal Zone within EEZ of Bangladesh
16:20-16:30	Mukta Roy	Department of Food Engineering and Tea Technology, Shahjalal University of Science and Technology, Bangladesh	Exploring Antioxidant Potential of Marine Microalgae from Coastal Region of Bangladesh
16:30-16:40	Abdullah	Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Bangladesh	Marine Spatial Planning: Facilitating Access to the Blue Economy
16:40-16:50	Mohammad Shakline Mostakim	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Breeding Biology of Liza tade Using Gonadosomatic Index and Gonadal Histology from the Moheshkhali Channel, Bay of Bengal
16:50-17:00	Mohammed Aftab Uddin Chowdhury	Founder and Managing Director, Aquamark Bangladesh limited, Bangladesh	Prospect of Marine Microorganism in Aquaculture to Foster Blue Economy of Bangladesh
17:00 – 17:10	Sadia Zaman	Creative Pathways Bangladesh, Dhaka, Bangladesh	Navigating the Blue Economy: Seaweed Farming in Bangladesh's Neoliberal Seascape

Session 4 (15 April 2025; Time: 14:30 to 17:00); Venue: IICT Building (8th Floor - Conference Room)
Session Chair: Professor Dr. Gawsia W. Chowdhury (Department of Zoology, University of Dhaka, Bangladesh)

Time	Speaker	Affiliation	Title of the talk
15:50-16:00	Alifa Bintha Haque	Department of Zoology, University of Dhaka, Bangladesh	From citizen science to open-source low-cost technology-monitoring vs. policing of small-scale fisheries in Bangladesh (case-study- sharks and rays
16:00-16:10	Most. Jarin Tabassum Tethe	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	Citizen science-based approach for saltmarsh habitat mapping to support conservation initiative in southeast coast of Bangladesh
16:10-16:20	Fahmida Akter	Department of Oceanography, Noakhali Science and Technology University, Bangladesh	Collaborative Conservation: Citizen Science for Sustainable Marine Spatial Planning in Bangladesh
16:20-16:30	Nahia Mantaka Chowdhury	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	Incorporating Storm Surge Model Based Early Warning System in MSP: A Pilot Case from Bangladesh
16:30-17:00		Discussion	

Day - 2

Session 5 (16 April 2025; Time: 09:00 to 13:00); Venue: IICT Building (Second Floor - Virtual Classroom)
Session Chair: Professor Dr. Abdullah-Al Mamun (Department of Fisheries and Marine Science, Noakhali Science and Technology University, Bangladesh)

Time	Speaker	Affiliation	Title of the talk
9:00-9:30	Keynote - 04 Lilian A. Krug	Centre for Marine and Environmental Research (CIMA), University of Algarve, Portugal	Enhancing Ocean Observation Capabilities: Training Opportunities
9:30-9:40	Rubaiath - E - Jannat	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Positioning Coastal Fisheries and Aquaculture in Sustainable Marine Spatial Planning of Bangladesh
9:40-9:50	Mohammad Mosarof Hossain	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Against the Tide: Vulnerability and Adaptive Responses in Bangladesh's Small-Scale Fisheries communities
9:50-10:00	Prabal Barua	Young Power in Social Action (YPSA), Chattogram, Bangladesh	Impact of Coastal Embankment on Climate Displacement and Relocation Initiative: Case Study of Community-Based Resettlement Program
10:00-10:10	Md. Sabuj Mia	Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Bangladesh	Governance and Challenges of Seabed Mining: Legal Frameworks and Strategic Directions under UNCLOS and the International Seabed Authority
10:10-10:20	Md. Mohasin Meah	Young Power in Social Action (YPSA), Chattogram, Bangladesh	Environmentally Sustainable Practices for Micro-Entrepreneurs in Coastal Aquaculture: A Case Study in Chattogram
10:20-10:30	Mosharof Hosain	Faculty of Fisheries, Sylhet Agricultural University, Bangladesh	Enhancing Sustainability: The Role of Bangladesh's Marine Dried Fish Industry in Achieving UN SDGs
10:30-10:40	Md. Harun-Or-Rashid	Ministry of Public Administration, Government of the People's Republic of Bangladesh	MSP in Bangladesh to Facilitate the Sustainable Growth of the Blue Economy
10:40-10:50	Muntasir Mamun Shanto	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Value Chain of Soft-shell Mangrove Crab (*Scylla sp.*) in the Satkhira District of Bangladesh
10:50-11:00	Md. Asaduzzaman Rasel	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Influential Factors in Making the Decision to Adopt Renewable Energy in Fisheries and Aquaculture Sectors of Coastal Bangladesh
11:00-11:20	Tea Break		
11:20-11:30	Joykrishno Chondra Biswashorma	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Value Chain Analysis and Cephalopod Fishery Management in South-eastern Coastal Bangladesh
11:30-11:40	Joy Talapatra	Department Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Assessing the Viability and Impacts of Introducing Seaweed Cultivation in Shrimp Farming Ghers/Ponds in Coastal Regions of Bangladesh
11:40-11:50	Mahbub Hasan	Department of Civil Engineering, Sylhet Engineering College, Shahjalal University of Science and Technology, Bangladesh	Addressing Coastal Gentrification Induced Injustice and Displacement of Fishing People in Bangladesh
11:50-12:00	Mukta Sarker	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Unveiling the unexplored social-ecological trap lens of hilsa fishery in Bangladesh
12:00-12:10	Md. Akimun Hasan Rafi	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Interpreting the Price Paradox: A Study on Rising Hilsa Fish Prices Despite Increased Catch
12:10-12:20	Md. Ramzan Ali	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Comparative growth performance on different farming systems of green seaweed (*Ulva lactuca*) cultured at the south-east coast of Bay of Bengal, Bangladesh
12:20-12:30	Md. Rejaul islam	Bluetech life science and agro Ltd, Bangladesh University, Bangladesh	Seaweed Marketing Plan for Blue Economy Development in Bangladesh
12:30-12:40	Sabrina Jahan	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	The growth performance and nutritional profiles of green mussels (*Perna viridis*) in a raft cultivation system: Impact of culture depths and site-specific ecological factors
12:40-12:50	Sadia Halima Tasnim	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Understanding the reproductive strategies and ecological dynamics of *Perna viridis*: An interdisciplinary approach
12:50-1:00	Ajit Ghosh	Humboldt Ambassador Scientist, Department of Biochemistry and Molecular Biology, Shahjalal University of Science and Technology, Sylhet	International Climate Protection Fellowship: Advancing Global Climate Leadership and Research in Germany
13:00-14:30	Lunch		

Session 6 (16 April 2025; Time: 09:00 to 13:00); Venue: IICT Building (Ground Floor - Gallery 1)
Session Chair: Mohammad Shahad Mahabub Chowdhury (Environmental Specialist, Global Department of Environment, South Asia Region, World Bank)

Time	Speaker	Affiliation	Title of the talk
9:00-9:30	**Keynote - 05 Sazlina Salleh**	**Centre for Policy Research, Universiti Sains Malaysia**	**Planning for Resilience: Integrating Conservation Strategies in Urban Coastal Environments**
9:30-9:40	M Shahadat Hossain	Institute of Marine Science, University of Chittagong, Bangladesh	Modelling Ghost Fishing Net in Bangladesh
9:40-9:50	M. Nahiduzzaman	WorldFish Bangladesh, Dhaka	Management and conservation priorities of Marine Protected Areas for a sustainable blue economy in Bangladesh
9:50-10:00	Habiba Mehedi Anika	Department of Environmental Science and Disaster Management, Daffodil International University, Bangladesh	Innovative Strategies for Marine Biodiversity Conservation: A Comprehensive Approach
10:00-10:10	Md Rahimullah Miah	Department of Health Information Technology and Research Scientist, North East Medical College Hospital, Bangladesh	Challenges of marine biodiversity protection through advanced satellite sensor technology
10:10-10:20	Md Shamsuddoha	Center for Participatory Research and Development-CPRD, Bangladesh	Implementation of the Marine Protected Areas (MPAs): A Likely Governance and Institutional Arrangement Synchronized With the Global Frameworks
10:20-10:30	M Shah Nawaz Chowdhury	Institute of Marine Science, University of Chittagong, Bangladesh	Safeguarding the future of St. Martin's coral ecosystem: A holistic approach combining conservation features and zoning
10:30-10:40	Nahia Mantaka Chowdhury	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	An Assessment of the Environmental Dynamics in the Swatch of No Ground to Bridge the Data Gaps in MPA Management
10:40-10:50	Syeda Ayshia Akter	Department of Geography and Environment, Shahjalal University of Science and Technology, Bangladesh	Importance of Spatial Plan for Saltmarsh Habitat Conservation in Bangladesh
10:50-11:00	Masiat Alam Zubair	Department of Oceanography, University of Dhaka, Bangladesh	Spatial Conservation Planning for Guitarfish in Bangladesh Using Local Ecological Knowledge
11:00-11:20			**Tea Break**
11:20-11:30	Kumar Chandrasekaran	Centre for Ocean Research (DST – FIST Sponsored Centre), MoES – Earth Science & Technology Cell, Sathyabama Institute of Science and Technology, Tamil Nadu, India	Complete Mitochondrial Genome of Mobula tarapacana (Philippi, 1892) and Its Phylogeny
11:30-11:40	Hossain Khandakar Zakir	Faculty of Health Sciences, Shinawatra University, Thailand	Comparison of fillet quality and organ health parameters between vaccinated and unvaccinated Atlantic Salmon (*Salmo salar L.*)
11:40-11:50	Mushfikur Rahman Tareque	Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Bangladesh	Value chain analysis of commercial mangrove fisheries of the Bangladesh Sundarbans
11:50-12:00	Shreejon Barua	Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh	Assessment of RAPFISH sustainability indicators of the Sundarbans mangrove fisheries towards creating an enabling environment for SDG 14 implementation
12:00-12:10	Captain Rezaur Rahman	Bangladesh Navy Hydrographic and Oceanographic Centre	Integrated Management Plan of Saint Martin Marine Protected Area for Sustenance of Maritime Economy and Preservation of Fragile Ecosystems
12:10-12:20	Aysha Siddica	Department of Zoology, University of Dhaka, Bangladesh	Ghost fishing: threats of abandoned, lost and discarded fishing gears in aquatic system
12:20-12:30	Rufaida Siddiquee	Institute of Marine Sciences, University of Chittagong, Bangladesh	Assessing Marine Zoning and MSP Nexus in Coastal Zone and Marine Waters of Bangladesh for Sustainable Development Goals (SDG's)
12:30-12:40	Showmitra Chowdhury	Bangladesh Oceanographic Research Institute, Cox's Bazar, Bangladesh	Jellyfish Diversity, Distribution, and Bloom Patterns Along the South-Eastern Coast of Bangladesh: A Marine Spatial Planning Approach for Sustainable Blue Growth
12:40-12:50	Md. Naimur Rahman	Department of Oceanography, Shahjalal University of Science and Technology	Ecological Interactions between Fisheries and the Sundarbans Mangrove Ecosystem
12:50-13:00	Abu Hena Muhammad Yousuf	Department of Oceanography, University of Dhaka, Bangladesh	Marine Pollution: A Critical Analysis of the Legal and Institutional Regimes in Bangladesh for the Sustainable Ocean Governance in the Bay of Bengal
13:00-14:30			**Lunch**

Session 7 (16 April 2025; Time: 09:00 to 13:00); Venue: IICT Building (8th Floor - Conference Room)
Session Chair: Dr. Stefan Alfred Groenewold (Principal Advisor/Commission Manager Biodiversity-Sector, GIZ)

Time	Speaker	Affiliation	Title of the talk
9:00-9:30	Keynote - 06 Marion Glaser	**Centre for Marine Tropical Research (ZMT), Bremen, Germany**	**Spatial Planning in MPAs and MPAs in spatial planning: Experiences from Indonesia and Brazil**
9:45-10:00	Srijon Paul	Institute of Marine Sciences, University of Chittagong, Bangladesh	Advancing Marine Spatial Planning through Comprehensive Ocean Accounting
10:00-10:15	Désirée Schwindenhammer	Leibniz Centre for Tropical Marine Research (ZMT) Bremen, Germany	Bringing together Community-centered Coastal and Marine Governance with Marine Spatial Planning: International Examples and Perspectives for Bangladesh
10:15-10:30	Till Odde Heitmann	Faculty of Forest and Environment, University for Sustainable Development (HNE) Eberswalde, Germany	The role of community participation and co-management for marine conservation in Bangladesh: Present and future pathways for inclusive marine management
10:30-11:00	**Discussion**		
11:00-11:20	**Tea**		
11:20-11:35	Jewel Das	Institute of Marine Sciences, University of Chittagong, Bangladesh	Uniting Blue Economy, Marine Spatial Planning, and Marine Protected Areas on one coast with many fishers
11:20-13:00	**Panel discussion on zoning marine species in Bangladesh – MPAs and other uses of/impact on marine spaces**		
13:00-14:30	**Lunch**		

Session 8 (16 April 2025; Time: 14:30 to 16:00); Venue: Central Auditorium, SUST
Session Chair: Professor Dr. M Shahadat Hossain (Institute of Marine Sciences, University of Chittagong, Bangladesh)

Time	Speaker	Affiliation	Title of the talk
14:30-15:00	Keynote - 07 Sayedur Rahman Chowdhury	**Institute of Marine Sciences, University of Chittagong, Bangladesh**	**Institutional Aspects of Marine Spatial Planning**
15:00-15:10	Commandaer Sajjad Raihan	Bangladesh Coast Guard	Role of Bangladesh Coast Guard in Implementation of Marine Spatial Planning
15:10-15:20	Md Saiful Islam	Bangladesh Institute of Maritime Research and Development (BIMRAD)	A Strategic Vision: Leveraging Bangladesh Navy's Expertise for Effective Marine Spatial Planning
15:20-15:30	Muhammad Tanvir Hossain Chowdhury	Department of Fisheries, Bangladesh	High Sea Fishing: Bangladesh Perspective
15:30-15:40	Mohammad Shahad Mahabub Chowdhury	Environmental Specialist, Global Department of Environment, South Asia Region, World Bank	Importance of a Legally Binding MSP in Bangladesh: Challenges and Pathways to Sustainable Ocean Management
15:40-15:50	Md. Kamruzzaman	Bangladesh Inland Water Transport Authority (BIWTA), Government of the People's Republic of Bangladesh	Maritime Shipping Routes in Bangladesh: Status, Challenges and Opportunities
15:50-16:00	A N M Samiul Huda	Cosmos Foundation, Cosmos Group, Bangladesh	Assessment of Blue Carbon Habitats with Tourism Potentials to Support MSP in the Coastal Region of Bangladesh

Poster Presentation and Tea (16 April 2025; Time: 16:30 to 17:15); Venue: Central Auditorium, SUST
Closing (16 April 2025; Time: 17:15 to 17:45); Venue: Central Auditorium, SUST

List of Posters		
Kanij Fatema Eti	Department of Marine Bio-resources Sciences, Chattogram Veterinary and Animal Sciences University, Bangladesh	Environmental Assessment and Growth Performance of Green Mussels (Perna viridis) on the Southeast Coast of the Bay of Bengal in Bangladesh
Prabal Barua	Young Power in Social Action (YPSA), Chattogram, Bangladesh	Relationship of Body Mass Index and Nutritional Status of Adolescent Youths in and around South-Eastern Coast of Bangladesh
Shilpi Rani Sikder	Department of Zoology, University of Dhaka, Bangladesh	Single-Use Plastics: A Threat to the Aquatic Systems of Bangladesh
Tabarok Bhuiyan	Department of Oceanography, Noakhali Science and Technology University, Bangladesh	Spatial Distribution and Health Risks of Arsenic (As), Iron (Fe), and Manganese (Mn) in Accreted Lands of the Greater Noakhali Coast Region, Bangladesh: Implications for Sustainable Blue Economy Development
Talbia Jahir Chowdhury	Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh	Application of spatial analysis for assessing heavy minerals prospect in Cox's Bazar Seabed
Mohammad Toufiqur Rahman	BRAC	Role of NGOs in supporting sustainable blue economy through marine spatial planning in Bangladesh
Noushad Ahmed Khan Mahi	Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh	A short review on Integration of Geographic Information Systems (GIS) in Marine Spatial Planning
Fayzur Rahman	Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh	Livelihood analysis of people involved in fish drying practices in the South-West coast of Bangladesh
Shaibal Bhattacharjee	Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries, University of Chittagong, Bangladesh	Evaluating Phytoplankton Diversity and Seasonal Trends in Chaufaldandi Khal, Bangladesh: A Step Towards Sustainable Mariculture
Shaibal Bhattacharjee	Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries, University of Chittagong, Bangladesh	Assessing Heavy and Trace Metals in Key Fish and Shellfish Species of Bangladesh: Implications for Human Health Standard

List of Posters		
Sintia Chowdhury Payel	Department of Fisheries Resource Management, Chattogram Veterinary and Animal Sciences University, Bangladesh	Microplastic Pollution in the Sangu River Bangladesh: Occurrence, Abundance and Physiochemical Features
Nafisa Naoar	Department of Fisheries and Marine Science, Noakhali Science and Technology University	Nutritional composition of seven commonly available seaweed species in Bangladesh and their potential contribution to public health nutrition
Israt Jahan Sumaiya	Department of Fisheries and Marine Science, Noakhali Science and Technology University	Freshness quality and shelf-life assessment of three commonly available ready-to-use (RTU) seaweed powders in Bangladesh
Farzana Afruz Sriti	Department of Zoology, University of Dhaka	Transmission of Microplastics in the Aquatic Systems of Bangladesh
Shaibal Bhattacharjee	Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries, University of Chittagong, Chattogram-4331, Bangladesh	Establishing a Comprehensive Fisheries Diversity Checklist in Cox's Bazar Coastal Region: Exploring New Potential for Mariculture Development in Bangladesh
Mahima Ranjan Acharjee	Department of Aquaculture, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh	Analysis of the shoreline dynamics and land use-land cover changes on Kutubdia Island, Bangladesh
Mohammed Joobayear Hossain	Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology	Exploring Machine Learning Applications in Sea Wave Forecasting: Implications for Marine Spatial Planning
Syeda Nowshin Ahmed	Department of Oceanography, Shahjalal University of Science and Technology	Spatio-temporal diversity of macrobenthic communities and their implications for spatial planning and management in the Naf River Estuary, Bangladesh
Sourav Chowdhury	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh	Building Resilience in Small Island Developing States: The Role of Ecosystems in Disaster Risk Reduction and Climate Adaptation
Md Musfikur Rahman	Chattogram Veterinary and Animal Sciences University, Chattogram	Seasonal Variations in Water Quality and Microplastic Contamination in the Surma River, Bangladesh: Implications for Aquatic Health and Human Safety
Md Musfikur Rahman	Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University	Microbial Innovations for Sustainable Pollution Management: Advances in Biodegradation, Bioremediation, and Bioengineering Solutions for Marine Environmental Restoration
Md. Al Mamun	Department of Oceanography, Shahjalal University of Science and Technology	Habitat Suitability of species with aquatic organisms using C4CEM
Md Shamsul Hoque	Department of Oceanography, Shahjalal University of Science and Technology	Environmental Aspects of Mariculture in the Coastal Area of Bangladesh
Md. Hasibul Hasan Hridoy	Department of Oceanography, Shahjalal University of Science and Technology,	Seasonal Distribution of Microplastic Contamination in Sediment from the South-East Coast of Bangladesh
Md.Nazmus Sakib	Department of Oceanography, Shahjalal University of Science and Technology,	Habitat Suitability Modeling of Asian Sea bass (Lates calcarifer) in Bakkhali and Naf River Estuary Using GAM (Generalized additive model)
Md Yeaminur Rahman	Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University	Population Discrimination of *Polynemus paradiseus* in Southern Bangladesh Using a Multivariate Approach to Body Shape Variation
Md Zohir Hossain	Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University	Comparative Growth Assessment of Culture Species Between Monoculture and Integrated Multitrophic Aquaculture (IMTA) in Near Shore System.
Israt Jahan	Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University	Production performance and ecological factors of Gracilaria sp. in different farming systems along the southeast coast of the Bay of Bengal, Bangladesh
Md Musfikur Rahman	Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University	Reproductive biology of the Indian threadfin (*Polynemus paradiseus*) from the southeast coast of Bangladesh
K. M Ekram Mahmud Anik	Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University	Environmental drivers of growth of *Hypnea musciformis*: A comparative study of off-bottom long-line and net farming in the Bay of Bengal
Md. Azharul Haque Shakil	Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University	Morphometric differentiation and stock discrimination of Scylla sp.: A multivariate approach in the coastal region of Bangladesh
Tamanna Islam	Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University	Pond-Based Integrated Multi-Trophic Aquaculture in Cox's Bazar: A Sustainable Approach to Coastal Aquaculture
Omite Ashraf Tihum	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	Abundance, Diversity and Distribution of Macrobenthic Fauna in the southeast coast of Bangladesh: Implications for Marine Spatial Planning
Md. Shabit Hossain	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	Assessment of Surface Water Quality in Estuarine Ecosystems to Support Marine Spatial Planning of the Southeastern Coast of Bangladesh
Farzana Afroz	Department of Oceanography, Shahjalal University of Science and Technology, Bangladesh	Importance of Spatial Plan for Mangroves Habitat Conservation in Bangladesh
Nabanita Das	NANO Research Fellow, Partnership for Observation of Global Ocean, UK	Application of Satellite Data to Support MSP in the Coastal and Maritime Area of Bangladesh
Kifaet Wahid Polok	Institute of Marine Sciences, University of Chittagong, Bangladesh	Conserving Sharks and rays in Bangladesh: Ecological Insights and Management Strategies from St. Martin's Island
Sadia Osman	Institute of Marine Sciences, University of Chittagong, Bangladesh	Taxonomic and ecological insights on a new record of Phyllophorid sea cucumbers (Thyone sp.): Contributing new knowledge for Marine Spatial Planning
Shashowti Chowdhury Riya	Aquatic ecology research group, University of Dhaka, Bangladesh	Eco-Hydrological Data in Coastal and Maritime Areas of Bangladesh: Current Status, Gaps, and Pathways to Support MSP
Sazzad Ahmed Bhuiyan	Institute of Marine Sciences, University of Chittagong, Bangladesh	Geo-Spatial Seafloor Coverage and Coral Habitat Assessment of Saint Martin's Island MPA Using PIT And SAM For MSP
Md.Talif Mia	Institute of Marine Sciences, University of Chittagong, Bangladesh	Spatial variations and factors affecting the phytoplankton diversity in the coastal waters of Sundarbans and St. Martin's Island

KEYNOTE PRESENTATION

Past, Present, and Future: Taking Stock on Marine Spatial Planning as a Mechanism for the Blue Economy

Myriam Lacharité

Institute for Marine and Antarctic Studies, University of Tasmania, Australia

Email: Myriam.Lacharite@utas.edu.au

Abstract

Australia was once considered a pioneer in marine spatial planning, but its implementation has been mixed and geographically limited. Now, increased pressures on Australia's unique marine biodiversity—such as overexploitation, pollution, and climate change—along with new entrants in ocean space, renew the need for a sustainable, evidence-based, and fair Blue Economy. Marine spatial planning could be a key mechanism – among others – to alleviate tensions and ensure ecological sustainability. Here, I provide an overview of the past, present, and future of marine spatial planning in Australia, highlighting its distinct nature compared to international approaches. From national to local levels, I explore where, how, and why marine spatial planning can be revitalized to support Australia's Blue Economy. I extract how Australia could learn from international experiences, and detail Australia's unique challenges and similarities with its neighbours. I focus on geographic challenges of a relatively small population occupying a vast continent, socio-economic and cultural tensions both favouring and resisting implementation, regulatory context, and data and knowledge gaps needed to support marine spatial planning processes. Addressing these factors is key to understanding where and why marine spatial planning could play a pivotal role in supporting a sustainable and resilient Blue Economy for Australia.

Site suitability mapping for different seaweed cultivation systems along the coastal and marine waters of Bangladesh: A Generalized Additive Modelling approach for prediction

Md Asaduzzaman

Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Khulshi 4225, Chattogram, Bangladesh

Email: a_zamanbau@yahoo.com

Abstract

While seaweed cultivation has reached an advanced stage in many Asian countries, this industry remains nascent in Bangladesh, hindered by a lack of comprehensive site suitability mapping. To address this gap, we employed the Generalized Additive Model (GAM) approach to develop habitat suitability maps for different seaweed cultivation systems encompassing the entire coastal and marine territorial areas of Bangladesh. Our study leveraged an *in-situ* dataset comprising production and environmental factors from 180 cultivation plots of four species (*Gracilaria* sp., *Enteromorpha intestinalis*, *Ulva lactuca*, and *Hypnea musciformis*) across five cultivation sites, supplementing this data with other ecological variables derived from satellite observations and model simulations. The GAM analysis identified seven key explanatory variables that collectively accounted for 78%, 76%, and 79% of the observed variability in seaweed data for off-bottom long-line, off-bottom net, and floating long-line cultivation systems, respectively. The model predicted that total suspended solids (TSS) predominantly influenced the habitat suitability for off-bottom net and floating long-line cultivation systems, while salinity was a crucial determinant for off-bottom long-line cultivation systems. The study further demonstrated that the predicted suitable areas (50-100%) for floating long-line cultivation systems (1,850 km^2) substantially outnumbered those for off-bottom long-line (372 km^2) and off-bottom net (380 km^2) cultivation systems. The model showed that the southeast coast, specifically the sandy bottom areas of the Moheshkhali channel and its surroundings, exhibited high suitability (>75% probability) for off-bottom long-line and off-bottom net cultivation systems. In contrast, the floating long-line cultivation system appeared most suitable for seaweed farming along almost the entire coastline of Bangladesh, excluding the Meghna and adjacent estuaries in the central region. Notably, the most suitable areas were specifically concentrated in the coastal areas of Moheshkhali Island, Cox's Bazar, Teknaf, and Saint Martin's Island in the southeast coastal zone, extending potentially to far offshore waters. The predictions of our model aligned well with *in-situ* observations, as evidenced by an area under the curve (AUC) of 0.83 and an R^2 value of 0.85. The insights gleaned from this research offer invaluable guidance to seaweed farmers, entrepreneurs, and policymakers, thereby contributing to the sustainable development of the emerging seaweed-based blue economy in Bangladesh.

Utilizing Tagging and Mark-recapture study to Inform Marine Spatial Planning for the Conservation of Critically Endangered Widenose Guitarfish in the Sonadia and Bakkhali River Estuary, Bangladesh

Nahla Khan[1], Shawnujjaman Khan[1], Md. Sazidul Islam[1], Masiat Alam Zubair[2], Khinma Cho[1], Alifa Bintha Haque[1*]

[1]Department of Zoology, University of Dhaka, Dhaka 1000, Bangladesh
[2]Department of Oceanography, University of Dhaka, Dhaka 1000, Bangladesh

Corresponding author and Project PI*- alifa.haque@du.ac.bd
Email: nahlakhan826@gmail.com

Abstract

The Critically Endangered Widenose Guitarfish (*Glaucostegus obtusus*), belonging to the Rhinopristiformes order, faces significant threats from habitat degradation, overfishing, and climate change. There is a substantial lack of baseline information regarding historical catch records, their ecology and their current presence in the Bay of Bengal region of the Northern Indian Ocean. This study aims to enhance species-specific knowledge and inform Marine Spatial Planning (MSP) strategies to spatially protect this globally threatened species in the Sonadia and Bakhkhali River Estuary, Bangladesh. This area has recently been identified as an ISRA (Important Shark and Ray Area) site for an undefined aggregation of widenose guitarfish. Using tagging and biotelemetry, we will estimate this particular species' population and stock health, investigate the movement patterns, habitat use, and population dynamics, and assess the impacts of habitat fragmentation and anthropogenic activities. Using technology, we will introduce a new synergy of scientific research and local ecological knowledge to conserve marine biodiversity and monitor the species population dynamics in Bangladesh. In our research, we will include fishers and fishing community stakeholders to identify suitable zones for this species and in the tagging-marking study. This mark-recapture method will address the population estimation of this species. It can be used to learn about their habitat usage, movement patterns and ecological structures, vulnerabilities, and underlying reasons for aggregating species near that area. This research will identify the critical habitats and aggregation zones, providing baseline data essential for policymakers in implementing catch limits and contributing to the broader goals of MSP in the region. This research integrates ecological data with socio-economic considerations in MSP to achieve balanced and community-involved conservation and resource use. By addressing the specific needs of the widenose guitarfish and their habitats, our study will contribute to preserving biodiversity and the sustainable development of coastal communities in the Bay of Bengal of Bangladesh.

Balancing Maritime Trade and Biodiversity Conservation: The Necessity of Strategic Spatial Planning for Shipping Routes in Bangladesh

Gawsia Wahidunnessa Chowdhury[1], ANM Samiul Huda[2], Zarin Tasnim[1] and Subrata Sarker[2]

[1]Department of Zoology, University of Dhaka, Dhaka 1000
[2] Department of Oceanography, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh

Email: gawsia@gmail.com

Abstract

Navigational activities in the coastal and maritime areas of Bangladesh have increased significantly over the years. However, studies focused on its impact on biodiversity and ecosystems on its vicinity are quite sparse. The available research indicates such activities to have negative impacts on the biodiversity and ecosystems of the Sundarbans. Focusing on navigation, biodiversity, and environmental conditions; data were collected from a protocol route (used for navigation) and a non-protocol route (not used for navigation) using field surveys, socio-economic surveys, and literature reviews. Observed stressors in navigation routes included- plastic contamination, noise pollution, oil discharge, metal pollution, invasive species, and changes in hydrological parameters and biodiversity. Non-navigational route showed higher species diversity compared to the navigation route. Bangladesh, strategically positioned along the Bay of Bengal, serves as a key hub for both international and domestic shipping. While Chittagong port handles majority of the international cargo, inland waterways, such as the Padma, Meghna, and Jamuna rivers, extensively support the domestic trades, connect major cities like Dhaka and facilitate economic integration. These shipping routes intersect several critical marine habitats, including the Sundarbans mangrove forest, St. Martin's Island, and Nijhum Dwip, which require careful management for conservation. Effective regulation, monitoring, and spatial planning are crucial to balance the economic activities with environmental protection, particularly in the Marine Protected Areas (MPAs). Navigational routes can conflict with other maritime activities such as fishing areas, recreational zones, and MPAs. Shipping is vital for global trade and economic development, but Marine Spatial Planning (MSP) must balance the economic benefits of navigation with other uses like fishing, tourism, and conservation. MSP can enhance emergency response strategies for maritime accidents through improving coordination and resource allocation. Sustainable MSP requires a holistic approach that considers the multifaceted impacts of navigation on aquatic systems and seeks to balance economic, social, and environmental goals.

Leveraging indigenous knowledge in marine spatial planning for mud crab aquaculture in the coastal landscapes of Bangladesh

Abdullah-Al Mamun

Department of Fisheries and Marine Science, Noakhali Science and Technology University, Noakhali-3814

Email: mamun_au22@yahoo.com

Abstract

Mud crab (*Scylla olivacea)* is one of the most commercially important crustacean species in Bangladesh. Wild-caught dependent hard shell and soft-shell crabs are produced in coastal areas. In recent years, there has been significant progress in seed production and the use of prepared feed instead of relying on trash fish. The livelihoods of coastal communities have been negatively impacted by severe climatic conditions, the influx of *Rohingya* refugees, extended fishing bans in both the sea and mangrove forests, and a decrease in coastal fishing activities. Recent progress in seed and feed production has created an opportunity for crab-based integrated coastal aquaculture development. Therefore, it is essential to have marine spatial planning (MSP) and 'aquaculture zoning" that are still in its infancy in Bangladesh due to lack of information, knowledge on its systematic implementation. MSP is a strategic and integrated approach for allocating space for different activities within the bounds of ecological limits. The objective of this study was to leverage the local ecological knowledge to get insights into the suitable locations for mud crab farming, breeding, and processing. We conducted targeted interviews with individuals involved in fishing, wild collection, farming, trading, wholesaling, feed supply, crab trading, hatchery operations, exporting, research, academics, and extension work. The south-east coastal area of Cox's Bazar was deemed very ideal for collecting broodstock due to the presence of water with a salinity of 30 ppt and also excellent for establishing hatcheries. The south-west coastal regions are very suitable for the culture of mud crabs using hatchery-originated and capture-based seed, as well as for the farming of both soft-shell and hard-shell crabs. In some regions of the southwest, there are established processing plants and soft-shell collection centers that are supportive of small-scale farmers. Along with this planning, participants expressed the view that crab biodiversity is still rich but requires the implementation of mass seed production, feed formulation, climate-smart farming technology, product diversification, coordination among government agencies, and initiatives to promote domestic consumption for its sustainable development. The crab industry faces significant challenges due to extreme climatic events such as cyclones, high rain, inadequate hatchery facilities, low survival rates of crablings, difficulties in transporting seeds, and the collection of export certificates. Mud crab aquaculture has been shown to significantly improve the well-being of the people engaged in its production. This is the first endeavor to develop an integrated aquaculture system centered on mud crabs, achieved by a combination of societal consensus and scientific evaluation. The results of this study will serve as a first step for the spatial planning and regulation of mud crab aquaculture in Bangladesh, which will contribute to the long-term sustainability of aquaculture and the promotion of the blue economy.

Fishers' as mappers: 3D mapping of Critically Endangered shark and ray overlap with fisheries in the Bay of Bengal

Alifa Bintha Haque

Department of Zoology, University of Dhaka

Email: alifa.haque@du.ac.bd

Abstract

Shark and ray populations have declined worldwide due to overfishing. Efforts to address this issue are hindered partly due to a lack of understanding of fishing patterns in critical areas. Bangladesh lacks data on the spatially explicit interaction between fisheries and sharks and rays, limiting effective management. Using a novel assessment technique to highlight the most appropriate spatial and temporal management units for fisheries interacting with sharks and rays, we analyzed socio-ecological and species distribution data. We identified areas where Critically Endangered sharks and rays are at risk from fishing activities. This study is the first to map these species' spatially detailed fishing footprints and risk assessments in Bangladeshi artisanal fisheries. Analysis of the 3D spatial operation of other gear types reveals that species of conservation concern are exposed to various gear types in specific areas. While some refuges for deep-dwelling species exist, several are exposed to shallow waters and used as nursery grounds at the juvenile or pregnant stage. There is a significant overlap between species ranges, critical habitats, and the footprint of artisanal fisheries. Spatially explicit maps, incorporating local socio-ecological knowledge, were created to address management challenges by area-based management actions in data-limited situations.

Approach for Implementing Marine Spatial Planning in Coastal Zone Management and Conflict Resolution; A Case study in Gulf of Mannar Area in Sri Lanka

Wijesundara W.A.A.P.

Department of Oceanography, Ocean University of Sri Lanka, Colombo 15, Sri Lanka.

*Email: AnushaW@ocu.ac.lk

Abstract

The coastal ecosystem is increasingly becoming a crucial and essential component by providing the wide range of services for achieving the ecological, economic and social benefits to ensure the sustainability in marine environment for long-term developments Marine Spatial Planning provides a framework for ecosystem-based management by integrating the connection between land, freshwater and the marine environments. Implementing of MSP is carried out as a conservation and resources management tool for Gulf of Mannar area integrated with adequate factors such as existing healthy, productive and resilient marine ecosystem. Over the years, there has been a growing concern in this area by identifying as potential sites for the oil and gas exploration, fishing and aquaculture practices, tourism, renewable energy extraction, marine transportation, conservation and the scientific research. As a result, the marine environment of this region is highly influenced by human activities to deliver the goods and services society needs and consequently it had led to rise conflicts among human uses and conflicts between human uses and the marine environment. Therefore, Marine spatial planning is the result for this conflict resolution and the allocation of space to different users by balancing needs for development, coastal zone management and environmental protection.

Ocean zoning was done using a Geographic Information System to define and analyze the existing conditions. This process utilized all gathered information relevant to the ecological, biological, and oceanographic conditions and the human activities. The final zoning map indicate spatial overlaps among human activities and between human activities and important natural areas to know which areas are most important to conserve and which are compatible with development. The results revealed that most of the landing sites are located associate with the dugong conservation areas and fish trawling activities running closed to the Vankalai coastal wetland which is environmentally sensitive. Results emphasize that MSP is the best solution for overcome the conflicts arising by the increasing development pressures on the coastal environment and sustaining the livelihoods of fisheries dependent communities in this area.

Submarine Cable Infrastructure and Digital Connectivity: Implication for Marine Spatial Planning

Mohammad Zakirul Alam

Deputy Generel Manager, Bangladesh Submarine Cables PLC (BSCPLC)

Email: dgm.hra@bscplc.gov.bd

Abstract

Marine Spatial Planning (MSP) is a critical tool for managing ocean resources efficiently while balancing ecological conservation and economic development. In Bangladesh, submarine cable infrastructure plays a pivotal role in digital connectivity, supporting over 97% of global data transmission. The Bangladesh Submarine Cables PLC (BSCPLC), formerly BSCCL, is at the forefront of integrating submarine cable expansion with MSP to ensure sustainable ocean use. This presentation examines how Bangladesh is incorporating MSP principles into submarine cable deployment and management, addressing key aspects such as site selection, environmental impact mitigation, and cross-sectoral collaboration. As a member of SEA-ME-WE-4, SEA-ME-WE-5, and the upcoming SEA-ME-WE-6 consortia, Bangladesh's strategic investments in undersea cables are shaping its role as a regional digital hub. The discussion will highlight the integration of submarine cable routes within the broader MSP framework, ensuring minimal disruption to marine ecosystems and promoting resilience against climate change and natural disasters.

A crucial component of this study is the regulatory and governance framework governing MSP and submarine cable infrastructure, exploring the role of international agreements, public-private partnerships, and technological innovations in optimizing connectivity while preserving marine biodiversity. Additionally, marine cable maintenance, redundancy planning, and security measures will be addressed to highlight best practices in sustainable submarine cable deployment.

By aligning submarine cable development with MSP strategies, Bangladesh is setting a precedent for balancing technological advancement with marine conservation. This session will provide valuable insights into how MSP can enhance global digital infrastructure planning, ensuring long-term sustainability, economic growth, and environmental protection in the era of digital globalization.

Strategic Development to Resolve Conflicts among Multiple Uses of Similar Location Using Marine Spatial Planning in the Western Coastal Zone of Bangladesh

Mohammad Saydul Islam Sarkar[*] and Md. Shamsul Huda Shovan

Department of Oceanography, University of Chittagong

[*]Email: saydul76@gmail.com

Abstract

This research reveals the interaction and conflicts among multiple users related in coastal areas particularly in Western Coastal Zone. This also focuses on the strategy or policy to resolve conflicts. In Bangladesh the coastal zone is recognized as areas of enormous potentials and intensive human uses. The conservation of coastal and marine ecosystem and resources is closely interlinked, and also the conflicts, with the activities of other sectors such as fisheries, forestry, environment, land, tourism, industry, power energy and mineral resources, education and research, climate change and disasters. Many countries are taking attempts to manage conflicts between users and reduce environmental damage through Marine Spatial Planning (MSP). Integrated coastal zone management (ICZM) and Ecosystem-based management (EBM) are also widely implemented processes that have been used to resolve conflicts among multiple coastal resource users. Bangladesh also needs to take necessary measures such as implementing rules & regulations and establish user friendly coordination among sectors for sustainable management of coastal and marine resources and to achieve Sustainable Development Goals (SDG's).

Coastal Resources Management Issues and Possible Adaptation of Marine Spatial Planning in Bangladesh

Muhammad Abdur Rouf[1*], Srabanti Das Ankhi[1], Joya Biswas[1], Md Rony Golder[2] and Md. Zakir Hossain[2]

[1]Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna, Bangladesh
[3]*Curtin University, Bentley WA 6102, Australia*
[2]Asian Institute of Technology, Thailand

*Email: roufku@yahoo.com

Abstract

Coastal zone of Bangladesh faces significant challenges related to land use change, biodiversity deterioration, and disruption of ecosystem services. These issues are raising a serious concern in recent decades and are highly associated with marine spatial planning. This study has explored these issues and associated policies following several relevant published reports and scientific articles intending to aware stakeholders in marine spatial planning. Land use, particularly agriculture, aquaculture, vegetation, forests, and infrastructure, has changed prominently over the last four decades in the coastal Bangladesh due to salinity intrusion, waterlogging, natural disturbances (flood, cyclone, etc.), drought, and anthropogenic activities. These changes have led to conflict, socio-economic vulnerabilities, soil and water quality degradation in the coastal areas. Anthropogenic pressures, climate change, and management failures have contributed to the extinction and threat to numerous species of coastal biodiversity. The value of total coastal ecosystem services in Bangladesh has decreased at a rate of 0.09% per annum from 1999 to 2019 due to unsustainable resource use, land-use change, overexploitation, pollution, natural calamities, lack of coordination among different agencies and poor enforcement. Relevant policy documents are remarkable but the policy efforts are severely fragmented and highly inadequate in implementation. Lack of coordination and harmonization, participatory mechanism for coastal development, human resource management, and coastal conflict resolution are found responsible for inadequate implementation of the policy efforts. Bangladesh recognizes the need for marine spatial planning to address these vulnerabilities and conflicts existing in the coastal zone. The country is currently in the pre-planning phase of adopting marine spatial planning to sustain its resources and benefit stakeholders.

KEYNOTE PRESENTATION

Marine Spatial planning for Sustainable Ocean Planning and Management: The Indian Ocean Context

Nimit Kumar[1][*]

[1]Marine Policy and Regional Coordination Section, Intergovernmental Oceanographic Commission (IOC)-UNESCO, 7 Place Fontenoy, 75352 Paris 07 SP, France

[*]Email: nd.joshi@unesco.org

Abstract

The Indian Ocean rim and island countries altogether houses about a third of our planet's population. Among the characteristics these countries share is high population density with limited land resources. Further, these countries have young demography, which potentially translates into high future demand of marine resources, need for matching infrastructure and resultant challenges. On the other hand, the coastal oceans in the region are usually less studied relatively with complex mosaics of monsoonal and biogeochemical issues. As more and more countries in the region develop their blue economy policies, the balance between harnessing resources and sustainability becomes further relevant. In these contexts, this talk emphasizes relevance of global programmes such as IOC-UNESCO's MSPglobal and Sustainable Ocean Planning and Management, and their alignment with the regional contexts.

Application of Hydrodynamic and Bio-Physio-Chemical Models to Support Marine Spatial Planning in Bangladesh

Raida Kadir[1*], Kunal Chakraborty[2] and Subrata Sarker[1]

[1]Department of Oceanography, Shahjalal University of Science and Technology, Sylhet, 3114, Bangladesh
[2]INCOIS, India

*Email: raidakadir3@gmail.com

Abstract

The coastal zone of Bangladesh is highly dynamic and ecologically significant, supporting diverse ecosystems and habitats. Effective marine spatial planning (MSP) is crucial for sustainable development, disaster management, and environmental conservation in this region. Utilizing modelling for MSP is a relatively new approach, but it has proven to be highly useful. In this research, a 2D coupled bio-physical model has been developed using Delft3D to simulate the hydrodynamics of the region, incorporating monthly data collected over one year. Spatial and temporal variations of physical and bio-chemical parameters were analysed. Based on the simulations, distinct salinity patterns were observed across Bangladesh's coastal zones. The eastern coast exhibited the lowest salinity levels, while salinity decreased progressively from the open sea towards the coast due to significant freshwater inflow from rivers in the central region. Conversely, salinity was higher along the western coast compared to the open sea. During the monsoon season, salinity decreased notably compared to pre-monsoon and post-monsoon periods, influenced by heavy rainfall and increased freshwater discharge. Nutrient distribution varied, with higher concentrations along the coast compared to the open sea across all three coastal zones. The central coast showed the highest nutrient availability. These nutrient patterns correlated with chlorophyll concentrations, indicating significant impact of nutrients over primary productivity. This approach aids in understanding the environmental requirements of organisms and habitats in these regions, crucial for planning which areas should be preserved, and determining where careful management is needed to support blue economy initiatives.

Finfish Mariculture in Coastal Bangladesh: Exploring Scopes, Addressing Challenges, and Developing Management Frameworks for Achieving Sustainable Blue Economic Growth

Shohanur Rahman

Center for Participatory Research and Development (CPRD), Dhaka 1216, Bangladesh

Email: rahman.shohan@cprdbd.org

Abstract

Bangladesh has enormous potential for aquaculture, especially in Bangladesh's coastal regions. In recent years, there has been a significant surge in the farming area, financial worth, and productivity of marine farming. In Cox's Bazar, marine finfish such as barramundi, grey mullet, green back mullet, pomfret, and hilsa are being cultivated experimentally. Major areas used for its cultivation are the Moheshkhali-Kutubdia canal, Sonadia and Dubla islands in Cox's Bazar, Satkhira, and Khulna-Meghna-Tetulia River basins. Notwithstanding these progresses, considerable challenges still remain to be addressed for the sustainable development of the marine finfish farming industry in Bangladesh, availability of quality seeds and species-specific feed, technological innovation on farming practices and disease management, environmental control, and a balanced marketing system. Challenges addressed miserably are of paramount importance in developing efficient management frameworks wherein both the goals of marine conservation and growth of the blue economy of Bangladesh can coexist and help each other.

Hydrodynamical Characterization to Support MSP for Mariculture Development in the central coast of Bangladesh

Tania Sultana[1]*, Tanjila Sultana[2], and Shah Newaz Alam Shuvo[3]

[1]Research Officer, Eutech Systems Limited, Niketon, Gulshan-1, Dhaka 1212, Bangladesh
[2]Department of Fisheries, University of Chittagong, Chattogram 4331, Bangladesh
[3]GIS Analyst, SPEKTER GmbH, Werner-Heisenberg-Strasse 9, 91074 Herzogenaurach, Germany
*Email: sultanatania077@gmail.com

Abstract

The central coast of Bangladesh, encompassing the dynamic Meghna Estuary, presents a unique and promising environment for the development of mariculture due to its complex hydrodynamical characteristics. This study provides an in-depth analysis of the hydrodynamics of the central coastal zone, highlighting its potential for mariculture development. Utilizing the Digital Shoreline Analysis System (DSAS) and various hydrodynamic models, the study examines the interplay between river discharge, tidal actions, and ocean currents, which together shape the coastal morphology and create conducive conditions for marine aquaculture. The central coast is marked by significant erosion and accretion processes influenced by the Meghna River, which is the primary outlet for the Ganges-Brahmaputra-Meghna (GBM) river system. The river discharges vast quantities of sediment and nutrients into the estuary, supporting a rich and diverse marine ecosystem. The study identifies key hydrodynamical features, such as the northward flow in the Sandwip Channel and southward flows in the Tetulia River and Shahbazpur Channel, which contribute to the region's dynamic sediment distribution and water quality. During the wet season, high river discharge leads to low salinity levels and increased nutrient concentrations in the estuary, creating ideal conditions for the growth of various mariculture species. Conversely, during the dry season, the estuary maintains low salinity levels due to residual flows, which helps sustain a conducive environment for mariculture. The study also highlights the role of tidal actions and ocean currents in maintaining water quality and distributing nutrients, which are crucial for the successful cultivation of marine species. The findings suggest that the central coast's unique hydrodynamical properties can be leveraged to develop a sustainable mariculture industry. The region's natural nutrient-rich waters and dynamic sediment processes provide an ideal habitat for a variety of mariculture species, including fish, shellfish, and seaweed. The study recommends further research to optimize species selection and cultivation techniques, ensuring the sustainable exploitation of this promising coastal zone.

Seagrass Ecosystem Conservation amidst Seasonal Variability of *Halophila beccarii* Meadows under Coastal Morphological Changes

Aisharja Barua Chowdhury[1*], M. Shah Nawaz Chowdhury[1]

[1]Institute of Marine Sciences, University of Chittagong, Chattogram – 4331
[*]Corresponding author: aisharjachowdhury15@gmail.com

Abstract

Seagrass *Halophila beccarii* ecosystem has been suffering in the Bangladesh coast due to coastal morphological changes influenced by the monsoonal climate despite providing several valuable ecosystem services. This study aims to investigate the seasonal changes in seagrass density and biomass along with sediment erosional and depositional rates at seagrass vegetated dynamic estuarine sites, located in the south-eastern coast of Bangladesh. The results indicated that shoot density and biomass of the seagrass, *Halophila beccarii* showed monthly variation, which ranged 109–3143 shoots m^{-2} and 0.38–13.21g DW m^{-2} respectively. The shoot density rapidly increased after the end of monsoon and reached maximum (3143±362 shoots m^{-2}) in October. It also showed sharp decrease during dry winter months due to sedimentation. Sediment deposition began during the post-monsoon, when the sea state conditions were relatively calm and continued until February. By the end of the winter (i.e. February) sediment accumulation reached maximum levels (11.31±1.56 cm) compared to October. Seagrass was absent for the period between February–June in the investigated sites as a result of unstable coastal morphology. However, a total 13 species of fish, 6 species of shrimps and 1 species of crabs were identified from the fisheries samples, taken from seagrass vegetated sites. On the other hand, the benthic sediment core sampling yielded a total of 10 polychaete species, 3 bivalve species, 7 gastropod species, 5 crustaceans and 2 other invertebrate species including sea cucumber and sea anemones. nMDS analysis for seagrass habitats explained 98% (R^2 = 0.98) of observed variation in the data on benthic sediment macrofauna. It also indicated that abundances of seagrass and soil organic contents positively influences the benthic macrofaunal communities in the sampling sites. This seagrass species is classified as Vulnerable on the IUCN Red List of Threatened Species due to pressure from coastal development, pollution and climate change. This study can contribute to formulate and adapt marine spatial conservational planning for seagrass ecosystem of the south-eastern coastal region of Bangladesh.

Taxonomic and Biochemical Investigation of Siliceous Sand Sponges (Family: Tetillidae) from the Southeast Bangladesh Coast: Implications for Marine Spatial Planning (MSP)

Mahmuda Akter Popy[a*], M. Shah Nawaz Chowdhury[a]

[a]Institute of Marine Sciences, University of Chittagong, Chattogram 4331, Bangladesh
[*]Email: mahmudapopy456@gmail.com

Abstract

Marine siliceous sand sponges, often regarded as a goldmine of marine biodiversity, exhibit a flattened to spherical morphology with a distinct osculum-ostia arrangement, lacking true tissues or organs. Their specialized water canal system enables efficient filtration, supported by a robust siliceous spicule composition, making them essential for nutrient cycling, benthic stability, and pharmaceutical research. However, research on their occurrence and biochemical properties in Bangladesh remains limited. This study bridges this gap by conducting a comprehensive taxonomic and biochemical analysis of Tetilla dactyloidea (Carter, 1869) from Sonadia Island, southeast Bangladesh. Specimens were collected using benthic sampling methods, followed by spicule analysis and mammographic imaging for taxonomic confirmation. Biochemical analyses included proximate composition, amino acid and fatty acid profiling via GC-MS, and heavy metal bioaccumulation using AAS. Results confirmed T. dactyloidea based on its characteristic spicules: anatriaenes (89.24 ± 1.84 μm), protriaenes (218.40 ± 2.80 μm), monoactinal monaxon styles (91.28 ± 2.22 μm), and diactinal strongyles (10.18–81.76 ± 0.68 μm), with an absence of sigmaspires, distinguishing it from other Tetillidae species. Habitat characterization indicated a preference for nutrient-rich substrates, consisting of a mix of sandy and muddy sediments with moderate wave action and suitable oxygenation. Biochemical composition revealed high glycine (27.30 ± 1.25 mg/g) and proline (10.49 ± 0.87 mg/g), suggesting structural resilience. The fatty acid profile was dominated by SFAs, particularly C11:0 (49.73 ± 2.45%), indicating potential antimicrobial and metabolic roles. Heavy metal analysis revealed bioaccumulation of Cd (0.63 ± 0.02 mg/L) and Ni (2.03 ± 0.06 mg/L), with MI value indicating a higher bioaccumulation capacity compared to surrounding water and sediment. This study establishes a foundational dataset for sponge research in Bangladesh, with direct implications for Marine Spatial Planning (MSP) through its bioaccumulation potential and pharmaceutical prospects. The integration of taxonomic and biochemical analyses into MSP framework can guide habitat conservation strategies and commercial sponge utilization in Bangladesh. Future research should explore the genetic characterization and pharmaceutical potential of T. dactyloidea through bioactive compound extraction and identification to further support sustainable marine resource management and conservation in Bangladesh.

Towards Green and Secure Energy: Mapping Offshore Wind Potential to Drive Sustainable Development in Bangladesh

Md Rashed Ul Alam[1*], Subrata Sarker[1], Rodney Forster[2]

[1]Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh
[2]Hull Marine Laboratory, University of Hull, Cottingham Road, Hull, UK

[*]Email: rashed.ocg@gmail.com

Abstract

With its extensive coastline and gentle slope along the Bay of Bengal, Bangladesh holds untapped potential for offshore wind energy. This research attempted to establish a comprehensive framework to assess site suitability for offshore wind farms by integrating geospatial analysis, multi-source remote sensing data, and Multi-Criteria Decision Making (MCDM). Historical satellite wind data from SAR (Sentinel-1) and scatterometers (QuickSCAT, ASCAT) are analyzed to map wind speed, direction, and seasonal variability across the Bay of Bengal. Supplementary datasets, including bathymetry, coastal geography, and environmental constraints, are incorporated using GIS to evaluate key factors such as wind power density, water depth, proximity to shore, and ecological sensitivities. The MCDM-GIS framework synthesizes these parameters to identify optimal zones for wind turbine deployment. Expected outcomes include high-resolution suitability maps, quantification of exploitable wind resources, and evidence-based recommendations for prioritizing development areas. This research aims to catalyze Bangladesh's renewable energy expansion, reducing dependency on fossil fuels while addressing energy security and climate resilience. By bridging data gaps and providing a scalable decision-making model, the findings will empower policymakers and investors to accelerate offshore wind projects, nurturing sustainable economic growth and positioning Bangladesh as a regional leader in clean energy innovation, directly supporting SDG 7 (Affordable and Clean Energy) and advancing the nation's commitment to a net-zero future.

Comparative Study of Monthly and Seasonal Variability of Sea Surface Height (SSH) and Sea Surface Temperature (SST) over Bay of Bengal and Arabian Sea

Mohammad Saifur Rahman[1*] and Mohammad Zahedur Rahman Chowdhury[2]

[1]Bangabandhu Sheikh Mujibur Rahman Maritime University, Bangladesh
[2]University of Chittagong, Chittagong 4331, Bangladesh

[*]Email: saifur.ocn@bsmrmu.edu.bd

Abstract

Recent advancements in satellite altimetry data and correction terms are encouraging studies of the remote sensed sea surface height (SSH) variation. The author analyzed and discussed the SSH variability of the Bay of Bengal (BoB) at monthly and intra-seasonal scale (Summer and Winter) and compared the findings with Arabian sea at only monthly scale. Additionally, SST data of BoB is also analyzed to establish relationship with SSH. 10 years (2010-2019) of both SSH and SST data are studied from Copernicus Climate Data Store and NASA Ocean Color Lab (MODIS-Aqua Sensor) respectively. The spatio-temporal coverage of gridded altimetry SSH data allows identify several variability patterns in BoB and Arabian Sea. For monthly time scale, from March to September the variability is higher than any other months of the year. Within the western periphery of BoB, especially Visakhapatnam coastal area showed maximum anomaly (+0.4m). However, SSH variability is comparatively less in Arabian Sea, but the Somalian coast portrayed the highest SSH variability. On intra-seasonal scale, during summer, variability was dominant than winter. Like monthly, the western periphery depicted maximum variation in summer whereas the western Sri Lankan coast shows maximum in winter. Moreover, a positive relation was drawn between SSH and SST, where the months with the highest SST shows the highest SSH. The Bay of Bengal and Arabian Sea are important parts of Indian Ocean and have significant contribution in both regional and global climate. SSH and SST variability the most important feature in climatic study.

Comparative performance of different farming systems and associated influence of ecological factors on *Gracilaria* sp. seaweed at the south-east coast of Bay of Bengal, Bangladesh

Nushrat Jahan[*], Md Mohiuddin and Md Asaduzzaman

Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Khulshi 4225, Chattogram, Bangladesh

*E-mail: Muktanushrat@gmail.com

Abstract

The study evaluated the production performance and biochemical composition of agar-enriched *Gracilaria* sp. in three culture systems (floating long-line, off-bottom long-line, and off-bottom net) from October 2021 to April 2022. Conducted on the southeast coast of the Bay of Bengal, Bangladesh, the participatory farming approach involved local coastal communities. *Gracilaria* sp., growing to lengths of 30-40 cm, were partially harvested every 15-30 days. Results showed that the floating long-line system outperformed the off-bottom systems, with average biomass production 135% and 67.28% higher than the off-bottom long-line and off-bottom net systems, respectively. Growth performance was positively influenced by high salinity, dissolved oxygen (DO), and nutrient concentration, while high temperature, turbidity, and total suspended solids (TSS) had negative impacts. Biochemical analysis revealed that *Gracilaria* sp. from the floating long-line system had significantly higher protein, lipid, essential amino acids (EAA), and mineral contents (Ca, K, Zn) than those from off-bottom systems. The floating long-line system also resulted in 11.23% higher n6-PUFA content and 18.79-21.29% higher agar content. Additionally, the floating long-line system produced *Gracilaria* sp. with significantly lower heavy metal (Cr, Cd, Pb, As) content. The study concluded that the raft-based floating long-line system is a promising technology for cultivating agar-enriched *Gracilaria* sp. in coastal Bangladesh and similar regions.

Interconnected Relationships Among Eco-physiological Factors, Seasonal Plankton Variations, and Selective Feeding Behaviors of Green Mussels (*Perna viridis*) Along the Southeast Coast of the Bay of Bengal

Sayeda Afrin Busra Esha[*] and Md. Asaduzzaman

Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Khulshi-4225, Chattogram, Bangladesh

[*]Email: sayedaafrinbusra@gmail.com

Abstract

The feeding behavior of marine bivalves, such as the green mussel (*Perna viridis*), is influenced by both intrinsic biological and extrinsic ecological factors. This study employed an integrated multivariate approach to explore the insights of the feeding biology of *P. viridis* collected from the southeast coast of the Bay of Bengal, Bangladesh, by linking ecological factors, seasonal plankton dynamics, reproductive traits, and plankton ingestion data. The correlation tests, multivariate analysis, and cluster analysis showed that water parameters, gut plankton abundance, and their composition were predominantly influenced by seasonality and ecological factors of the environment. The selectivity indices analysis confirmed that green mussels preferentially ingest specific plankton taxa. The multivariate analysis indicated that plankton ingestion by green mussels was not affected by sexual dimorphism but increased during gonad development and maturation. This suggests that *P. viridis* adopts opportunistic feeding patterns to build their gonads, utilizing energy from ingested planktons available in the water column. The correlation outcomes consistently demonstrated a positive relationship between the quantitative ingestion of plankton and the gonadosomatic index of green mussels. Although green mussels predominantly ingested Coscinodiscophyceae (20-60% of total ingestion), they also selectively ingested increased amounts of Bacillariophyceae, Fragillariophyceae, Dinophyceae, and zooplankton during gonad development and maturation stages to meet the specific metabolic requirements of gametogenesis. The principal component analysis (PCA) revealed that seasonality and reproductive cycles explained over 47% of the variability. The first two principal components indicated that the selective ingestion of different plankton taxa by *P. viridis* was closely linked to seasonality, ecological drivers, plankton biomass, and community structure, depending on the metabolic energy requirements during gametogenesis stages. These findings provide a deeper understanding of the selective feeding behavior of *P. viridis*, which is essential for maintaining ecosystem sustainability and improving the growth and productivity of this important species in aquaculture systems.

Spatiotemporal dynamics of physicochemical properties in the Matamuhuri River catchment of southern Bangladesh: Implications for environmental sustainability and management practices

Shaibal Bhattacharjee [a*], Md. Imran Hossain Khan [a], Kazi Mohammad Reduanul Islam Shakil [a], Jewel Das [a], Md. Mostafa Monwar [a], Avijit Talukder [bc], Md. Shafiqul Islam [a]

[a] Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries, University of Chittagong, Chattogram-4331, Bangladesh
[b] Division of Marine Science, School of Ocean Science and Engineering, The University of Southern Mississippi, Stennis Space Center, MS 39529, USA
[c] Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh

Email: shawonimsfcubd@gmail.com

Abstract

The southern region of Bangladesh is characterized by different rivers and watersheds that lie under the Ganges-Brahmaputra-Meghna deltaic system. This deltaic system carries large amounts of transboundary water and alluvial sediments, where different physicochemical parameters profoundly influence the spatiotemporal distribution of streams and tributaries. However, the dynamic pattern in which these features influence total hydro-pedological distribution is still unexplored in this region. To explore this pattern, the current study was conducted in the Chowfaldandi catchment of the Matamuhuri River, Bangladesh. Twenty-four environmental samples were collected during the winter, pre-monsoon, monsoon, and post-monsoon seasons using the transect method. All parameters were measured using standard methods at the 1% significance level, and in terms of sites, no parameters showed a significant difference except some sediment (S) parameters: bulk density, porosity, moisture, sand, silt, and clay. In contrast, sediment temperature, salinity NO_2-N, SiO_3-Si, and all hydrological comparisons were statistically significant except for transparency and pH throughout the seasons. Principle component analysis (PCA) 1 and PCA 2 revealed that ten major variables greatly influence the 55.85% variance of hydro-pedological chemistry in this catchment. Besides, cluster analysis segments those variables and seven sites into four clusters. There is a very strong positive link (r > 0.75) between SW temperature and salinity, SW-temp vs. SiO_3-Si, TSS vs. W-pH, TDS vs. W-salinity, TDS vs. TSS, and sand vs. bulk density. In essence, this study underscores the spatio-temporal dynamics and anthropogenic impacts on the hydrology-pedological characteristics of this region. These environmental data will be more useful for further coastal zone planning and improving resource management approaches in similar transboundary coastal regions of the country and abroad.

KEYNOTE PRESENTATION

MSP and Blue economy

Pierre Failler

Centre for Blue Governance, Faculty of Business and Law, Richmond Building, Portland Street, Portsmouth, PO1 3DE, United Kingdom

E-mail: pierre.failler@port.ac.uk

Abstract

The blue economy development cannot be done without a proper planning both in terms of time and space. Marine spatial planning (MSP) provides a useful tool to ensure that coastal and marine space occupation is done properly without negative externalities between activities. MSP implementation is also a pertinent way to reassure economic investors as they have a clear view of the way the coast and the sea will be used for. The presentation aims to present the BE development for a country like Bangladesh with the MSP requirement and steps for establishment.

Potentials for the Development of Blue Economy: Prospects and Challenges of Mariculture in Bangladesh

M. Gulam Hussain[1]*, Sheikh Aftab Uddin[2] and Pierre Failler[3]

[1]Feed the Future Innovation Lab for Fish, Mississippi State University, USA
[2]Institute of Marine Sciences (IMS), University of Chittagong, Chittagong-4331 Bangladesh
[3]Economics and Finance Group, Portsmouth Business School, University of Portsmouth, Portsmouth, UK

*Email: hussain.mgulam@gmail.com

Abstract

This paper sets out to address the prospects and potentials for the development of blue economy in Bangladesh through the sustainable use of its vast marine resources. It lays out the current state of comprehensive knowledge regarding opportunities and challenges for developing the sector as well as the emerging potentials in developing the blue economy for improving social and economic conditions of the country. The paper also highlights a total of 26 productive blue economy development and economic sectors, which have been identified for full utilization of ocean-based resources within the present maritime boundary of Bangladesh, among which 12 sectors have been prioritized as major sectors including Marine Fisheries and Aquaculture. Emphasis has been given to this sector as the most potential one for overall economic benefit and livelihood development of hundreds and thousands of coastal rural peoples of the country. Specifically, prospects for developing mariculture opportunities of both brackish and marine fish species as well as mariculture of non-traditional marine species in the coast, near shore and offshore areas have been addressed. In fine, the paper describes the current framework of marine resource management in the Bay of Bengal, delves into the challenges of mariculture development under the concept of blue economy in the seventh 5 Year Plan of the Govt. of Bangladesh and also recommends ways to advance blue economy governance in order to address pressures and ensure sustainable development of mariculture in the country. However, further researches/investigations are required to make a detailed account about the prospects, contributions, challenges and managements of mariculture-based blue economy in the development of Bangladesh's economy in commensurate with the national and international perspectives.

Mariculture: Advancement, Challenges and opportunities

Mrityunjoy Kunda

Faculty of Fisheries, Sylhet Agricultural University, Sylhet

Email: kunda.arm@sau.ac.bd

Abstract

Fisheries subsector plays an important role in the national diet and economy of Bangladesh. Most of the aquaculture production comes from freshwater providing 57% share to the total fish production, but mericulture has proved to be an efficient supplier of animal protein in many countries of the world. Bangladesh is lag behind though there is a great potential in Bay of Bengal having an area of 118813 sq km. According to vision (Rupakalpa) 2041 the demand of fish is 8.5 million MT and advancement of freshwater aquaculture almost reached its peak, so that mericulture could be the most promising option to meet up the huge demand. Under the concept of blue economy development in Bangladesh a number of potential areas and opportunities for mariculture development have been identified for implementation. Mericulture covers a wide range of activities, practiced using a variety of techniques from extensive to intensive habitats ranging from coastal waters to the open sea. There is a number of species have been identified as promising fish species for mericulture, such as hilsha (*Tenualosa ilisha*), seabass (*Lates calcarifer*) and grey mullet (*Mugil cephalus*), and some shrimp species, tiger shrimp (*Penaeus mondon*), brown shrimp (*Metapenaeus monoceros*), Indian white shrimp (*Penaeus indicus*) and also mud crab (*Scylla serrata*). There are so many non-traditional marine species having a great potential for mericulture, such as seaweed, mussel, oyster, sea cucumber, etc. needs to be incorporated in our culture system. By this time seaweed has been able to drawn attention to the fish farmers in the coastal areas, especially in Cox's Bazar. There are so many challenges and constraints in developing the mericulture that need to be addressed for its wider dissemination. One of the main constraint is seed production technology of important suitable species - like, seabass, mullet, hilsha, crab, etc. is not yet developed in our country. Feed for different mericulture species is also not yet manufacturing in Bangladesh. Another important issue is potential sites of mericulture not yet identified. Need to be developed a good mariculture plan with ecosystem considerations was therefore paramount. Marketing is a big challenge for non-traditional marine species, because domestic consumption is very poor, people are not habituated to consume it and alternate use of these species is not yet developed. A series of researches need to be performed involving universities, research institutions and private entrepreneurs' for furnishing the mericulture technologies and effective implementation to contribute in the Blue economy.

Innovation and Sustainability in Marine Biofouling Management

D. Inbakandan

Centre for Ocean Research, MoES - National Facility for Coastal and Marine Research, Sathyabama Institute of Science and Technology, Tamilnadu, INDIA

Email: inbakandan@gmail.com / inbakandan@sathyabama.ac.in

Abstract

Marine biofouling is a persistent challenge affecting maritime industries, particularly the shipping sector, where fouled hulls lead to increased fuel consumption, higher greenhouse gas emissions, and the global spread of invasive aquatic species. Addressing these concerns, research at the Centre for Ocean Research, Sathyabama Institute of Science and Technology, has focused on developing eco-friendly antifouling strategies using marine-derived natural compounds, nanomaterials, polymer composites, and surface modification techniques. An in-house experimental testing facility has been established to evaluate bacterial attachment, diatom adhesion, and seaweed spore settlement, enabling validation of both novel and commercial antifouling solutions. Additionally, studies on chlorine biocide optimization have contributed to controlling mussel attachment in power plant cooling water circuits, while research on hydrophobic surface grading has provided insights into biofouling resistance in fishing harbor environments. By integrating science-based approaches, this research provides a comprehensive understanding of marine organism adhesion strategies and existing mitigation techniques, assessing both the environmental and economic impacts of biofouling. The findings emphasize the strategic use of biocidal and non-toxic antifouling solutions, promoting sustainable practices. Overall, these advancements offer broad applications across marine industries, contributing to innovative, efficient, and environmentally responsible antifouling technologies.

Identification of Upwelling Zones, Oxygen Minimum Zones, and Potential Fishing Zones for Sustainable Resource Management in the Northern Bay of Bengal: A Baseline Study for Sustainable Marine Spatial Planning

K M Azam Chowdhury

Department of Oceanography, University of Dhaka
Email: azamch0188@yahoo.com

Abstract

Marine Spatial Planning is essential for sustainable resource management in the Northern Bay of Bengal (NBoB), where upwelling, oxygen minimum zones (OMZs), and potential fishing zones (PFZs) shape marine productivity. Thus, this study integrates high-resolution numerical modeling, remote sensing, and field observations to assess the spatiotemporal variability of these key oceanographic features, providing a foundation for strategic fisheries and environmental management. Upwelling intensity peaks during the summer monsoon, with the largest extent in August (3.57 million km²), driven by strong Ekman pumping. Productivity in the NBoB is enhanced by upwelling in the offshore and riverine discharge in coastal areas. PFZ analysis identifies six key zones, with three Very High Potential Fishing Zones (VHPFZ) that are extremely persistent in the GBM Delta, extending from the Bangladesh coast to the West Bengal coast, close to the Irrawaddy River Estuary, and offshore into the central Bay. These zones are highly persistent in terms of being productive for most of the months, whilst another three PFZs have been identified as having low persistence in terms of not being highly productive for all the months. Two of these are near the Myanmar coast, while another is near the eastern coast of India. Among these PFZs, the one towards the central bay is a novel discovery for this study. It is more productive during summer due to the strong southwest monsoon wind, which influences the positive vertical velocity of Ekman transport, bringing nutrients upwards and resulting in a high chlorophyll content (~1.4 mg/m3) in this region. OMZ assessments reveal fluctuating upper and lower boundaries (50–275m and 100–900m), with a recent OMZ thickness varying from 20–800m. Severe OMZs in the northern Bay, driven by riverine Total Dissolved Solids (TDS), pose ecological risks, particularly for demersal and pelagic fish populations. These findings underscore the need for seasonally adaptive fisheries management, strategic PFZ zoning, and mitigation of OMZ impacts. Integrating these insights into MSP can enhance fisheries sustainability, conservation efforts, and economic resilience in the region.

Development of a Portable Photobioreactor for Microalgae Culture: Sustainable Shrimp Hatchery Solutions of Bangladesh

Zahidul Islam[1*], Turabur Rahman[1], Shafiqur Rahman[1] and Anuradha Bhadra[2]

[1]Bangladesh Fisheries Research Institute, Marine Fisheries and Technology Station, Cox's Bazar-4700
[2]Bangladesh Fisheries Research Institute, Headquarter, Mymensingh-2201

[*]Email: zahidaphs@gmail.com

Abstract

In Bangladesh's shrimp (*Peneaus monodon*) hatcheries; the microalgae *Skeletonema* sp. is used as post larvae (PL) diet for rearing. In the hatcheries microalgae culture system, the contamination of initial algae stock was found a common phenomenon through a survey, which ultimately resulted in shrimp PL production loss. This study was designed to develop an optimized portable photobioreactor model for microalga pure stock maintenance. Initially, *Skeletonema* sp. was selected for optimization as it is the most widely used species in the shrimp hatcheries of Bangladesh. A 3ft × 3ft photobioreactor system with nine separate culture jars had developed which possesses an automatic temperature-controlled system using controlled temperature water flow. The physico-chemical parameters i.e. salinity, temperature and *pH* were optimized for *Skeletonema* sp. culture using response surface methodology in the function of Box-Behnken design for maximizing the cell density and culture period. The modified f/2 guillards medium was used as the culture medium for *Skeletonema* sp. culture in the photobioreactor system. A total of 17 experiments were conducted to analyze the optimum conditions of the selected three parameters. According to the desirability parameters run of the model of 27 ºC temperature, 29 ppt salinity and a *pH* of 7.5 produced the maximal cell density of 1.01×10^6 cells/mL at day 4. Under these optimal conditions, *Skeletonema* sp. produced 43.40 ± 1.35% protein, 18.44 ± 1.77% lipid and 21.90 ± 0.60% carbohydrate. Under these conditions, *Skeletonema* sp. synthesized 47.87% of essential amino acids, 74.38% monounsaturated fatty acids, 4.76% omega-6 fatty acids, 2.17% omega-3 fatty acids and 6.93% polyunsaturated fatty acids in its dried biomass. This optimized photobioreactor model will aid a new dimension in microalgae stock maintenance.

Marine Spatial Planning for Analyzing Existing Conflicts in the Eastern Coastal Zone within EEZ of Bangladesh

Mohammad Saydul Islam Sarkar* and Md. Mahmudul Hasan Saiful

Department of Oceanography, University of Chittagong

*Email: saydul76@gmail.com

Abstract

Due to multiple uses and vast economic activities many conflicts are happen in the eastern coastal zone & EEZ of Bangladesh. This research's aim was to find and analyze those conflicts. By studying literature and collecting data from MODIS the sector of conflicts is identified. Aquaculture, Industry, Tourism, Mangrove, Energy & Resources, Ecosystem, Coastal Land, Coastal Community and Climate Change are the major sector of conflict in the eastern coastal zone. In Exclusive Economic Zone, conflicts are happening in Fishing ground, Minerals, Military Activities and, Maritime Trade Sector. Marine Spatial Planning (MSP) is the finest way to solve of the conflicts.

Exploring Antioxidant Potential of Marine Microalgae from Coastal Region of Bangladesh

Mukta Roy*, Animesh Sarkar and Md. Mozammel Hoque

Department of Food Engineering and Tea Technology, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh

*Email: muktaroy-fet@sust.edu

Abstract

This study evaluates the antioxidant properties of methanolic extracts from three microalgae species—*Nannochloropsis oculata*, *Chaetoceros muelleri*, and *Tetraselmis subcordiformis*—isolated from the Bakkhali river estuary in Cox's Bazar, Bangladesh. The total phenolic content (TPC) and total flavonoid content (TFC) were determined, and antioxidant activities were measured using 1, 1-diphenyl-2-picryl hydrazyl (DPPH) radical scavenging activity and total antioxidant capacity assays. The TPC values were found to be 10.93 mg GAE/g for *N. oculata*, 13.04 mg GAE/g for *C. muelleri*, and 18.48 mg GAE/g for *T. subcordiformis*. The TFC values were 25.12 mg QE/g for *N. oculata*, 9.48 mg QE/g for *C. muelleri*, and 13.04 mg QE/g for *T. subcordiformis*. At a concentration of 4 mg/ml methanolic extract, the DPPH radical scavenging activities were 60.69 % for *N. oculata*, 66.87 % for *C. muelleri*, and 73.41 % for *T. subcordiformis*, compared to 78.63 % for ascorbic acid. The IC_{50} values were 2.64 mg/ml for *N. oculata*, 2.25 mg/ml for *C. muelleri*, and 1.86 mg/ml for *T. subcordiformis*, with ascorbic acid at 1.24 mg/ml. Total antioxidant capacities were determined to be 14.13 mg AAE/g for *N. oculata*, 14.97 mg AAE/g for *C. muelleri*, and 17.20 mg AAE/g for *T. subcordiformis*. The results indicate that *Tetraselmis subcordiformis* exhibited the highest antioxidant activity among the studied species, suggesting its potential as a valuable source of natural antioxidants. The findings highlight the significant antioxidant potential of these microalgae, emphasizing their applicability in developing antioxidant-rich functional foods and nutraceuticals.

Marine Spatial Planning: Facilitating Access to the Blue Economy

Abdullah*, Seju Ahmed Hasan, Syed Ali Mortuza Naeem and Md. Numan Hossain

Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh

Email: limonabdullah616@gmail.com , m.numan-pme@sust.edu

Abstract

While relinquishing nonrenewable energy sources is imposing severe challenges for meeting energy needs in the near future, renewable marine-based energy sources are the beckoning hope in this regard. Blue Economy is the use of the marine environment in a sustainable way to produce resources. As the world energy sector shifts towards more environmentally friendly and renewable substitutes for the present energy sources, the EU plans to meet its annual gross final energy consumption by at least 32% from renewable resources. The sea and oceans store energy through tides, waves, heat, and currents. The primary objective of the blue economy is to exploit these energy resources and devise technology that can transform these energy sources to be used by humans. A sustainable and eco-friendly approach is the primary demand in this regard. Marine spatial planning comes in handy to devise a strategy where the primary objective can be attained sufficiently and sustainably with minimal to no side effects and aftereffects. Marine spatial planning assesses the systematic distribution of activities and resources in marine environments to achieve ecological, social, and economic objectives. Many countries with a border along the sea or ocean have used MSP for a long time to get the most out of their marine resource. According to UNESCO, 66 countries from 6 continents were developing their personal MSP. Although many countries are still developing, others have plans already in place. In this paper, we will review the ongoing MSP and its effect on the blue economy and try to conclude how the future energy sector might be affected by the usage of MSP in enhancing the blue economy.

Breeding Biology of *Liza tade* Using Gonadosomatic Index and Gonadal Histology from the Moheshkhali Channel, Bay of Bengal

Mohammad Shakline Mostakim[*] and Md Asaduzzaman

Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Zakir Hossain Rd, Bangladesh

[*]Email: akilshakline99@gmail.com

Abstract

This study investigated the reproductive biology of *Liza tade* from the southeast coastal region of Bangladesh. A total of 979 specimens were collected monthly from the Moheshkhali Channel between February 2023 and January 2024. The cumulative male-to-female sex ratio was 0.91:1. The mean gonado-somatic index (GSI) for females peaked in December (11.5 ± 6.55) and was lowest in June (0.11 ± 0.03). The highest individual absolute fecundity (61248 ± 7560) was recorded in December. Histological examination of the ovaries revealed the highest percentage (80%) of mature oocytes at various developmental stages in December. Based on GSI, fecundity, and gonadal histology, the breeding season of *Liza tade* extends from November to February, with a remarkable peak in December. Both sexes exhibited low condition factor levels in December and February but high levels in October. The length-weight relationship (LWR) showed a coefficient of determination value (r^2) of 0.72 and a slope of b=2.17, indicating negative allometric growth (b<3). A significant linear relationship was observed between fecundity and total length, body weight, and gonad weight. These findings provide critical information for the improvement of induced breeding techniques and the long-term management of *Liza tade*.

Prospect of Marine Microorganism in Aquaculture to foster Blue Economy of Bangladesh

Mohammed Aftab Uddin Chowdhury

Founder and Managing Director, Aquamark Bangladesh limited
Email: aftabimscu@gmail.com

Abstract

The sustainable development of aquaculture has garnered significant attention due to the increasing demand for seafood and the need to minimize the environmental impact of traditional aquaculture practices. Currently, the industry relies heavily on antibiotics and disinfectants to manage disease outbreaks, which can lead to antibiotic resistance and environmental contamination. As an alternative, probiotics and parabiotics have gained popularity for their potential to enhance the health and productivity of aquaculture species. Probiotics, which are live beneficial microorganisms, and parabiotics, which are non-viable microbial cells or their components, are increasingly being imported from countries such as the USA, Thailand, Japan, China, and India. Despite their growing usage, there is a lack of concrete data on the quantity of probiotics being imported. In the context of the Blue Economy, marine microorganisms present a promising avenue for developing anti-infective strategies in aquaculture. The study by Hamza and Zinjarde (2023) in the Journal of Applied Microbiology highlights the potential of marine microorganisms in designing sustainable aquaculture production methods. Building on this foundation, this research aims to focus on the utilization of marine microorganisms, particularly probiotics and parabiotics, to promote sustainable aquaculture practices. The study will investigate the efficacy of various marine-derived probiotics in enhancing disease resistance and overall health of aquaculture species, thereby reducing dependency on antibiotics and chemical disinfectants. In collaboration with Aquamark, this research will also explore the business expansion and marketing opportunities for marine microorganisms in aquaculture. Aquamark has proposed to take responsibility for the business aspects, ensuring that the findings from this research are effectively translated into commercial products and practices. This partnership aims to bridge the gap between scientific research and market application, contributing to the sustainable growth of the aquaculture industry.

Navigating the Blue Economy: Seaweed Farming in Bangladesh's Neoliberal Seascape

Sadia Zaman

Creative Pathways Bangladesh, House 62, Road 1, Block I, Banani, Dhaka 1213

Email: zaman.sadia.du@gmail.com

Abstract

Seaweed farming has emerged as an alternative development solution in Bangladesh's burgeoning blue economy agendas, driven by the global demand to address food security, sustainable marine resources and livelihood options for coastal communities. Although the seaweed sector in Bangladesh has shown potential and garnered attention from development practitioners, it remained unclear why it has not taken off. This study was conducted to explore the theoretical framework of the blue economy, specifically focusing on its past relations to the development history of Bangladesh and future application seaweed aquaculture. Additionally, it investigated the expert's experiences and insights and farmer's experience and perceptions on the seaweed aquaculture in Bangladesh to see if the two imaginations and realities are contested. This study, however, attempted a qualitative approach by conducting primary data collection through KIIs with key personnel and IDIs with the farmers within the industry. By pursuing these mixed-method approaches and Kasia Paprocki's perspectives on the adaptation regime in Bangladesh, this study found out that the neoliberal regimes that shaped the market-driven policies and NGO interventions in the 80s are still hindering the growth of marine aquaculture including seaweed in Bangladesh. Another finding of the study suggested that the rules and regulations created by such institutions are still affecting the communities to pursue a decent livelihood strategy by creating complexities such as enforcement of ban period, limited use of protected areas and trade or fishing licensing issues. Currently, the seaweed farming sector is tangled with many multidimensional challenges such as technological, environmental, market demand, social and cultural acceptance and capacity development. This study provided an overall understanding of how remnants of the neoliberal policies affected the blue economy strategies and how it failed to provide alternative solutions to the livelihood generation and social equity. Finally, by providing an understanding on the political economy of aquaculture in Bangladesh, this study addressed the need for a shift in the alternative development paradigm for the rapid social and environmental transformation in the coastal communities.

From citizen science to open-source low-cost technology- monitoring vs. policing of small-scale fisheries in Bangladesh (case-study- sharks and rays)

Alifa Bintha Haque

Department of Zoology, University of Dhaka

Email: alifa.haque@du.ac.bd

Abstract

Elasmobranchs (hereafter referred to as 'sharks and rays') have declined in landings, species diversity in catch, and population size in various regions of the world due to human-driven pressures, primarily unsustainable fishing. Combined with their life history characteristics, these pressures make them highly vulnerable to ongoing threats. Incidental shark and ray catches (or bycatch) are substantial and essential livelihood options for food security in developing countries. Considerable shark and ray catches and traded products come from countries marked by the perpetual poverty of coastal communities that depend highly on artisanal fisheries. Artisanal fisheries in the Bay of Bengal of Bangladesh contribute to the worldwide fishing pressure on sharks and rays. However, it is also one of the most data-poor regions of the world. While informed conservation decision-making, data, and fisheries monitoring are crucial, collecting such data in the long term is extremely challenging. In my study, I have been using different models of citizen sciences to improve data collection and foster meaningful collaboration with locals and fisher communities to improve our knowledge of these fisheries and ensure the data gives back some power to the fishers. For instance, since 2021, 10 fishing vessels have voluntarily collected spatial data using a mobile app. This endeavor is a pilot for our technological innovation "FishSafe," an audio-visual device to record bycatch events at sea. Since 2023, 5 fishing vessels have been using this device. Fishers are incentivized by access to communication with other boats and land in the absence of mobile networks at sea. This will also act as a non-monetary and sustainable incentive to initiate an organized live release and self-regulated catch monitoring. However, this opens up further questions regarding what kind of monitoring we are looking after in the world of surveillance and punitive measures as our main tools for law enforcement. In my talk, I will present these models' results and discuss the predicament of who gets the power from the science we do, especially in the case of marine conservation.

Citizen science based approach for saltmarsh habitat mapping to support conservation initiative in southeast coast of Bangladesh

Most. Jarin Tabassum Tethe[1*] and Subrata Sarker[1]

[1]Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh
[*]Email: jarintethe23@gmail.com

Abstract

This study mapped the saltmarsh habitat along the 38 km long coastal belt from the Salimpur coast. In addition, diversity of saltmarsh dependent communities was also assessed. Data were collected through regular field visits and geo-referenced photograph collection. About 3500 geo-referenced photographs were collected from a eight months study. The study found that Porteresia coarctata is the saltmarsh species from the study area. About three species of crabs, two species of horseshoe crabs were identified along with a number of snails, shorebirds and bio-turbating organisms were found as the saltmarsh dependent communities. Density of saltmarsh and its dependent community was found higher in the Sitakunda and Salimpur area. In addition, horseshoe crab habitats are also concentrated at Salimpur and Sitakunda area. Crabs, snails, shorebirds and bio-turbating organisms are evenly distributed along the costal belt. The saltmarsh ecosystem of the southeast coast serves as the nursing ground of juvenile species. During survey a number of juvenile species of crab (2 species of crabs) and fish species were found from this area. Major threats to the southeast coastal area include burning of saltmarsh, oil spill, boat anchoring, fishing, human interference (i.e. walk way through the saltmarsh habitat, use as playground), shipbreaking and plastic pollution. Overall, the ecological significance of this area lies in its ability to sustain a complex web of interconnected habitats and species, making it a valuable ecosystem worthy of conservation efforts and sustainable management practices.

Collaborative Conservation: Citizen Science for Sustainable Marine Spatial Planning in Bangladesh

Fahmida Akter[1]*, Tabarok Bhuiyan[1]

[1]Department of Oceanography, Noakhali Science and Technology University,
Noakhali-3814, Noakhali, Bangladesh
*Email: fahmida.ocn@nstu.edu.bd

Abstract

Bangladesh has a large sea area (118,813 km2), almost as large as its land area. Therefore, this vast expanse of sea prompted Bangladesh to use its marine resources sustainably, which is called the "Blue Economy". The implementation of the "Blue Economy" in the maritime space requires an appropriate marine management tool. Unfortunately, Bangladesh is still in the early stages of managing its marine resources. Marine spatial planning (MSP), increasingly used around the world, is a critical process for managing the sustainable use of marine resources, balancing economic development and environmental protection. In Bangladesh, where marine ecosystems are rich and fragile, effective MSP is essential to promote a sustainable marine economy. This study examines the potential of using citizen science to improve MSP in Bangladesh. Citizen science, which involves public participation in scientific research, can provide valuable data, local knowledge, and greater stakeholder engagement. By integrating citizen science into MSP, this research aims to fill data gaps, incorporate local knowledge, and promote community participation in ocean management. In order to contribute Bangladesh sustainable ocean economy, this review study investigates how citizen science could be potentially included into MSP procedures. The findings indicate that the accuracy and relevance of MSP may be greatly enhanced by citizen science, which will enhance resource management and improve the consequences of environmental conservation. The results indicate that citizen science engagement with local populations can greatly support MSP initiatives, resulting in more resilient and sustainable marine management practices in Bangladesh. Eventually, this study offers a road map for supporting Bangladesh's sustainable ocean management using citizen science, opening the door for a robust and balanced ocean economy.

Incorporating Storm Surge Model Based Early Warning System in MSP: A Pilot Case from Bangladesh

Nahia Mantaka Chowdhury[1*], Pedro Enrique Montoro[2], Kazi Mainul Islam[3], Subrata Sarker[1]

[1] Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh
[2] WNJU, NBCUniversal Telemundo Enterprises, New Jersey, United States
[3] Geodesy and Geoinformation Science, Technical University of Berlin, Germany

*Email: nahiamantaka@gmail.com

Abstract

The coastal regions of Bangladesh are highly vulnerable to tropical cyclones and storm surges due to the region's geographical characteristics, posing severe risks to coastal communities, especially fishers who are among the most exposed to these natural hazards. Clear and understandable warning messages significantly enhance trust and encourage swift responses, improving safety and resilience. When integrated with an effective early warning system, Marine Spatial Planning (MSP) can further enhance safety and resilience by providing fishers with critical information to avoid hazardous conditions and comply with fishing regulations. This research aims to utilize numerical modeling to create a storm surge prediction model and integrate it into an early warning advisory service that will provide a 7-day sea condition forecast to fishers and track the location of their fishing vessel. Delft3D Flow and Delft Dashboard are used for the hydrodynamic simulations and atmospheric data processing to develop the model. The model integrates factors such as Coriolis force, tides, wind-induced currents, and pressure gradients on a structured grid with varying spatial resolutions. Validation is conducted by comparing simulated surge heights with in-situ data from selected stations. The early warning advisory service features a sea state map displaying conditions categorized as calm, turbulent, or dangerous within Bangladesh's Exclusive Economic Zone (EEZ) and integrates a vessel tracking system (VTS) for real-time location data of fishing vessels to ensure safe fishing practices and regulatory compliance. This integrated approach to storm surge prediction and early warning advisory, coupled with vessel tracking capabilities, represents a significant advancement in safeguarding Bangladesh's coastal communities. By providing timely sea state information and real-time vessel location, the system not only enhances safety for fishermen but also promotes sustainable fishing practices and effective marine resource management.

KEYNOTE PRESENTATION

Enhancing Ocean Observation Capabilities: Training Opportunities

Lilian A. Krug[1,2]

[1]Partnership for Observation of the Global Ocean (POGO), United Kingdom
[2]Centre for Marine and Environmental Research (CIMA), University of Algarve, Portugal

Abstract

Observing the ocean is crucial for understanding its natural cycles, predicting changes and impacts, monitoring human effects, managing marine biodiversity, resources, and habitats, and implementing effective conservation and sustainable development strategies. Despite technological advancements significantly improving our ability to observe the ocean, there is still much progress to be made. Achieving efficient long-term global ocean monitoring requires substantial investment in skilled personnel, a pressing need highlighted in the Global Ocean Science Report. Organisations like the Partnership for Observation of the Global Ocean (POGO) play a pivotal role in this effort. POGO, along with other entities, provides training, networking, and technology transfer opportunities for scientists and institutions, particularly aiming at young researchers from developing countries. These initiatives are designed to help these nations build self-sustaining ocean science and observational communities. This talk will showcase various training opportunities available to early-career ocean professionals. By equipping them with the necessary scientific and technical skills, these programmes enable them to implement and maintain ocean observations in their respective countries. Furthermore, they prepare professionals to deliver crucial scientific data to decision-makers, facilitating actions that protect both the planet and humankind.

Positioning Coastal Fisheries and Aquaculture in Sustainable Marine Spatial Planning of Bangladesh

Rubaiath - E – Jannat* and Mohammad Mahmudul Islam

Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Sylhet 3100, Bangladesh

*Email: rubaiath17@gmail.com

Abstract

Bangladesh possesses a marine area spanning 118,813 km^2, nearly equivalent to its land area. Various sectors such as mining, shipping, conservation, and tourism are interested in utilizing this area for their economic growth. Without well-planned intervention, there is a high risk of depleting marine resources in these areas. To ensure the sustainable use of the resources in the Bay of Bengal, it is essential to implement wise planning, which is instrumental for sustainable blue growth as well. This study aims to identify and suggest ideal spatial planning for marine fisheries and aquaculture. This planning would mitigate conflicts and promote the sustainable use of marine fisheries resources. The research involved gathering data from the interviewing of key stakeholders as well as spatial analysis software such as QGIS and Google Earth Engine. This finding would identify proper usage patterns of competing stakeholders and suggest designated areas in the Bay of Bengal where fisheries and aquaculture can maximize benefits without unfairly impacting other stakeholders. Thus the study would inform policymakers about the best areas for fisheries and aquaculture in the marine region, enabling them to provide proper design and planning to local stakeholders.

Against the Tide: Vulnerability and Adaptive Responses in Bangladesh's Small-Scale Fisheries Communities

Mohammad Mosarof Hossain[1]*, Md. Tariqul Alam[2], Md. Mostafa Shamsuzzaman[1], Mohammed Mahbub Iqbal[3] and Mohammad Mahmudul Islam[1]

[1]Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh
[2]Department of Aquaculture, Sylhet Agricultural University, Sylhet-3100, Bangladesh
[3]Department of Fish Biology and Genetics, Sylhet Agricultural University, Sylhet-3100, Bangladesh

*Email: mosarofmh.cmf@sau.ac.bd

Abstract

Small-scale fisheries (SSF) play a vital role in local livelihoods, food security, poverty reduction, and national economies. Despite their importance, SSF communities are among the most vulnerable globally, facing multifaceted threats. This study aims to assess the sources and types of SSF vulnerabilities in Bangladesh and identify community responses. A mixed-methods approach, integrating qualitative and quantitative data from literature reviews and key informant interviews, was employed. Findings reveal that SSF in diverse aquatic ecosystems—such as inland floodplains, rivers, estuaries, mangroves, coastal wetlands, and marine waters—face threats from both natural and anthropogenic sources. The major types of vulnerabilities include biophysical (e.g., climate change, cyclones, salinity intrusion), economic (e.g., poverty, unemployment, high fishing costs), social (e.g., illiteracy, poor awareness, social marginalization), technological (e.g., inadequate infrastructure and processing facilities), and governance factors (e.g., top-down decision-making, regulatory mismatches, fishing bans). SSF communities employ various short-term coping strategies, such as receiving relief from government and NGOs, borrowing money, reducing operational costs by involving family members, selling assets, and reducing meal frequency. Long-term adaptation strategies include participating in training programs, promoting child education, saving money, joining community organizations, engaging in afforestation programs, and improving housing and boat structures to withstand environmental stressors. These responses are dynamic and context-specific, influenced by SSF communities' capacities, sociocultural contexts, perceptions, learning, and experiences. While further research is needed for a deeper understanding, these findings can help stakeholders identify challenges and effective responses, contributing to building resilient SSF communities in Bangladesh.

Impact of Coastal Embankment on Climate Displacement and Relocation Initiative: Case Study of Community-Based Resettlement Program

Prabal Barua* and Morshed Hossan Molla, Mohammad Shahjahan and Mohammad Arifur Rahman

Young Power in Social Action (YPSA), Chattogram, Bangladesh

*Email: prabalbarua.ypsa@gmail.com

Abstract

Bangladesh is one of the most climate-vulnerable countries, significantly impacting the life and livelihood of coastal communities. This study examines the relationship between coastal embankments and poverty in southeastern cost of Bangladesh from 1975 to 2018. It focuses on patterns of coastal erosion, land loss, displacement, and adaptation strategies. The study finds a close link between agricultural production, aquaculture, livestock, housing, occupation, and income-generating activities and the presence of coastal embankments. Over 38 years (1980-2018), 560,000 people were displaced due to natural hazards in this region. Using satellite images and GIS mapping, the study identifies that erosion primarily affects the northwestern, western, and southern banks, causing the island's shoreline to shift northeast. Recently, the construction of concrete embankments has reduced the displacement rate, with people returning to their original homes over time. Historically, earthen embankments have been used for flood protection, being cheap and easy to construct. However, they deteriorate, causing environmental degradation and exacerbating sea-level rise and salinity intrusion. Shrimp farming, which requires holes in the embankments, further degrades these structures. The study highlights that embankment, while initially protective, have contributed to habitat disintegration and environmental changes. Traditional practices and community-based approaches are suggested as alternatives. The research strongly recommends a "Community-Based Resettlement Program" to address the resettlement crisis of climate-displaced individuals in coastal areas. Reintegration of livelihoods post-disaster should be viewed as an opportunity to enhance community-based rehabilitation, aiding the helpless and landless populations in overcoming displacement challenges.

Governance and Challenges of Seabed Mining: Legal Frameworks and Strategic Directions under UNCLOS and the International Seabed Authority

Md. Sabuj Mia[*], Md. Numan Hossain[*]

Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh

[*]Email: smsabuj.sust17@gmail.com , m.numan-pme@sust.edu

Abstract

The exploration and exploitation of seabed minerals have become critical issues due to increasing global resource demand and economic development. This document examines the development of international legal frameworks governing seabed mining, mainly focusing on the United Nations Convention on the Law of the Sea (UNCLOS) and establishing the International Seabed Authority (ISA). UNCLOS, adopted in 1982, laid the groundwork for international ocean governance, which was later enhanced by including Part, creating the ISA to manage and regulate activities in areas beyond national jurisdiction. The ISA's Strategic Plan for 2019-2023 highlights challenges such as environmental protection, equitable benefit sharing, and the need for robust regulatory frameworks to manage seabed mining sustainably. The plan aims to align ISA's functions with global Sustainable Development Goals (SDGs) while addressing technological advancements and economic pressures. Despite these efforts, significant debate remains about the environmental impact and equitable distribution of benefits from seabed mining, indicating the complexity and contentious nature of exploiting ocean resources.

Environmentally Sustainable Practices for Micro-Entrepreneurs in Coastal Aquaculture: A Case Study in Chattogram

Md. Mohasin Meah[1*], Mohammed Arifur Rahman[1], Prabal Barua[1], and
M. Shah Nawaz Chowdhury[2]

[1]Young Power in Social Action (YPSA), Bangladesh
[2] Institute of Marine Sciences, University of Chittagong, Bangladesh

*Email: mohasin.ypsa@gmail.com

Abstract

Coastal aquaculture contributes significantly to rural employment and economy but this is overshadowed by negative ecological impacts. This study surveyed 250 Micro-Entrepreneur (ME) of YPSA aimed to evaluate the effect of YPSA coastal aquaculture interventions in protecting the environment as well as safety production. Study found that improved traditional (55%) and extensive system (41%) are practiced mostly as culture system. Study visualized disease outbreak and water pollution is the most top-ranked challenges in these areas where 54% of responders try to not use antibiotics, but rest of 46 % responders use it and 68% responders reduce antibiotic application their farm and more than 90% responders use probiotic as well. YPSA formulated necessary guidelines highlighting 20 Environmentally Sustainable Practices (ESPs) for their MEs. Then most following practices were ESP No. 1, 15 and 17. Among those ESPs, 12 ESPs are being practiced in the study areas. ESP No. 17 (i.e., Use of sign, symbol and poster for awareness) has been adopted by all the MEs (n = 250). ESP No. 1 is related for worker's health safety and use of PPE (i.e., gloves, safety glasses, mask, apron, boots). ESP No. 12 is to use of organic inputs for safe production to ensure food security. Recently organic farming is becoming popular in worldwide that are safe for human health. ESP No. 12 help the farmers to reduce the use of chemical fertilizers and harmful medicine in their farm. To replace those chemicals, they use organic fertilizer and probiotics. This practice reduces the risk in farming and increase the safety of fish product. YPSA helped the MEs to improve their skills in aquaculture practices, particularly water, feed and aquatic health management. YPSA guidelines for water quality monitoring and fish disease management along with the knowledge gathered from variety of trainings and technical sessions contributed to minimize the risk and challenges associated with their business successes.

Enhancing Sustainability: The Role of Bangladesh's Marine Dried Fish Industry in Achieving UN SDGs

Mosharof Hosain[1]* Md. Abdul Baten[2], Binay Kumar Chakrborty[3], Mahbub Hasan[4] and Mohammad Mosarof Hossain[5]

[1] Faculty of Fisheries, Sylhet Agricultural University, Sylhet, Bangladesh
[2] Department of Fishing and Post Harvest Technology, Sher-e-Bangla Agricultural University, Bangladesh
[3] Department of Fisheries, Matshya Baboon, Dhaka, Bangladesh
[4] Department of Civil Engineering, Sylhet Engineering College, School of Applied Science and Technology, Shahjalal University of Science and Technology, Bangladesh
[5] Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Sylhet, Bangladesh

Abstract

This study investigates the marine dried fish industry in coastal Bangladesh, emphasizing its critical role in nutrition, food security, and the livelihoods of small-scale fisher's community. Despite its importance, the industry's significance is often underappreciated in discussions about global food security. This research aims to bridge this gap by integrating qualitative and quantitative data to assess species composition, stakeholder perceptions of vulnerabilities, and sustainability prospects in the Chattogram and Cox's Bazar districts. The study employs the Constraint Facing Index (CFI) and ten sustainability indicators to evaluate the industry's challenges. A total of 28 marine dried fish and shellfish species were recorded, with seasonal variations observed between post-monsoon and winter. Cox's Bazar recorded 17 species post-monsoon and 24 in winter, while Chattogram recorded 19 and 26 species, respectively. *H. nehereus* exhibited the highest species composition (9.9%), whereas *R. kanagurta* had the lowest (0.3%). Market surveys revealed that *P. chinensis* had the highest market price (1200-2300 BDT/kg) and *D. acuta* the lowest (180-250 BDT/kg). The CFI assessment identified 17 major constraints, categorized into high, medium, and low priority levels. The top constraints included inadequate storage facilities (CFI score 410), insufficient raw material supply (396), insect infestations (380), seasonal unemployment (378), irresponsible use of insecticides and dyes (375), high labor costs (366), and poor raw material quality (362). The study suggests three modes of action based on capacity and resource availability: urgent, medium, and low priority. The marine dried fish industry is inextricably linked to achieving several UN Sustainable Development Goals (SDGs), such as eliminating poverty (SDG 1), reducing hunger (SDG 2), promoting good health and well-being (SDG 3), and fostering economic growth (SDG 8). However, existing constraints significantly hinder progress. The analysis of sustainability indicators raises concerns about the industry's long-term viability, calling for immediate and comprehensive policy actions to ensure its sustainable development in Bangladesh.

MSP in Bangladesh to Facilitate the Sustainable Growth of the Blue Economy

Md. Harun-Or-Rashid

Senior Assistant Commissioner, Ministry of Public Administration, Government of the People's Republic of Bangladesh

Email: harun.du@gmail.com

Abstract

The idea of the 'Blue Economy' has gained popularity in recent years as more countries become aware of the enormous economic possibilities found within their maritime domains. This also applies to Bangladesh's large Bay of Bengal coastline. However careful planning that balances economic growth and environmental conservation is required for the sustainable utilization of marine resources. This summary captures the essence of a thorough research project focused on Marine Spatial Planning (MSP) in Bangladesh to support sustainable growth of blue economy. The naval space of Bangladesh is a complicated web of interconnected factors, from its abundant fisheries to its expanding shipping sector and the expanding possibilities for offshore production of renewable energy. It is a difficult undertaking to manage these resources while protecting marine biodiversity and ecosystems. This paper employs a multidisciplinary approach, fusing ideas from policy analysis, economics and environmental science to provide a road map for integrated planning. This study aims to map a course that fosters economic development, improves the quality of life for coastal populations in Bangladesh and protects the natural integrity of its maritime through thorough research and consultation. By doing so, it contributes to the global discourse on sustainable blue economy development while tailoring its findings to Bangladesh's unique needs and circumstances. Ultimately, this research aims to guide policymakers, industry leaders and conservationists alike as they navigate the complex waters of maritime planning in pursuit of a more sustainable and prosperous future.

Value chain of soft-shell mangrove crab (*Scylla* sp.) in the satkhira district of Bangladesh

Muntasir Mamun Shanto and Md. Mostafa Shamsuzzaman*

Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Bangladesh

*Email: shamsuzzamanmm.cmf@sau.ac.bd

Abstract

The soft-shell mangrove crab, renowned for its tender meat and rich nutritional profile, plays a vital role in the livelihoods of local communities engaged in crab harvesting and processing. The value chain of this crab involves a series of intricate activities from acquisition to delivery, each stage enhancing its value. This study seeks to analyze the value addition throughout the chain, identify the activities involved, allocate marketing costs, calculate net margins, and identify supply chain challenges within the economically important mangrove crab value chain. To understand these dynamics, the researcher conducted 229 in-depth interviews, 11 key informant interviews, and 3 focus group discussions within two crab fishing communities, three *arats*, and two crab markets in various locations across the Satkhira district of Bangladesh. By monitoring the molting of shell, farmer harvest crabs at the precise moment of soft-shell formation, ensuring optimal yield and quality. Findings revealed that farmer earned a profit margin of 6.76%, while their marketing costs accounted for 12.22% of the value chain. Paiker, who earned the lowest net margin of BDT 14.4 per kilogram, incurred minimal value addition costs at 1.27%. In contrast, exporter achieved the highest margin, earning BDT 834.75 per kilogram from processed soft-shell crabs, with a value addition cost of 34.15%. Only the highest-graded crabs are exported, while the average-graded ones are processed and distributed in domestic markets through retailer. Retailer earned BDT 676.75 per kilogram with a value addition cost of 25.75%. The involvement of intermediaries negatively impacted the profits of collector and farmer. Risk analysis and the Challenge Facing Index (CFI) identified extreme weather, high salinity, and seasonal vulnerability as major constraints within the value chain. To create a more efficient value chain, measures such as market modernization, centralization, enhanced inspection, policy revisions, and government initiatives are crucial.

Influential factors in making the decision to adopt renewable energy in fisheries and aquaculture sectors of coastal Bangladesh

Md. Asaduzzaman Rasel[1]*, Mohammad Mahmudul Islam[1]

[1]Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Sylhet, Bangladesh

*Email: arasel1803048@gmail.com

Abstract

Fisheries and aquaculture rely heavily on fossil fuels, and a transition to renewable energy is instrumental to reducing carbon emissions and achieving planetary health goals. This study evaluates the key factors driving renewable energy implementation in coastal Bangladesh's fisheries and aquaculture sectors. The study identified the current usage pattern of renewable energy and its challenges and opportunities in selected fisheries and aquaculture sectors of coastal Bangladesh. The primary data was collected through 100 individual interviews using a semi-structured questionnaire, five key informant interviews, and seven focus group discussions. A Random Forest classifier was employed to predict the decision to completely shift towards renewable energy. Feature importance analysis revealed that the most influential factors in the decision to adopt renewable energy were occupation, annual production, energy consumption per month, number of employees, and prior energy efficiency improvements. Occupation emerged as the most significant predictor, followed closely by annual production and energy consumption. Other factors, such as familiarity with solar energy, age, and years of schooling, had lesser influence, while gender and perceived benefits of using solar energy contributed minimally to the model. The findings from this study provide valuable insights into the factors influencing the decision to completely shift towards renewable energy. The model's perfect accuracy underscores the strong predictive power of the selected features. The high importance of occupation suggests that different professional environments significantly impact renewable energy adoption, likely due to varying levels of access to information, financial resources, and incentives. To support the implementation of clean green energy sources in the sector of fisheries and aquaculture As envisioned in the Renewable Energy Policy (2008), and to promote more resilient and environmentally friendly coastal ecosystems in Bangladesh; this research delivers important guidance for policymakers and stakeholders for improving renewable energy in these sectors.

Value chain analysis and cephalopod fishery management in south-eastern coastal Bangladesh

Joykrishno Chondra Biswashorma[1]*, Mohammad Mahmudul Islam[1]

[1]Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Sylhet, Bangladesh.

*Email: joysharma0096@gmail.com

Abstract

Cephalopod fisheries (e.g., octopus, squid, and cuttlefish) have gained increasing attention as an emerging alternative to the traditional marine harvest and hold the potential to supply seafood. The study maps the production chain of cephalopod fishery and identifies key players and their roles in the value chain. Understanding the socioeconomic structure of the fisheries value chain is crucial as seafood trade expands from domestic to international markets. This study used a structural mapping approach to locate catch trends and important actors in the cephalopod production chain in south-eastern coastal Bangladesh. Primary data was collected through semi-structured individual interviews, key informant interviews, and focus group discussions (FGD) with fishers, traders, and other key stakeholders along the value chain. The key findings highlighted the connections between various participants in the value chain, influenced by dominant corporations in the export industry. Despite being the largest group in the production chain, fishers have the lowest level of empowerment among traders. The study also reveals the major constraints in the value chain within the actors, unfair market price, and improper processing of fish products. The study concludes that a balance is needed between improving socioeconomic conditions in communities and ensuring fair trade with important participants in the cephalopod value chain. Collaboration among the actors can significantly enhance cephalopod fishing governance and value chain.

Assessing the Viability and Impacts of Introducing Seaweed Cultivation in Shrimp Farming Ghers/Ponds in Coastal Regions of Bangladesh

Joy Talapatra*, Md. Ramzan Ali, Mohammad Shakline Mostakim and
Md Asaduzzaman

Department of Marine Bioresource Science, Chattogram Veterinary and Animal
Sciences University, Khulshi-4225, Chattogram, Bangladesh

Email: talapatrajoy36@gmail.com

Abstract

Bangladesh's coastal districts, hosting over 55,000 marine shrimp farms across approximately 170,000 hectares, often face high salinity levels exceeding 10 ppt and frequent viral disease outbreaks, particularly during the seaweed culture season from October to March. These conditions highlight the potential for integrating seaweed farming into unused shrimp ponds, which could offer mutual benefits for both shrimp and seaweed cultivation. Seaweed cultivation can improve water quality by absorbing excess nutrients and providing habitat for beneficial microorganisms. Therefore, this study examined the integration of red seaweed (*Gracilaria* sp.) into shrimp farming systems to enhance sustainability and profitability in coastal Bangladesh. The main objectives were to evaluate the economic feasibility and growth performance of *Gracilaria* sp. across different culture systems and to investigate how ecological factors and seasonal variations impact productivity. The study was conducted in Ukhiya (the southeast coastal region of Bangladesh), using three culture methods: floating long-line, floating net, and broadcast system. A total of 9 seaweed culture plots were established and managed until harvesting within three shrimp farming ponds. Water quality was monitored monthly, measuring parameters such as temperature, salinity, pH, dissolved oxygen, turbidity, total alkalinity, nitrate, ammonia, phosphate, and total suspended solids. Growth performance was assessed through partial harvesting every 30 days, with metrics including daily growth rate (DGR) and biomass yield. Results demonstrated that the hapa net system achieved superior growth for *Gracilaria* sp., with a maximum DGR of 3.61 g/day and a biomass yield of 0.62 kg/m². The floating long-line and broadcast systems also showed growth but at lower rates and yields compared to the hapa net system. The study concludes that seaweed cultivation in shrimp ponds is a feasible strategy for enhancing aquaculture sustainability in coastal Bangladesh, offering benefits such as improved water quality, habitat creation, and carbon sequestration. Successful implementation demands a thorough understanding of biological and environmental factors and collaboration with local communities and experts.

Addressing Coastal Gentrification Induced Injustice and Displacement of Fishing People in Bangladesh

Mahbub Hasan[1*], Mosharof Hosain[2] and Mohammad Mosarof Hossain[3]

[1]Department of Civil Engineering, Sylhet Engineering College, School of Applied Science and Technology, Shahjalal University of Science and Technology, Bangladesh
[2] Faculty of Fisheries, Sylhet Agricultural University, Bangladesh.
[3]Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Bangladesh

Abstract

Gentrification in Bangladesh's coastal areas pose significant challenges to ecosystems, livelihoods, housing rights, and the resilience of small-scale fishing (SSF) communities. This study investigates the socio-economic conflicts arising from coastal gentrification, which disrupts established SSF communities. Typically, gentrification in these regions involves wealthier residents moving in, rising property values, and the development of luxury resorts and residential complexes. While these changes can stimulate economic growth, they frequently displace traditional fishing communities, leading to forced evictions, escalating rents, and restricted access to housing and fishing areas. Many displaced fishing families migrate to overcrowded urban slums, facing severe socio-economic instability and loss of cultural identity. Employing a mixed-method approach, we utilized the "Eight W-helper" framework and ten sustainability indicators by analyzing data from interviews with local stakeholders, participatory mapping, and expert consultations, supplemented by a review of scholarly literature and government policies. Field data were collected from four emerging touristic hotspots: Cox's Bazar Sadar, Saint Martins, Char Kukri Mukri, and Kuakata. Additionally, we analyzed a 35-year dataset on Land Use Land Cover (LULC) changes using ArcGIS Pro 3.1. Results shows significant land use changes due to gentrification-induced displacement, with the highest build-up rates in Cox's Bazar Sadar, followed by Saint Martins and Kuakata, and the lowest in Char Kukri Mukri. Findings reveal that economic-centric development strategies have far-reaching consequences for vulnerable coastal communities, resulting in epistemic injustice, marginalization, and identity crises. SSF communities risk losing access to essential resources and traditional fishing grounds, undermining their socio-economic stability and cultural identity. This study emphasizes the need for development approaches that consider the unique needs and rights of marginalized groups while ensuring environmental sustainability, economic viability, and social equity. High-level policy attention, inclusive governance, robust legal protections, and participatory planning are essential to address these issues and secure viable SSF communities in Bangladesh.

Unveiling the Unexplored Social-ecological Trap Lens of Hilsa Fishery in Bangladesh

Mukta Sarker and Md. Mostafa Shamsuzzaman*

Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh

*Email: shamsuzzamanmm.cmf@sau.ac.bd

Abstract

Hilsa shad (*Tenualosa ilisha)* comprises the largest and most valuable single fishery of Bangladesh, contributing the highest to around 11.91% of the country's total fish production in 2021-22. This study assesses various social-ecological traps which contribute to the entrapment of fishers and communities within an undesirable state and to investigate the factors which significantly impact on the livelihood adaptation strategies in banning period. The Sustainable Livelihood Approach (SLA) was used as a theoretical framework. Primary data collection involved extensive fieldwork and in-depth interviews were conducted, totaling 247, through the semi-structured questionnaire along with 6 focus group discussions and, 10 key informant interviews in the Chattogram and Patuakhali districts of Bangladesh. The result showed that poverty (about 17% respondents income <5000 BDT), high interest of loans from *dadandar* (10-12% interest) and *aratdar* (5% interest), high harvesting costs, increasing number of hilsa fishermen, inter-generational traps (about 81.78% respondents involved in fishing from their family) are creating social-ecological traps (SETs) in the hilsa fishery. Besides, the study revealed that, the significant factors ($p<0.05$) affecting choice of adaptation strategies include family members, training facilities, house ownership, belong to formal society. Apart from fighting against some extreme climate events, the negative feedbacks come from lack of cold storage facilities (41.29%), illegal fishing nets use (17.28%), frequent banning season (69.64%), lack of proper rules and regulations, lack of alternative livelihood opportunities (13.88% remained without any work in banning period) and poor supply of drinking water (49.52%). Hilsa fishermen of these region about 48.18% respondents depended on *aratdar* and 17.81% respondent depended on *dadondar* for their financial support which results the low prices compare to the prevailing market prices. To escape from the SETs, some positive feedbacks, e.g. property rights, strong local institutions, financial support from government for alternative income sources, opportunities for technical education of their children, strong collaboration between management authority and local stakeholders are important to maintain the sustainability of hilsa fishery in Bangladesh.

Interpreting the Price Paradox: A Study on Rising Hilsa Fish Prices Despite Increased Catch

Md. Akimun Hasan Rafi[1] and Md. Mostafa Shamsuzzaman[1]*

[1]Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh

*Email: shamsuzzamanmm.cmf@sau.ac.bd

Abstract

Hilsa (*Tenualosa ilisha*) is the largest single fish species, accounting for 12.23% of total fish production in Bangladesh. Since the precipitous loss of its harvest in early 2000, the government of Bangladesh has implemented a number of steps to boost hilsa production, including the introduction of the hilsa fisheries management action plan in 2005. Under WorldFish's enhanced coastal fisheries project, which was undertaken in collaboration with the Department of Fisheries, the hilsa fishery reversed and recorded a significant harvest in 2016. From 2015 to 2023, hilsa production climbed by 3.89% to 5.88% of the total fish production of Bangladesh. Though the production of hilsa increase accordingly the price has not been decreased at all throughout all these years. This study was conducted to analyze and portray the causes of the price of hilsa, despite the increased production. Analysis conducted in Barishal district, Alipur and Mohipur hilsa landing centers in Patuakhali district, and four landing centers (Fisheryghat, Kattolighat, Ali Akmol Ghat, Kathghor) in Chattogram district, reveals the consistent trends of hilsa fish price. The findings demonstrated that rising inflation rates increased the costs of production and distribution, mitigating the potential for downward pressure on hilsa fish prices despite increased availability. Rising fuel prices increase fishermen's operational costs, limiting their ability to bear additional expenses and resulting in sustained or rising hilsa fish prices despite higher supply. The findings can help policymakers, fisheries management authorities, and stakeholders develop strategies to ensure sustainable pricing mechanisms and the economic viability of the hilsa fishery sector.

Comparative Growth Performance on Different Farming Systems of Green Seaweed (*Ulva lactuca*) Cultured at the South-east Coast of Bay of Bengal, Bangladesh

Md. Ramzan Ali[1*], F.A. Chamily[1], Md Mohiuddin[1], Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Khulshi 4225, Chattogram, Bangladesh

*E-mail: rjfims.nstu@gmail.com

Abstract

Seaweeds are fast-growing marine plants that have plenty of essential nutrients, especially trace elements and several bioactive substances. *Ulva lactuca,* known as sea lettuce, comprises highly productive species and its extracts exert antioxidant, anti-microbial, and anti-viral activities. The production performance and biochemical composition of Green Seaweed (*Ulva lactuca*) were evaluated under three farming systems (floating long-line, off-bottom net, and off-bottom long-line) from October 2021 to June 2022. For this study, 10 plots of each system were established in different locations on the southeast coast of the Bay of Bengal, Bangladesh. While growing to a length of 30-40 cm, *Ulva lactuca* was partially harvested every 15-30 days, depending on the culture months. The daily growth rate (DGR) and Biomass production of cultured *Ulva lactuca* were significantly higher in the floating long-line culture system compared to the off-bottom long-line or off-bottom net culture system. Many of the parameters of nutritive value (proximate composition, mineral contents, fatty acid, and amino acid profile) were also significantly higher in floating long-line culture systems compared to the off-bottom long-line or off-bottom net culture system. Moreover, production performances were greatly affected by the culture season due to differences in physio-chemical water quality parameters. Harvested *Ulva lactuca* from floating culture was very clean, mostly free from encrusted organisms and impurities, and had an attractive green coloration. Among the 10 minerals analyzed, Ca, Na, and K contents and among fatty acids, the n6-PUFA content of *Ulva lactuca* were different in the three culture systems. The study also revealed that heavy metals (Cr, Cd, Pb, and As) obtained from *Ulva lactuca* significantly differ in the three systems. The findings of the study demonstrated that raft-based floating long-line systems could be a promising culture technology for the production of *Ulva lactuca* in the coastal areas of Bangladesh.

Seaweed Marketing Plan for Blue Economy Development in Bangladesh

Md. Rejaul islam

Bluetech life science and agro Ltd, Bangladesh

Email: nijam.ims@gmail.com

Abstract

Bangladesh has significant potential for seaweed marketing due to its extensive coastline and favorable growing conditions. This business initiative aims to revolutionize the seaweed industry in Bangladesh by establishing a comprehensive and sustainable model for seaweed farming, product development, and marketing. By leveraging both own farming and collection from local farmers, the project seeks to create a diverse range of seaweed-based products, including raw materials, human food items (such as seaweed tea, paste, pickles, and butter), medicinal raw materials, and cosmetics (including skincare, creams, makeup products, cleaners, and toothpaste). To drive market penetration and consumer awareness, the strategy employs four primary marketing channels: a dedicated website, email campaigns, digital advertising, and event marketing. These efforts are complemented by seminars and other marketing tools to stimulate internal demand. Scientific research collaborations will expand the product dimensions and applications, further enhancing market appeal. Integrating seaweed-derived products with existing aqua product businesses can create synergistic benefits, such as complementary farming, diversified product ranges, joint marketing strategies, shared distribution channels, collaborative research and development, and sustainable practices. The ultimate goal is to open new markets for export, develop a robust marketing infrastructure, and establish Bangladesh as a key player in the global seaweed industry. By doing so, this venture promises significant economic opportunities for Bangladesh, bolstering local livelihoods and contributing to sustainable industry practices.

The Growth Performance and Nutritional Profiles of Green Mussels (*Perna viridis*) in a Raft Cultivation System: Impact of Culture Depths and Site-specific Ecological Factors

Sabrina Jahan[1*], Md. Mohiuddin[1] and Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Zakir Hossain Road, Chattogram 4202, Bangladesh

[*]Email: sj2590013@gmail.com

Abstract

Raft farming is an eco-friendly method of aquaculture that uses floating structures to grow mussels, optimizing space and minimizing environmental impact. The study explored how water depths (0.5 m, 1 m, and 1.5 m) and site-specific factors (Moheshkhali, Khurushkul, and Chowfaldandi) affect the growth and nutritional profiles of green mussels (*Perna viridis*) on the southeast coast of the Bay of Bengal, Bangladesh. Ten mussel socks with twenty mussels each were suspended at various depths from floating rafts at each site and cultivated for six months. Results showed that all growth parameters (specific growth rate, weight gain, soft tissue weight, shell dimensions) were significantly higher at 0.5 m depth than at greater depths. Growth parameters were also significantly higher at the Khurushkul site compared to the other sites. Environmental factors like salinity, pH, dissolved oxygen, chlorophyll a, nutrient concentrations, and plankton abundance positively correlated with mussel growth, while turbidity and NO_2-N had negative correlations. Nutritional analysis revealed significant differences in protein and lipid content among mussels from different depths, though no significant differences in essential and non-essential amino acid content were observed. Fatty acid profiles varied significantly with depth. This study enhances understanding of bivalve aquaculture, promoting sustainable practices to meet global seafood demand.

Understanding the reproductive strategies and ecological dynamics of *Perna viridis*: An interdisciplinary approach

Sadia Halima Tasnim[1*] and Md. Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Khulshi-4225, Chattogram, Bangladesh.

*Email: stasnim2000.wwf@gmail.com

Abstract

A comprehensive multidisciplinary approach was employed to deepen our understanding of the reproductive biology and ecology of the green mussel (*Perna viridis*) by linking ecological factors, ingested gut plankton, gonadal fatty acid profiles, and reproductive traits. The study involved year-round collection of mussels from the coastal areas of the Bay of Bengal in Bangladesh. Histological analysis of 242 mussels revealed five distinct stages of gametogenesis, with a concentrated spawning season occurring annually from January to April. The research focused on the gonadosomatic index (GSI), which exhibited strong correlations with various water quality parameters, ingested gut plankton composition, and gonadal fatty acid profiles. Notably, these correlations were influenced significantly by seasonal variations. Principal component analysis across all datasets indicated that more than 65% of the observed variability was explained by seasonal changes, with distinct multivariate patterns aligning closely with different stages of gonad development. Factors such as elevated salinity levels, nutrient richness, chlorophyll a concentration, and abundant plankton in the water column were found to positively correlate with enhanced gonad development and increased spawning activities among mussels. During the developmental stages, mussels demonstrated increased ingestion of plankton, particularly species like Bacillariophyceae and Pyrrophyceae, which contributed significantly to the heightened presence of n-3 polyunsaturated fatty acids in their gonads. Furthermore, mature and spawning gonads exhibited substantial accumulation of lipids and saturated fatty acids, which are believed to serve as essential energy sources during embryogenesis and early larval development, as well as vital components of cellular membranes. This study provides a comprehensive model for understanding the reproductive biological traits of *Perna viridis* and their intricate relationships with surrounding environmental variables. Such insights hold promise for informing strategies in marine aquaculture and promoting sustainable management of fishery resources.

International Climate Protection Fellowship: Advancing Global Climate Leadership and Research in Germany

Ajit Ghosh[*]

Humboldt Ambassador Scientist, Department of Biochemistry and Molecular Biology, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh.

[*]Email: aghosh-bmb@sust.edu

Abstract

The International Climate Protection Fellowship by the Alexander von Humboldt Foundation offers a unique opportunity for prospective leaders from non-European developing and transition countries to engage in climate-related research and practical projects in Germany. This fellowship aims to foster global collaboration in climate protection, resource conservation, and sustainability, addressing critical issues such as climate adaptation, biodiversity conservation, and sustainable urban development. Each year, up to 15 fellowships for prospective leaders are awarded. The program provides a 12 to 24-month fully funded research stay in Germany, enabling fellows to collaborate with German institutions and experts. The initiative is funded through the International Climate Initiative (IKI) under the Federal Ministry for Economic Affairs and Climate Action (BMWK).
Fellows receive monthly stipends (2,200€–2,700€), along with individual support, financial assistance for dependents, travel expenses, private health insurance, and German language courses. Eligibility criteria include engagement in climate-related fields, leadership experience, and citizenship of an eligible country. Prospective leaders must hold a minimum Bachelor's degree and have at least one to two years of professional experience and academic publications. Applicants must secure a host in Germany, submit a detailed research proposal, and provide letters of recommendation. This fellowship presents an excellent opportunity for future decision-makers to contribute to climate action and sustainability on a global scale while building international networks.

KEYNOTE PRESENTATION

Planning for Resilience: Integrating Conservation Strategies in Urban Coastal Environments

Sazlina Salleh

Centre for Policy Research
Universiti Sains Malaysia

Email: sazlina@usm.my

Abstract

Urban coastal regions face significant challenges reconciling economic development with environmental sustainability, particularly where sensitive marine ecosystems are under increasing pressure from urbanisation, industrial expansion, and resource exploitation. In many jurisdictions, fragmented sectoral policies hinder the implementation of integrated conservation strategies, leading to governance inefficiencies and suboptimal environmental outcomes.

A comprehensive approach integrating Marine Spatial Planning (MSP) with stakeholder-driven governance mechanisms is essential to balancing developmental imperatives with conservation priorities. Effective coastal management necessitates collaborative policy frameworks that facilitate coordination across multiple governance levels, address jurisdictional overlaps, and ensure regulatory coherence. Furthermore, incorporating scientific data, such as coral reef health assessments and ecological indicators, into policy formulation enhances the effectiveness of conservation strategies and supports evidence-based decision-making.

Drawing on global best practices, zoning serves as a strategic tool for achieving sustainable reef and marine habitat management. Key components of effective conservation planning include legislative frameworks, integrative data management, incorporation of traditional ecological knowledge, and participatory governance mechanisms, all of which play a critical role in fostering comprehensive and adaptive marine resource management. Emphasis will be placed on integrating science-based policy approaches and bottom-up governance models, ensuring marine resource management remains empirically grounded and socially inclusive.

Strengthening conservation frameworks through multi-sectoral collaboration, adaptive governance, and ecosystem-based management principles is crucial. Ensuring the long-term resilience of urbanised coastal ecosystems requires a holistic and interdisciplinary approach that aligns developmental objectives with ecological sustainability to safeguard marine biodiversity and the socio-economic benefits it provides.

Ghost Fishing Footprints in the Bay of Bengal

M. Shahadat Hossain and M. Eleyeas Chowdhury

Institute of Marine Sciences, University of Chittagong, Chittagong- 4331, Bangladesh

Email: hossainms@yahoo.com

Abstract

Ghost fishing is the unattended, destructive capture and killing of marine animals with abandoned, lost, and discarded fishing gear (ALDFG). This study was conducted using participatory surveys and interactions with 381 respondents of marine fishers, fishing gear manufacturers, gear traders, and researchers as well as field observations in 26 sites along the coast to identify the number of fishing crafts and quantify both used and lost fishing gears in the marine fishing zone of Bangladesh. Moreover, media records on entanglement of marine animals and degradation of coastal habitats were analyzed for 12 consecutive months. Geo-spatial modelling was developed to identify ALDFG hotspots and affected habitats. Based on this study, 18,960 mechanized fishing crafts (i.e. 18,695 boats and 265 trawlers) annually used 40,110 tonnes plastic fishing gears, of which 2,740 tonnes (6.8%) was ALDFG to the marine environment. This averages annually 144 kg plastic gears per craft that provides an indication of the scale of ALDFG from the marine fishing industry of Bangladesh. The study identified ALDFG drivers, including fishing conflicts, oceanic depressions and storms, bottom obstructions, thefts or vandalism, and movement of megafauna, whereas lack of awareness amongst fishers and poor waste management facilities both onboard and onshore cannot be ignored. Geo-spatial modeling demonstrated fishing gears lost hotspots in the South Patches, northeast Swatch of No Ground, and north Middle Ground, along 30-80 m isobathic contours in the Bay of Bengal. Similarly, Teknaf coast and Sandwip Channel are the hotspots for abandoned gears, while discarded gears hotspots covered the coastal zone of Chittagong, Noakhali, Patuakhali and Barguna. The study recorded 353 marine animals including dolphins, turtles, fishes, and crabs were entangled with ALDFG in the coastal water. This study recommends indication of gears during operation, real-time loss reporting, fisherfolks awareness and training to enhance ALDFG tracking and recovery, along with promoting biodegradable fishing gear for sustainable fisheries.

Management and Conservation Priorities of Marine Protected Areas for a Sustainable Blue Economy in Bangladesh

M. Nahiduzzaman[1*], M. Tanvir Hossain Chowdhury[2] and M. Mokarrom Hossain[1]

[1]WorldFish Bangladesh, Dhaka, Bangladesh
[2]Department of Fisheries, Dhaka, Bangladesh

*Email: nahidzm@gmail.com

Abstract

A key strategy for the blue economy involves both the sustainable extraction of marine resources and the conservation of marine ecosystems through various management and conservation tools. Marine Protected Areas (MPAs) are pivotal in this approach, as they protect biological diversity and maintain ecosystem functions, thus supporting the blue economy by harmonizing ocean use with conservation. When implemented effectively, MPAs not only contribute to ecological sustainability but also provide significant benefits to communities that depend on marine resources. Recognizing the importance of MPAs in biodiversity conservation, ecosystem health improvement and improving the livelihood resilience of small-scale fishers, the Department of Fisheries (DoF), with support from the USAID/ECOFISH II Activity of WorldFish is leading efforts to explore, assess, and delineate MPAs in Bangladesh. The Government of Bangladesh has established so far one Marine Reserve and four MPAs: the Swatch of No Ground, Nijhum Dwip, St. Martin, and the more recent Naf MPA, collectively covering 6.82% of Bangladesh's marine area. In line with SDGs, Bangladesh is committed to designating and managing more MPAs covering 10% of its marine areas. Declaring MPAs marks an important milestone, but adoption of effective management strategies is key to realizing their full potential. Identifying and addressing the key management and conservation priorities for MPAs in Bangladesh is crucial for enhancing ecological health and maximizing socio-economic benefits. The management plan for each MPA should be tailored to its specific objectives, and implemented inclusively, ensuring active participation from the stakeholders. Additionally, the plan should include a spatial framework that divides the area into 4-5 zones based on management and conservation priorities, developed through a data-driven and stakeholder-inclusive approach. However, the government, development partners, and philanthropic organizations need to step forward and invest in managing Bangladesh's MPAs, addressing the unique social, economic, and institutional factors of each area.

Innovative Strategies for Marine Biodiversity Conservation: A Comprehensive Approach

Habiba Mehedi Anika

Department of Environmental Science and Disaster Management, Daffodil International University, Ashulia, Dhaka, Bangladesh

Email: mehedi241-30-002@diu.edu.bd

Abstract

Marine conservation, also known as ocean conservation, involves the protection and preservation of ocean and sea ecosystems through planned management, aiming to prevent the over-exploitation of marine resources. Biodiversity allows nature to be productive, resilient and adaptable to environmental changes. Such changes might be caused by global warming, the spread of disease, pollution, invasive species, overfishing (Around 37.7% of the world's fish stocks are currently overfished) or other human-related impacts such as coastal land and sea use .Carbon dioxide emissions are making the ocean more acidic, making it harder for shellfish, corals, and types of plankton to survive. Marine biodiversity is essential for the health and stability of marine ecosystems. Some important strategies for marine biodiversity conservation are establishing Marine Protected Areas (MPAs) that are the designated regions in oceans and seas where human activities are regulated to protect natural and cultural resources. , implementing sustainable fishing practices, and habitat restoration initiatives. Technological advancements, such as remote sensing, genetic analysis, and artificial intelligence, are highlighted for their roles in enhancing the monitoring and management of marine ecosystems. By addressing immediate threats and building resilience against future challenges, these innovative approaches contribute to the long-term sustainability of marine ecosystems. This comprehensive strategy emphasizes the need for continuous innovation and stakeholder cooperation in marine conservation. The ocean provides essential resources, including the oxygen we breathe, the food we eat, and a moderate climate. To prevent further drastic biodiversity loss, it is crucial to implement strong protections for over 30 percent of the ocean and ensure sustainable fishing practices throughout. This is vital for the billions of people who depend on the ocean.

Challenges of marine biodiversity protection through advanced satellite sensor technology

Md Rahimullah Miah[1,3,*], Mohammed Belal Uddin[2], Jorin Tasnim Parisha[3], Alexander Kiew Sayok[4], Md Main Uddin Miah[5], Tofayel Ahmed[5], Shahriar Hussain Chowdhury[6], and Ahsan Habib[7]

[1]Department of Health Information Technology and Research Scientist, North East Medical College Hospital, Affiliated to Sylhet Medical University, Sylhet, Bangladesh. and PhD Awardee from the IBEC, UNIMAS, Sarawak, Malaysia. Email: drmiahbd@gmail.com, ORCID: https://orcid.org/0000-0002-6271-4100
[2]Department of Forestry and Environmental Science, Shahjalal University of Science and Technology, Sylhet, Bangladesh. Email: belal-for@sust.edu, ORCID: https://orcid.org/ 0000-0001-9847-5888
[3]Sylhet Government Women's College, Affiliated to National University, Sylhet Sadar, Sylhet, Bangladesh. Email: tasnimjorin2021@gmail.com, ORCID: https://orcid.org/0009-0003-2421-8530
[4]IBEC, Universiti Malaysia Sarawak (UNIMAS), Kota Samarahan, Sarawak, Malaysia. Email: alexksayok@gmail.com, ORCID: https://orcid.org/0000-0002-8393-0064
[5]Faculty of Forestry and Environment, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh. Email: mmumiahbsmrau@gmail.com
[6]Department of Dermatology & Venereology, North East Medical College Hospital, Affiliated to Sylhet Medical University, Sylhet, Bangladesh
[7]Institute of Information and Communication Technology, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh

Abstract

The vast biodiversity of the ocean is vital for all generations to survive. But many are unaware that this biodiversity is being destroyed by the misuse of wireless sensor technology. Yet marine biodiversity professionals have been constantly challenged for several years to recognize biodiversity loss as a very important global problem due to tracking GPS sensor technology. This study attempts to rethink the adequate strategic measures for the deployment of safe sensor technologies based on marine biodiversity management policy. The Spatial ISNAPHO study was conducted to observe biodiversity status in and around the Batang Ai National Park Lake in the Sarawak province of Malaysia. The study found that GPS sensor tracking is a serious threat to the biodiversity of Batang Ai Lake. Digital tracking has caused various sensor diseases in the lake water and surrounding fauna and flora. The study also noted that wireless sensor tracking has caused sudden contamination of water in the designated area, which is a threat to the survival of biodiversity. The study also found that the volume of biodiversity-related regulatory amendments in Malaysia and Bangladesh was higher from 2010 to 2024 than in previous years due to global concerns. The study revealed that the growth of advanced sensor technology is higher than in biodiversity policy, but lower in marine environmental conservation governance services. Research has shown that existing marine conservation instruments are inadequate and slow for effective management compared to other spatial strategic tools, and their protection performance is still substandard. Advanced GPS sensor satellite knowledge is crucial for marine biodiversity management, but the amount of this knowledge among policymakers and other stakeholders is relatively low. These results reflect the importance of protecting marine biodiversity through state-of-the-art sensor technology for transparency provided by the state. Moreover, the question remains whether marine biodiversity was affected when the technology was not invented - which was natural. The study showed that GPS sensor tracking with photoreceptors, magnetoreceptors and phonoreceptors of biodiversity in a specific marine location in an active cloud network disrupts the movement of electrons in the bodies of living organisms, causing their instant digital death. The study represents that the Marine Biodiversity Protection through Advanced Satellite Sensor Technology (MBPAST) model would protect marine ecosystems more safely and efficiently, saving millions of lives. The study is a unique scientific research pathway that will open many gateways to national and global policies linked to the Sustainable Development Goals 2030.

Implementation of the Marine Protected Areas (MPAs): A Likely Governance and Institutional Arrangement Synchronized With the Global Frameworks

Md Shamsuddoha[1] and Shohanur Rahman[2]

[1]Chief Executive
Center for Participatory Research and Development-CPRD
E-mail: doha@cprdbd.org
[2] Research Officer
Center for Participatory Research and Development-CPRD
E-mail: rahman.shohan@cprdbd.org

Abstract

Two out of three UN Rio Conventions namely Convention on Biological Diversity (CBD) and the Framework Convention on Climate Change (UNFCCC), adopted at the Earth Summit in 1992, provided due emphasis on the conservation, management and sustainable use of marine resources with an enhanced coverage of the protected areas.

The UNCBD, in particular, in its 2nd Conference of the Parties (COP 2) recognized the Marine Protected Areas (MPAs) as the benchmark of marine and coastal conservation. Henceforth, its successive CBD COPs (Conference of the Parties) established, a well-agreed scientific, legal, and governance frameworks of MPA and set a requirement for the members states, though not legally bound, to protect certain percentage of marine and coastal areas with nationally determined governance and institutional embedding. The COP 11 in 2012 that adopted **Aichi Biodiversity Targets (2011-2020) required the Parties to protect** 10 percent of their marine and coastal areas by 2020. The post-2020 global biodiversity framework agreed at COP 15 in 2022 reiterated MPAs and integrated its scope also to realizing global adaptation and mitigation objectives set under the Paris Agreement adopted at the 21st UN Climate Conference in 2015.

While not in the initial COPs of the UNFCCC, the science-based argument on the complementarity between UNCBD and UNFCCC helped evolving and mainstreaming oceans, including the MPAs, to the global climate negotiation of addressing climate change. The Paris Agreement, in particular, introduced ocean-based climate solutions with the integration of the MPAs into adaptation planning, also underscored the potential of carbon sequestration with an enhanced blue carbon habitants in the protected areas. Though the post-Paris climate negotiation framed MPAs as ecosystem-based adaptation (EbA), the COP 25, termed as blue COP, in 2019 acknowledged the role of the MPAs in carbon sequestration and ocean resilience and called for the protection of 30 percent of ocean areas by 2030- a goal persuaded by the High-Level Panel for a Sustainable Ocean Economy 2020 and adopted by the UNCBD's Kunming-Montreal Global Biodiversity Framework. Further on this, the COP 26 in 2021 introduced 'Ocean-Climate Dialogue' to guide the global negotiation and national planning for institutionalizing ocean and implementation of MPAs with governance and financial measures.

In similar fashion, the Sustainable Development Goal 14 (SDG 14; Conserve and sustainably use the oceans, seas and marine resources for sustainable development) set a particular target of MPAs in relation to marine areas. Its target 14.5 required the countries to conserve at least 10 per cent of coastal and marine areas by 2020.

Literally a synchronized global governance for scaled -up MPAs has been established under the UN System, however, which is yet to be translated to the national governance with mainstreamed policy and institutional embedding.

Bangladesh's Ministry of Fisheries and Livestock, by its 'Marine Fisheries Act 2020' is empowered to declare Fisheries Sanctuary or Marine Protected Areas under its legislative scope of conserving and sustainably managing marine fisheries in Bangladesh. However, the extended scope of the MPAs, aligned to the UNCBD and UNFCCC falls under the purview of the Ministry of Environment Forests and Climate Change and its allied technical arms-Department of Environment (DoE) and Bangladesh Forests Department (BFD). Further on this, while the Ocean is considered as extended space for 'Development', it becomes and concern of the Ministry of Finance for expanding economic activities and the Ministry of Foreign Affairs for upholding national interest and resolving conflicts that might arise while negotiating the international and regional treaties such as Convention on the High Seas and the Regional Seas Programme of the United Nations Environment Programme (UNEP).

Understandably, the implementation of MPAs is not 'stand-alone' or 'parallel process'. Likewise, the global frameworks, the MPAs implementation require synchronization of national plans and programmes of the relevant ministries and departments. This paper suggested a synchronized governance and institutional arrangement for the implementation of MPAs in Bangladesh.
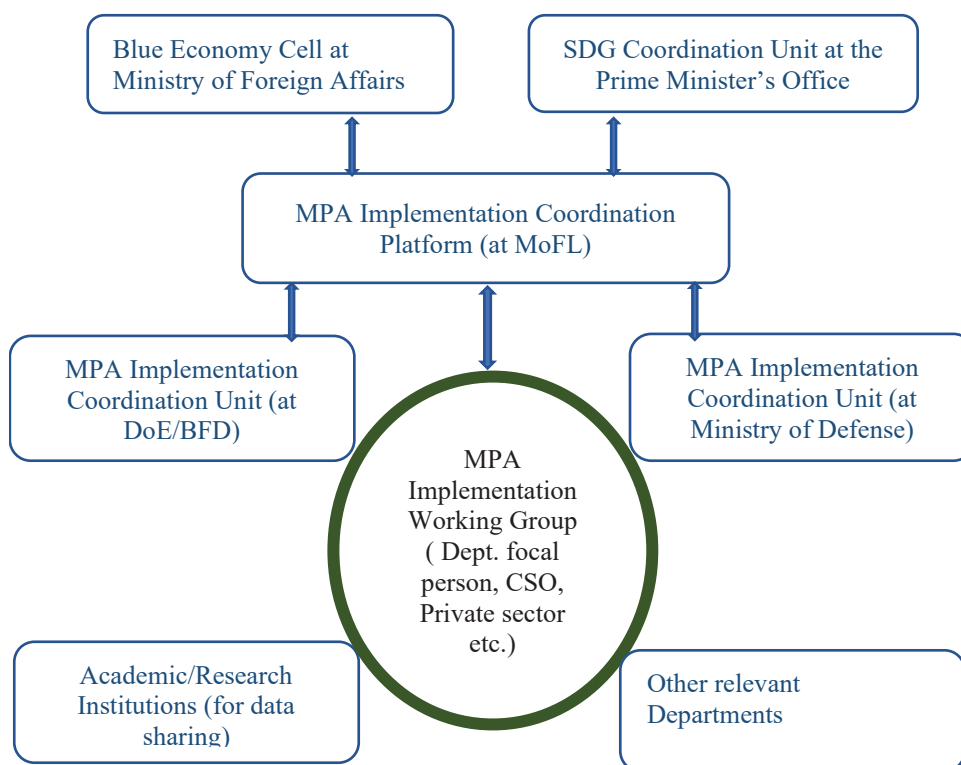

Figure: A likely governance and institutional arrangement for the implementation of MPAs in Bangladesh

This paper also underscores mobilizing the means of MPAs implementation such as finance, capacity building and technological supports from a variety of sources, including through enhanced development cooperation and public-private partnership provided that the MPAs are evolved to a 'window of opportunity' for carbon trading with their enhanced potentials of sinking atmospheric carbon-di-oxide.

Safeguarding the future of St. Martin's coral ecosystem: A holistic approach combing conservation features and zoning

M. Shah Nawaz Chowdhury[1*] and Tomas Tomascik[2]

[1]Institute of Marine Sciences, University of Chittagong, Chittagong 4331, Bangladesh
[2] Vancouver, British Columbia, V6G 3G3, Canada

Email: msnchowdhury@cu.ac.bd

Abstract

St. Martin's Island is a biodiversity hotspot that delineates the northernmost distribution of scleractinian corals in the Bay of Bengal region. The island provides critical habitat for rare, endangered and threatened marine species. However, different anthropogenic activities, such as unplanned tourism development, coral extraction, fishing, boat anchorage and pollution, combined with natural environmental challenges like sedimentation, turbidity, low salinity and rising sea surface temperature, are posing serious threats to the Island's biodiversity, particularly its coral communities. This study has been conducting comprehensive underwater surveys within the St. Martin's Island MPA using state of the art ocean submersibles and SCUBA diving techniques to assess the present state of the corals and their associated ecosystems. This study has documented the rapid degradation of coral habitats, leading to a decline in biodiversity and pushing the ecological health of St. Martin's Island to a critical state. Additionally, the collected data have been used to generate geo-spatial maps and ocean models to identify areas requiring immediate conservation or restoration efforts. Moreover, this study has been investigating the socio-ecological linkages in order to understand the dependency of islanders to coastal and marine resources, aiming to formulate alternative livelihood opportunities to improve the well-being of local communities. Based on conservation features, area sensitivity, level of dependency, usage patterns and degradation status, ecosystem-based zoning and community-oriented management approaches have been developed to restore and conserve the coral community structure and functions that will contribute to reducing the socio-environmental tensions of St. Martin's island.

An Assessment of the Environmental Dynamics in the Swatch of No Ground to Bridge the Data Gaps in MPA Management

Nahia Mantaka Chowdhury[1], Md. Azizul Fazal[1], A B M Sarowar Alam[2] and Subrata Sarker[1]

[1]Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh
[2]Programme Manager, Species and Habitats, IUCN (International Union for Conservation of Nature), Bangladesh Country Office
*Email: nahiamantaka@gmail.com

Abstract

In 2014, the government of Bangladesh created the nation's first marine protected area, the Swatch of No Ground Marine Protected Area (SoNG MPA), aimed at protecting dolphins, porpoises, whales, and sharks. Despite its ecological importance, there is a scarcity of baseline information concerning the environmental and species dynamics within the Swatch of No Ground and its Marine Protected Area. This research sets a precedent for future integrated environmental and ecological assessments in the region by combining nutrient and physiochemical dynamics, sediment transport processes, food web interactions, and benthic species distribution into a single, comprehensive study. Field surveys were conducted across 50 strategically located sampling stations along a transect from Mongla Port to the endpoint of the SoNG MPA. Water, nutrients and plankton, alongside measurements of key physicochemical parameters, were collected from all 50 stations for 4 consecutive months. Benthos and sediment samples were collected from depths up to 50m. Diverse strategies of biodiversity data collection were applied, which included field surveys, citizen science-based monitoring, fish catch monitoring with fishermen during their fishing time, monitoring the landing center and fish market, and fishermen surveys. Laboratory analyses were conducted to quantify phytoplankton, zooplankton, and benthos distributions; determine diet composition through gut content analysis; and characterize sediment properties. The Ecopath and Ecosim food web model quantified the energy flow, analyzed species interactions, and predicted ecosystem changes under varying environmental conditions. The Delft3D model simulated sediment transport pathways with the impact of wave, current, tide and storm surges on sediment transport pattern integrated. This facilitated predictions of future changes in the SoNG MPA under varying sea conditions. Benthic health across the stations was assessed by calculating diversity indices, applying PCA to relate species distributions to environmental variables, and the ecological quality of the benthic habitats were classified using AMBI and M-AMBI. This research serves as a crucial starting point for upcoming monitoring initiatives in the SoNG MPA by creating base stations, which will allow the identification of ecosystem shifts over time, whether caused by natural variation or human activities.

Importance of Spatial Plan for Saltmarsh Habitat Conservation in Bangladesh

Syeda Ayshia Akter[1*] and Pranto Saha[2]

[1]Department of Geography and Environment, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh
[2]Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh

*Email: sayshaa@gmail.com

Abstract

Saltmarsh is the most productive and salt tolerant plant species on earth, which is grow in estuaries, low-energy coastal regions and able to adapt to stressful conditions. These systems are dynamic and provide the most important ecosystem services such as nursery ground, carbon sequestration, water purification and prevent land erosion. They also provide a habitat for many fish, amphibians, reptiles, birds, mammals, and invertebrate classes. Saltmarsh habitat is distributed along temperate zone as well as tropical and subtropical zone. The south-central (Moheshkhali, Patuakhali, Meghna River estuary) and southeastern coasts of Bangladesh (Salimpur coast, Chittagong, and the Bakkhali River estuary, cox's Bazar) is the higher abundance of saltmarsh. The saltmarsh ecosystem faces threats from changes in natural hydrology, pollution and coastal development. Mixed source of anthropogenic inputs, especially from agricultural activities and industrial effluents (ship breaking effluents) near the coast release vast amounts of pollution into the environment, which significantly change the saltmarsh ecosystems structure and function. Bangladesh's saltmarsh environment is always in danger because of factors including population growth, intensive agriculture, overfishing, siltation, pollution, poorly planned infrastructure, a lack of institutional coordination, a lack of knowledge, etc. The saltmarsh ecosystem of Bangladesh plays a significant role in blue carbon storage. However, identified threats are decreasing saltmarsh extent and density in Bangladesh coast. This will have a significant negative impact on blue carbon stock. Currently a spatial plan for saltmarsh habitat conservation is missing. Thus, study highlights the importance of saltmarsh habitat conservation through developing a spatial plan. Wetlands ecosystem in Bangladesh are crucial for the country's lifecycle and sustainable landscape. They are highly productive and diverse and must be managed effectively.

Spatial Conservation Planning for Guitarfish in Bangladesh Using Local Ecological Knowledge

Masiat Alam Zubair[1]*, Alifa Bintha Haque[2], Md. Sazidul Islam[2],
Shawnujjaman Khan[2] and Nazia Hosssain[2]

[1]Department of Oceanography, University of Dhaka, Dhaka 1000, Bangladesh
[2]Department of Zoology, University of Dhaka, Dhaka 1000, Bangladesh

*Email: zubairmasiatalam@gmail.com

Abstract

Artisanal fishing in the Bay of Bengal area has been characterized by heterogeneity and a lack of comprehensive data regarding threatened elasmobranchs, including guitarfishes, due to a lack of baseline information. The guitarfish is in high demand in the international market due to its highvalue fins. For many years, these species have been caught as bycatch and also targeted specifically. These fish are further processed (fins, skin, intestines, etc.) and traded in international markets. Due to its late maturity and a k-selected species, this species is now highly vulnerable to any fishing. Our study aims to identify the catch records of 4 guitarfish species: *Glaucostegus granulatus* (sharpnose), *Rhina ancylostoma* (Bowmouth), *Glaucostegus obtusus* (widenose), *Rhinobatos annandalei* (Bengal guitarfish) in last ten years from 150 fishers and traders local ecological knowledge (LEK) from different coastal communities. From the perceived knowledge from the fishers, it is confirmed that sharpnose guitarfish and bowmouth guitarfish significantly dropped in their catch in the last 10 years. In this study, we identified critical fishing variables and techniques (gear soak time, fishing depth, vessel storage capacity) and socio-economic drivers (income, debt levels, experience) impacting guitarfish catch levels for fishers. Guitarfish were caught incidentally and found in different areas, with the most captures occurring in the southcentral region of Bangladesh. The fisher's information identifies four hotspots of guitarfish catch zones. The nursery grounds in the Ganges-Brahmaputra-Meghna delta mouth area are vital habitats for guitarfish, highlighting the need to protect these ecosystems. Southcentral shallow-water char (sand island) areas are considered essential habitats, providing substantial fishing grounds. The predominant threats are overexploitation by unselective gear use, bottom trawling, target catch, international trade and source of protein and income. Our study will provide guidelines in geographical contexts to identify the critical nursery grounds of threatened marine species in coastal waters for developing marine spatial planning in Bangladesh.

Complete Mitochondrial Genome of *Mobula tarapacana* (Philippi, 1892) and Its Phylogeny

Kumar Chandrasekaran[1], Inbakandan Dhinakarasamy[1*] and Thirugnanasambandam Rajendran[1]

[1]Centre for Ocean Research (DST – FIST Sponsored Centre), MoES – Earth Science & Technology Cell, Sathyabama Institute of Science and Technology, Chennai 600 119, Tamil Nadu, India

[*]Email: inbakandan@gmail.com

Abstract

The evaluation of mitochondrial genome analysis provides significant insights into molecular phylogenetic analysis and evolution. The sicklefin devil ray, *Mobula tarapacana*, has black ventral patterns and a pale leaf-green to dark muddy dorsal surface. Fishermen and divers occasionally misidentify these subspecies as manta rays due to their gray ventral stripes. This study investigated the complete mitochondrial genome sequence of the spiny mobula, which was decoded, interpreted, and reported to GenBank to prevent misclassification during catches and to enhance scientific understanding of this species in alignment with SDG Goal 14.A. The mitochondrial genome of *M. tarapacana* is 15,686 bp in length and consists of closed circular dsDNA, which encodes 13 protein-coding genes (PCGs), 22 tRNAs, and 2 rRNAs. The proportion of genes in the genome that code for proteins is 60.30%. Except for COX1 and ATP8, which have ATG codons instead of GTG and CCT, each PCG starts with an ATG codon. Leucine (Leu, L) and serine (Ser, S) are the most prevalent amino acids in the PCGs. The maximum likelihood method in MEGA X software was used to generate the phylogenetic relationships and evolutionary distances. The mitogenomes of *Mobula eregoodootenkee* (MKU MG10, KM364987) and *Mobula kuhlii* (NC 025954) were found to be closely related. In conclusion, the mitochondrial genetic data show promise but highlight a larger issue that sharks and rays face. By establishing partnerships with scientists, non-governmental organizations, coastal fishermen, and communities, we believe that successful species recoveries and rebuilding efforts could be extended globally.

Comparison of fillet quality and organ health parameters between vaccinated and unvaccinated Atlantic Salmon (*Salmo salar* L.)

Morkore Turid[1], Rorvik Kjell- Arne [1], and Hossain Khandakar Zakir [2*]

[1]Department of Aquaculture and Animal Sciences, Norwegian University of Life Sciences, Ås- 1432, Norway
[2]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Bangladesh and Faculty of Health Sciences, Shinawatra University, Thailand
Email: zakir_fisheries.bau2008@yahoo.com

Abstract

Atlantic salmon (*Salmo salar* L.) is a prominent economic fish species around the globe. Fry quality, diet, and vaccination are all critical factors in successful salmon farming. Nonetheless, while immunization represents a significant improvement in the prevention of specific diseases, it has some adverse consequences for fish. The major goal of this research was to investigate the effects of vaccinations on fillet quality, organ health, and melanization in the tissues of Atlantic salmon. 420 salmon (1+ spring smolt) with an average body weight of 2548 ± 2 gram (mean ± standard error) were randomly dispersed in three same-sized net pens (125 m³; 100 vaccinated and 40 seawater injected salmon in each net pen) at Marine Harvest Fish Feed Station in Averøy, Norway. The experimental period lasted from June 5 to August 19, 2014. The salmon were vaccinated (MSD Animal Health, *Norvax Minova 6*, 0.1 ml dose) or injected with seawater on April 4, 2013, when their body weight was at least 35 g. The fish were fed a standard commercial feed. There was no significant difference in mean body weight (P = 0.22) between the vaccinated and SW-injected fish at the end of the growth trial in August. However, there were differences in some biometric, fillet quality, and organ health characteristics between the vaccinated and unvaccinated salmon. Vaccinated salmon demonstrated significantly higher levels of condition factor (P = 0.0014), fillet yield (P = 0.0227), organ adhesions (P < 0.0001), visceral fat (P = 0.0073), and fillet fat (P = 0.0248). In contrast, the flesh texture of the posterior region of the fillet was substantially softer (P = 0.0006). Melanin spots in fillets did not differ substantially between vaccinated and unvaccinated salmon. However, vaccinated salmon had considerably greater melanin levels in the abdominal wall and organs (P = 0.0169 and P < 0.0001, respectively). Gender had a significant effect on the mean melanin score in abdominal wall (P = 0.0113), but not in organs (P = 0.4753). It is revealed from the findings that vaccines have a great impact on salmon farming by improving condition factor, fish growth rate, fillet yield, and fat contents in the flesh. Therefore it is recommended to administer vaccines in the salmon farms to boost their health and production performances that contribute to the fishing industries.

Value chain analysis of commercial mangrove fisheries of the Bangladesh Sundarbans

Mushfikur Rahman Tareque and Md. Mostafa Shamsuzzaman*

Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh
*Email: shamsuzzamanmm.cmf@sau.ac.bd

Abstract

A comprehensive understanding of marketing function, market margin and value addition cost-profit is paramount to establish a well-planned and effective marketing strategy. According to the study's objectives, it is hypothesized that the percentage allocation of costs and profit related to value addition, as well as the challenges encountered by various intermediaries, are influenced by the identified marketing functions. In-depth interviews were conducted, totaling 275, along with 15 key informant interviews and 3 focus group discussions in various locations across the Khulna region of Bangladesh. The study unveiled the value addition due to marketing function like grading, landing, icing and transporting where 70.6% fishers used bamboo baskets and 39% traders used PVC baskets as transport mode. The value chain actors also used 96.3% vans for short distance and 19% trucks for long distance that raised their marketing cost. The study found that the fisher had the highest individual marketing cost US\$ 0.425 kg^{-1}, while the *paikers* had lowest US\$ 0.075 kg^{-1}. As an input supplier, the fishers had the highest average marketing margin US\$ 8.79 kg^{-1} for *Pampus chinensis* and also shared 69.71 % of value addition profit for *Trichiurus Lepturus*. As an input receiver among the traders, processors had the recipient of the highest margin US\$ 3.98 kg^{-1} for *Pampus chinensis* and 65.12% share of value addition profit for *Exopalaemon styliferus*, while the *beparis* had a lowest 2.35% share of value addition profit for *Pampus chinensis.* An assessment of challenges within the value chain, as determined by the Challenge Facing Index (CFI), identified market volatility as the most prominent concerns with CFI of 675. Based on these insights, the study advocates for the establishment of a well-planned, modern-equipped fish market that includes provisions for sufficient financing, high-quality cold storage, centralized market, inspection, and revised policies. Implementing these measures could pave the way for a streamlined supply chain and smoother transaction routes spanning from production to consumption.

Assessment of RAPFISH sustainability indicators of the Sundarbans mangrove fisheries towards creating an enabling environment for SDG 14 implementation

Shreejon Barua[1], Mohammad Mahmudul Islam[1], Mushfikur Rahman Tareque[1], Fatin Ilham Fahim[1], Md. Mostafa Shamsuzzaman[1*]

[1]Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh
E-mail: shamsuzzamanmm.cmf@sau.ac.bd

Abstract

A multidimensional analysis to assess the sustainability condition of the Sundarbans mangrove fisheries was undertaken utilizing the Rapid Appraisal Fish (RAPFISH) approach with 48 attributes spanning five evaluation categories (social, economic, ethical, ecological, and technological). The approach used a multidimensional scaling technique; uncertainty was conveyed by Monte Carlo simulation and vulnerability by leverage assessment. Findings revealed that, the Sahash community exhibited an average RAPFISH score of 50.66 (fairly sustainable), albeit with social (45.92), ecological (40.98), and technological (36.06) dimensions showing lower sustainability. Following the Srifoltola community ranked second with a mean RAPFISH score of 50.31 (fairly sustainable), reflecting similar challenges in economic (43.85), ecological (38.89), and technological (39.92) dimensions. In the end, Toiobpur community maintained the third position with an average RAPFISH score of 48.43 (less sustainable), particularly social (32.92), economic (34.28), and ecological (42.86) dimensions remained less sustainable. The research discovered different causes for lowering sustainability across all dimensions. Social dimension was lower because of low level of education, conflict among fishers, and lack of fishers' participation on actual fishery regulations. The hindrance of economic dimension was for the fishers getting free access to local market, market type and the domination of middleman on marketable right. Ecological dimension was threatened for catching fish of being oversized, harvesting fish before maturation and continual geographical range reduction. Technological dimension was inhibited in case of increasing vessel size, enhance catching power through power assisted vessel. Finally, after overcoming the following lacks and gaps these findings will facilitate progress toward SDGs 14 and fostering sustainable fisheries practices where data limitations exist.

Integrated Management Plan of Saint Martin Marine Protected Area for Sustenance of Maritime Economy and Preservation of Fragile Ecosystems

Captain Rezaur Rahman*
Bangladesh Navy Hydrographic and Oceanographic Centre
Email: rezaur2000@gmail.com

Abstract

The waters around Saint Martin's Island are 'biodiversity hotspot' supporting a large variety of threatened coral colonies, numerous species of fish, migratory birds, marine mammals and turtles. Having a tiny area of 8 km², the island hosts 7,000 residents and used to welcome 8,000 tourists between November to March till 2024. The buoyant tourism industry has generated considerable economic activities and as by-product, massive environmental pollution, degradation of coral colonies and marine ecosystems. Considering the existential threat, the Government of Bangladesh (GoB) has declared 1,743 km² as Saint Martin Marine Protected Area (SMMPA) in January 2022 and in October 2024, adopted several measures like regulated tourism to restore environmental health.

In line with the directives of GoB, Bangladesh Navy and Coast Guard have been working to monitor and enforce this MPA. However, the presence of numerous stakeholders and absence of any management plan, the SMMPA is regarded as a mere 'paper-park' with continuous environmental degradation. For an effective Integrated Management Plan, the following steps may be considered:

Awareness: Awareness Campaigns may raise awareness and customized educational programmes may educate local population and tourists about marine conservation within SMMPA.

Zoning: The SMMPA may be divided into no-go, no-take and sustainable fishing zone to facilitate a balance among conservation, sustainable fishing and tourism.

Sustainable Tourism: Implementing eco-tourism practices may support local economies without degrading environmental health.

Climate Resilience: Promoting coral restoration and mangrove reforestation may enhance ecosystem resilience and restore the health of SMMPA.

Enforcement: Regular surveillance and periodic patrols by Navy and Coast Guard vessels and Unmanned Aerial Vehicles may help prevent illegal fishing, unsustainable tourism practices and habitat destruction. Incorporation of Automatic Identification System onboard all vessels may ensure better enforcement.

Community Engagement: The consultation and involvement of local communities in decision-making processes may facilitate formulation and execution of effective management plan.

National/Regional Collaboration: Collaboration among various stakeholders (both regional & national) may facilitate shared research, funding and exchange of knowledge & expertise.

The declaration of SMMPA is an important milestone for marine conservation in Bangladesh. The formulation and enforcement of an integrated management plan through consultation of various stakeholders are crucial not only to protect island's very existence and its fragile ecosystems, but also to sustain local economy and marine tourism. Through active collaboration among policy makers, conservationists and local populations, SMMPA has the potential to become a role model of marine environmental protection with associated socio-economic benefits for generations to come.

Ghost Fishing: Threats of Abandoned, Lost and Discarded Fishing Gears in Aquatic System

Fatima Jannat and Aysha Siddica*

Aquatic Zoology Research Group's Plastic Pollution and
Mitigation Research Unit, Department of Zoology, University of Dhaka

Email: ayshajulie4@gmail.com

Abstract

Abandoned, lost or otherwise discarded fishing gear (ALDFG) contributes significantly to the marine plastic pollution that occurs worldwide, resulting ghost fishing which have negative effects on the environment and the economy. Large marine animals may become trapped in the ghost gears and die slowly and painfully. Bangladesh, a country with hundreds of rivers as well as marine systems provide good source of fishes that facilitate fisheries at a large scale. Due to poor weather, low concern about adverse effects of ALDFG and plastic pollution, unsafe retrieval of lost gear, illegal fishing, lack of implementation of legislation on proper management, the fishing gear are moving towards ALDFG. These discarded mismanaged fishing gears have been reported as one of the major sources of plastic pollution to the aquatic systems. Lack of understanding about loss rates, locations, data availability and accuracy, consequences, and legislative impediments to retrieval makes managing ALDFG challenging. In this review paper, the current state of knowledge of global scenario of ALDFG in aquatic systems being discussed. A total of around 67 studies relevant to ghost fishing were found that published from 2015 to 2023, of which 21 were selected for this study under the selection criteria. Among them eight were focused on global south countries and thirteen were focused on global north. Only one study was found on discarded fishing gears in Bangladesh. This reflects significant research gap in this field. The lack of available data highlights the need for more research to track and evaluate the movement of aquatic ghost gears and consider the effects on aquatic life forms. In this study, the reviewed publications revealed the current status on estimation, monitoring, management, retrieval, environmental impact and threats of ALDFG and ghost fishing. This review work will create a baseline to develop national management strategies addressing abandoned, lost, and discarded fishing gears.

Assessing Marine Zoning and MSP Nexus in Coastal Zone and Marine Waters of Bangladesh for Sustainable Development Goals (SDG's)

Rufaida Siddiquee [1] *, Md. Jahidul Hasan[2] , Deen Muhammed Sabbir[3] and Tasnim Rahman Rimu[1]

[1]Institute of Marine Sciences, University of Chittagong, Chattogram-4331, Bangladesh
[2]BRAC Centre, 75 Mohakhali, Dhaka-1212, Bangladesh
[3]Department of Oceanography, University of Chittagong, Chattogram-4331, Bangladesh

*Email: rufaidasafa13@gmail.com

Abstract

The coastal zone and Exclusive Economic Zone (EEZ) of Bangladesh is characterized by a complex interplay of various sectors, each with its own unique environmental implications. As a result of diverse utilization and extensive economic activities these areas are experiencing numerous conflicts. It is crucial to understand and address these conflicts in order to ensure sustainable development and the preservation of the delicate coastal ecosystem. This study evaluates the integration of Marine Spatial Planning (MSP) and marine zoning in the coastal and marine waters of Bangladesh to achieve sustainable development goals (SDGs), with a focus on SDG 14. This research utilized satellite images from the USGS archive to analyze coastline dynamics for 2003, 2013, and 2023 using Landsat 7 (ETM+), Landsat 8 (OLI), and Landsat 9 (OLI). Images with less than 10% cloud coverage were selected for higher classification accuracy, and QGIS 3.18 was used to fix scanline issues in Landsat 7. Through a comprehensive analysis of literature and the systematic collection of data from the Moderate Resolution Imaging Spectroradiometer (MODIS), the discernible patterns and characteristics pertaining to areas of conflicts have been identified and documented. By examining Bangladesh's 710-kilometer-long coastline and its 118,813 square kilometers of maritime area, the research highlights the ecological, economic, and social significance of these regions. It identifies challenges such as overfishing, habitat degradation, and climate change impacts while emphasizing the need for effective management strategies. Utilizing satellite data, field observations, and stakeholder input, the study assesses land use changes, coastal dynamics, and environmental vulnerabilities. The findings aim to inform policy recommendations to balance resource use, protect marine ecosystems, and address conflicts, ensuring the sustainable use of Bangladesh's coastal and marine resources.

Jellyfish Diversity, Distribution, and Bloom Patterns Along the South-Eastern Coast of Bangladesh: A Marine Spatial Planning Approach for Sustainable Blue Growth

Showmitra Chowdhury[1*], S. M. Sharifuzzaman[2], Abdullah Al Mamun Siddiaqui[1,] Sadia Sultana[2], Sumaia Afrin[2], Mehedi Hasan Peas[3]

[1]Bangladesh Oceanographic Research Institute, Bangladesh
[2] Institute of Marine Sciences, University of Chittagong, Bangladesh
[3]Bangladesh Space Research and Remote Sensing Organisation, Bangladesh

*Email: showmitra@bori.gov.bd

Abstract

Jellyfish play a vital role in marine ecosystems and are gaining attention for their ecological and economic significance. This study examines jellyfish diversity, distribution, and bloom dynamics along the South-Eastern Coast of Bangladesh, highlighting their potential as blue foods and high-value bioproducts. Field surveys conducted in 2023–24 at eight sampling sites during dry and wet seasons revealed a strong correlation between jellyfish abundance and environmental factors such as temperature, salinity, chlorophyll-a, and pH. A total of 16 jellyfish species were identified, with three edible species—*Crambionella annandalei, Rhopilema hispidum*, and *Lobonemoides robustus*—found to be highly abundant. The most commonly observed species included *Crambionella annandalei, Rhopilema hispidum, Pelagia panopyra, Aequorea pensilis, Lychnorhiza malayensis, Cephea cephea, Phyllorhiza punctata*, and *Chrysaora caliparea*, with Saint Martin's Island, Teknaf, and Shamlapur emerging as key jellyfish hotspots. Jellyfish abundance and diversity were significantly higher in the dry season compared to the wet season. The most abundant species, *Aequorea pensilis* and *Crambionella annandalei*, reached peak densities of over 180 Ind m^{-3} and 18 Ind m^{-3}, respectively. *Pelagia panopyra* was more concentrated near Saint Martin's Island, whereas *Crambionella annandalei* was prevalent further north. Notably, the venomous jellyfish *Cyanea nozakii* was observed near the Cox's Bazar coast in both seasons. Four bloom events were recorded, with GIS-based hotspot analysis identifying Saint Martin's Island as the primary bloom hotspot. These findings suggest that jellyfish can be sustainably harvested to support Bangladesh's blue economy, contributing to food security, pharmaceuticals, and biotechnological advancements while mitigating their ecological impact. This study provides crucial insights for marine resource management, conservation planning, and the development of jellyfish-based industries.

Ecological Interactions between Fisheries and the Sundarbans Mangrove Ecosystem

Md. Naimur Rahman[*], Md. Hamim Chowdhury, Fairuz Faria Saika and
Subrata Sarker

Department of Oceanography, Shahjalal University of Science and Technology,
Sylhet-3114, Bangladesh.

[*]Email: mdnaimur22@student.sust.edu

Abstract

Mangroves play a vital role in supporting fisheries production within aquatic ecosystems. This study aimed to understand the interaction between mangroves and fisheries in the coastal ecosystems of Bangladesh. Data on water quality and fisheries were collected from 25 stations located near the Sundarbans mangrove forest and 25 stations situated farther from the mangrove ecosystem. The results revealed significant differences in water quality variables between mangrove and non-mangrove aquatic ecosystems, with major variations observed in nutrient levels and primary production. In the mangrove-associated aquatic ecosystem, nitrate and phosphate concentrations were measured at 1.29 µmol/L and 0.85 µmol/L, respectively, while lower concentrations were recorded in non-mangrove areas. Phytoplankton and zooplankton abundance were also higher in aquatic ecosystems near mangroves compared to those farther away. The study found a strong relationship between mangroves and fisheries. Species diversity of fish was highest in the mangrove ecosystem (85 species) and lowest in non-mangrove aquatic areas (42 species). The high fish species diversity near mangroves was attributed to increased productivity driven by elevated nutrient levels, which were significantly correlated with mangrove litterfall. Furthermore, several commercially important fish species showed a positive association with mangrove fruits. Gut content analysis of these species indicated that they feed on mangrove fruits, with their seasonal occurrence corresponding to the availability of these fruits. This study provides the first evidence of mangrove-fisheries interactions in the coastal ecosystem of Bangladesh, highlighting the critical role of mangroves in sustaining aquatic biodiversity and productivity.

Marine Pollution: A Critical Analysis of the Legal and Institutional Regimes in Bangladesh for the Sustainable Ocean Governance in the Bay of Bengal

Abu Hena Muhammad Yousuf[1,2*]

[1]*Associate Professor, Department of Oceanography, Faculty of Earth & Environmental Sciences,University of Dhaka.*
[2]*Honorary Research Fellow, International Centre for Ocean Governance (ICOG), School of Law, Western Sydney University, Australia*

Corresponding author: yousuf.ocn@du.ac.bd
.

Abstract

Bangladesh is a coastal state of the Bay of Bengal under severe threat of marine pollution, habitat depletion and degradation of biodiversity. The pressure of human activities in the ocean, overexploitation of ocean resources and the marine pollution that is a penalty for boosting economic benefits are creating severe threats to Sustainable Ocean Governance. An example case study that explains the current state of heavy metal pollution in this area. The ability to control and manage affluence is primarily dependent on the right organization of institutional and supervisory procedures. An original and lucrative technique for protecting marine contamination, particularly from industrial sources, might be guided by a comprehensive approach pertaining to domestic, regional, and global statutory documents. These include making required legislative changes, increasing organizational capacity, creating economic incentives for polluters, integrating local communities into river water quality monitoring, and incorporating information disclosure.

KEYNOTE PRESENTATION

Spatial Planning in MPAs and MPAs in spatial planning: Experiences from Indonesia and Brazil

Marion Glaser

Centre for Marine Tropical Research (ZMT), Bremen, Germany

Email: marion.glaser@leibniz-zmt.de

Abstract

Marine protected area (MPA) planning is a deeply spatially focused exercise. Zoning within MPAs, the development of spatially connective MPA networks, and the interactions of MPAs with other types of marine territories are often planned in a top-down manner and tend to ignore local needs. Where this is not the case, interesting outcomes ensue. This presentation offers information and analysis on the spatial dimension of planning that relates to MPAs in North, North-East and Southern Brazil (namely "Marine Extractive Reserves (RESEX) in North Brazil; Area de Proteção Ambiental (APA Costa dos Corais) in Pernambuco, North East Brazil and on the MPA in Babitonga Bay (Santa Catarina, South Brazil) as well as on the large MPA in Spermonde Archipelago, South Sulawesi, Indonesia.

MPA Planning is, or should be, also part of Marine Spatial Planning (MSP), of Integrated Coastal Zone Management (ICZM), and it is part the important spatial dimension of Blue Economy (BE) planning. All these are national undertakings that relate to the marine realm, albeit with often separate constituencies.

The question is: MPAs, BE and MSP: duplication, complementarity or emerging synergies? I will attempt to draw some lessons from experiences elsewhere in the Global South that might be of use to those who work on these issues in Bangladesh.

Advancing Marine Spatial Planning through Comprehensive Ocean Accounting

Srijon Paul[*] and Jewel Das

Institute of Marine Sciences, University of Chittagong, Chattogram-4331, Bangladesh

[*]Email: srijonpaul@gmail.com

Abstract

The United Nations has proclaimed the "Ocean Decade" (2021-2030), which proposes transformative solutions for the oceans, with the objective of "the science we need for the ocean we want". Marine Spatial Planning (MSP) can play a pivotal role in achieving the vision of the ocean decade. To facilitate the implementation of MSP, Ocean Accounting (OA) provides a framework for informed decision-making through data-driven interpretations that consider social, ecological, and economic sustainability. This could be enhanced by integrating the System of National Accounting (SNA) and the System of Environmental-Economic Accounting (SEEA). The integration of these two approaches provides a fundamental basis for MSP, embodying principles of global ocean governance. As a nation with a coastal territory, Bangladesh is obliged to devise a comprehensive policy for the sustainable governance of its coastal and marine resources. An effective ocean governance policy for Bangladesh needs to be coupled with MSP and OA to achieve sustainability. We propose an OA framework based on a thorough review and analysis of relevant literature and policies. The proposed policy framework aims to identify how targeted MSP interventions can provide equitable and effective solutions for balancing coastal and marine social-ecological systems. This approach seeks to meet the expectations established by the Ocean Decade, both globally and within Bangladesh.

Bringing together Community-centered Coastal and Marine Governance with Marine Spatial Planning: International Examples and Perspectives for Bangladesh

Désirée Schwindenhammer

Leibniz Centre for Tropical Marine Research (ZMT) Bremen, Germany; Chair of Sustainability Governance, University of Freiburg, Germany

Email: desiree.schwindenhammer@leibniz-zmt.de

Abstract

Marine Spatial Planning (MSP) is a process for coordinating and balancing diverse human activities within coastal and ocean spaces, considering ecological, economic, and social objectives. In context of marine conservation and the sustainable use of coastal and marine resources, MSP identifies and dedicates areas of significance for management and/or protection, for example Marine Protected Areas (MPAs).

Research on the effectiveness and sustainability of MPAs emphasizes the importance of fair and legitimate stakeholder involvement, particularly of communities reliant on marine resources. Approaches such as co-management and community-based management aim to realise this involvement in the governance of coastal and marine areas. However, meaningful stakeholder involvement already begins with the inception of marine protected and managed areas, i.e. the planning stage.

This contribution explores how MSP can effectively connect to and enable community-based governance by 1) recognizing existing (informal) marine management practices, including customary tenure; 2) ensuring equitable stakeholder participation; and 3) integrating local knowledge with scientific data for informed decision-making. International examples from Canada, Europe, and Tanzania will be used to address these questions and discuss perspectives for MSP and community-centered marine governance in Bangladesh.

The role of community participation and co-management for marine conservation in Bangladesh: Present and future pathways for inclusive marine management

Till Odde Heitmann[1]

[1]Faculty of Forest and Environment, University for Sustainable Development
(HNE) Eberswalde, 16225 Eberswalde, Germany
[*]Email: till.heitmann@hnee.de

Abstract

Marine conservation in Bangladesh is still at an early stage particularly regarding the involvement of small-scale fisheries (SSF) communities in the management of marine protected areas (MPAs). An increasing MPA presence and the implementation of other management approaches such as marine spatial planning (MSP) in the marine and coastal ecosystems of Bangladesh may have negative and positive effects on SSF communities that are dependent on conservation-targeted ecosystems. This study assesses the status of marine and coastal co-management, and how the involvement of SSF can contribute to successfully develop and implement management approaches for the coastal and marine protected areas of the country. An integrated review of relevant literature, data, management plans and official documents from 2014-2024 is being undertaken using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Key Informant Interviews (KIIs) are being conducted with a variety of stakeholders, decision makers and practitioners to collect information and perspectives for the combined thematic-interpretative analysis. As Bangladesh is focusing on the expansion of MPAs and other forms of ocean-centered management efforts, this study will develop pathways for participatory sustainable conservation and improving SSF livelihoods.

Uniting Blue Economy, Marine Spatial Planning, and Marine Protected Areas on one coast with many fishers

Jewel Das*

Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries,
University of Chittagong, Chattogram 4331

*Email: jewelrny@gmail.com

Abstract

Small-scale fisheries (SSFs) play a vital role in coastal livelihoods, food security, and cultural heritage, but face increasing challenges from economic development, environmental degradation, and competing marine uses. This study explores an integrated framework that harmonizes the blue economy, marine spatial planning (MSP), integrated coastal zone management (ICZM), and marine protected areas (MPAs) to support SSFs in terms of equity and justice. By analyzing a single coastal region, I assess how these approaches interact and identify synergies and conflicts that affect fishers and marine ecosystems. The findings highlight the need for inclusive governance, participatory decision-making, and adaptive management strategies to ensure that SSFs benefit from economic growth while maintaining ecological resilience. I argue that an equity-centered balanced approach, where conservation and growth efforts are aligned with economic and social priorities can enhance the long-term viability of SSFs. This research contributes to policy discussions on sustainable ocean governance by advocating for tailored strategies that recognize the unique vulnerabilities and opportunities within SSF communities.

KEYNOTE PRESENTATION

Institutional Aspects of Marine Spatial Planning

Sayedur Rahman Chowdhury

Institute of Marine Sciences, University of Chittagong, Bangladesh

Email: sayedurrchowdhury@gmail.com

Abstract

Marine Spatial Planning (MSP) has emerged as a crucial tool for the sustainable governance of marine and coastal resources, ensuring a balanced approach to economic development, environmental conservation, and social well-being. In Bangladesh, a country with a vast Exclusive Economic Zone (EEZ) and significant dependence on marine resources, institutional frameworks play a pivotal role in the successful implementation of MSP. This study explores the institutional landscape governing MSP in Bangladesh, highlighting key policies, regulatory frameworks, and the roles of governmental and non-governmental stakeholders.

Bangladesh's MSP is primarily shaped by policies such as the Bangladesh Delta Plan 2100, the Blue Economy policy framework, and the Coastal Zone Policy. However, the institutional structure remains fragmented, with multiple agencies—including the Ministry of Fisheries and Livestock, the Ministry of Environment, Forest and Climate Change, and the Ministry of Shipping—overseeing various aspects of marine governance. The lack of a dedicated, integrated authority for MSP has led to challenges in coordination, enforcement, and stakeholder engagement.

To enhance the effectiveness of MSP, Bangladesh needs to establish a cohesive institutional mechanism that fosters inter-agency collaboration, data sharing, and participatory decision-making. Strengthening legal frameworks, promoting cross-sectoral governance, and incorporating scientific and indigenous knowledge will be crucial in advancing a sustainable and inclusive MSP framework. The paper concludes by recommending policy measures to enhance institutional coordination and governance, ensuring that MSP in Bangladesh supports economic growth while safeguarding marine ecosystems for future generations.

Role of Bangladesh Coast Guard in Implementation of Marine Spatial Planning

Commandaer Sajjad Raihan, (ND), psc, BN (P No- 1898)

Bangladesh Coast Guard
Email: sajjadbn@gmail.com

Abstract

The Coast Guard plays a significant role in implementation of Marine Spatial Planning (MSP) due to its responsibilities in ensuring maritime safety, security, and environmental protection. Marine Spatial Planning is a total planning process regarding sea usage by a country that organizes nation's activities in marine areas to achieve ecological, economic, environmental, legal and social objectives.

Maritime Security and Navigational Safety.

a.   Trade Protection. The Coast Guard is responsible for the protection of trade on the sea routes.

b.   Port Security.   The Coast Guard is responsible for the security of ports and waterways. MSP must consider security zones and ensure that other activities do not compromise the safety and security of these critical areas.

c.   Traffic Separation Schemes (TSS).   The Coast Guard helps design and enforce TSS, which is crucial for preventing collisions and ensuring the smooth flow of maritime traffic. These schemes must be integrated into MSP to avoid conflicts with other uses like fishing, energy production, or conservation areas.

d.   Maritime Domain Awareness (MDA). The Coast Guard monitors maritime activities to enhance security and safety. MSP can benefit from this data to make informed decisions about the allocation of marine space.

3.   Search and Rescue (SAR) Operations.   The Coast Guard is responsible for search and rescue operations at sea.

4.   Environmental Protection.

a.   Oil Spill Response.   The Coast Guard often leads or coordinates responses to oil spills and other environmental hazards. MSP must consider the locations of sensitive ecosystems and ensure that response mechanisms are in place and not obstructed by other marine uses.

b.   Restriction on Tourism in St Martin.   Bangladesh Government imposed few restrictions on tourism in St Martins Island to protect various marine species and corals as part of MSP. Bangladesh Coasts Gurad is strictly monitoring the tourist restrictions.

b.   Marine Protected Areas (MPAs).   The Coast Guard may enforce regulations in MPAs, which are designated zones aimed at conserving marine biodiversity. MSP must balance the protection of these areas with other human activities.

5.   Fishery Protection.   Fishery Protection is the most important part of the MSP and Bangladesh Coast Guard is actively involved in Fishery Protection duty s it is her mandated duty. Bangladesh Coast Guard implements various fishing ban and restriction as ordered by government.

6.   Regulatory Compliance and Enforcement. The Coast Guard enforces maritime laws and regulations, including those related to fishing, shipping, and environmental protection. MSP must align with these regulations to ensure compliance and avoid conflicts.

7.   Stakeholder Engagement.   The Coast Guard often participates in stakeholder consultations and public meetings as part of the MSP process. Their input is valuable for understanding the operational requirements and constraints of maritime activities.

8.   Data and Information Sharing. The Coast Guard collects and maintains extensive data on maritime activities, environmental conditions, and navigational hazards. This data is crucial for informed decision-making in MSP.

9.   Interagency Collaboration.   The Coast Guard frequently collaborates with Ministry of Ports and Shipping, Ministry of Fisheries and Livestock, Ministry of Environment Forest and Climate Chane, River Police, Border Guard Bangladesh and local agencies, as well as international bodies, in the MSP process. This collaboration ensures that various interests and responsibilities are balanced and integrated into the planning process.

10.   Emergency Preparedness and Response. The Coast Guard's role in emergency preparedness and response is critical. MSP must consider emergency routes, response times, and the availability of resources to ensure that the Coast Guard can effectively respond to emergencies.

11.   Climate Change Adaptation.   The Coast Guard is increasingly involved in addressing the impacts of climate change, such as rising sea levels and increased storm intensity.

A Strategic Vision: Leveraging Bangladesh Navy's Expertise for Effective Marine Spatial Planning

Md Saiful Islam[1*], Md Shahidullah[2]

[1]Bangladesh Institute of Maritime Research and Development, Dhaka, Bangladesh
[2]Bangladesh Navy Hydrographic and Oceanographic Centre, Chottagram, Bangladesh

[*]Email: imsaiful86@gmail.com

Abstract

Bangladesh, with its extensive coastline and vast maritime zone in the Bay of Bengal, faces significant challenges in managing the competing demands of its marine space, including fisheries, shipping, energy exploration, and environmental conservation. Effective Marine Spatial Planning (MSP) is essential to achieving a balanced and sustainable approach to managing these diverse activities. While MSP has been successfully implemented globally, Bangladesh's adoption of this framework has been hindered by fragmented governance, lack of coordination, and insufficient integration of key marine data. This paper highlights the critical role of the Bangladesh Navy Hydrographic Department (BNHD) in driving effective MSP. The Navy has been conducting comprehensive hydrographic surveys, producing high-quality navigational charts and environmental data that are vital for managing marine resources and ensuring maritime safety. Despite its expertise, the Navy's role in MSP has not been fully recognized in national policy-making, resulting in underutilization of its data and capabilities. This paper advocates for a strategic shift that positions the Bangladesh Navy as the lead agency for MSP in the country, given its unique capacity to collect and analyze hydrographic and oceanographic data. Furthermore, it emphasizes the importance of fostering collaboration between various stakeholders, including government agencies, local communities, and international organizations, to create a centralized and integrated data platform, that is Marine Spatial Data Infrastructure (MSDI). By empowering the Bangladesh Navy to take the lead in MSP, the country can create a cohesive, sustainable framework that balances economic development, environmental protection, and social equity. This strategic move will not only enhance Bangladesh's blue economy but also ensure the resilience of its marine ecosystems in the face of climate change and increasing maritime activities.

High Sea Fishing: Bangladesh Perspective

Samsul Alam Patwari[1], Md. Abdullah Al Mamun[2], S. M. Mustafizur Rahman[2], Md Hasan Ali[1], Gaziur Rahman[1], Md Asadujjaman[1], Stefan Alfred Groenewold[3] and Muhammad Tanvir Hossain Chowdhury[1*]

[1]Department of Fisheries, Matshya Bhaban, Ramna, Dhaka, Bangladesh
[2]Department of Oceanography and Hydrography, Bangabandhu Sheikh Mujibur Rahman Maritime University, Dhaka, Bangladesh
[3]GIZ, Dhaka, Bangladesh

[*]Email: tanvir_h1998@yahoo.com

Abstract

Ocean water covers about 72% of the earth's surface. The majority of people on earth get a large portion of their protein and other essential nutrients from seafood. Bangladesh is one of the periphery coastal countries in the Indian Ocean, with a long 710-kilometer coastline. Following the recent resolution of its maritime disputes with India and Myanmar, Bangladesh gained around 1,18,813 sq. km of sea territory, which makes up more than 81% of its entire land area. Due to a lack of sophisticated fishing vessels, trained crews, and other necessary logistics, a significant portion of the deep sea remains undiscovered. Besides, there is no practical experience or experienced manpower to exploit Tuna and Tuna like other large pelagic fishes beyond the 200 nautical mile of our sea. Industrial fishing trawlers are the sole means of exploiting large pelagic fish, including tuna. These large pelagic fish are exploited only as by-catch of commercial fishing trawlers. Therefore, Bangladesh cannot exploit large pelagic species like tuna from the deeper waters of her Exclusive Economic Zone (EEZ) and Area Beyond National Jurisdiction (ABJN). Hence, exploring the deep waters surrounding Bangladesh's exclusive economic zone is crucial to capturing deep-sea pelagic species from the Bay of Bengal. In this regard, the subsequent measures have been taken by the government in order to capitalize on deep sea fishing: In order to catch tuna and other large pelagic fish from the deep sea area of international waters, the Ministry of Fisheries and Livestock (MoFL) has granted permission for the import of 19 long liner, 7 purse seiner and 2 support vessels. The awarded companies are making an effort to collect suitable vessels and equipment. Furthermore, Bangladesh gained membership in the Indian Ocean Tuna Commission (IOTC) on April 24, 2018. In this context, with the goal of exploiting deep sea fish in the ABJN, more comprehensive effort and collaboration are required by both government and private entrepreneurs for the exploration and exploitation, as well as encouraging private investment in this sector.

Importance of a Legally Binding MSP in Bangladesh: Challenges and Pathways to Sustainable Ocean Management

Mohammad Shahad Mahabub Chowdhury

Environmental Specialist, Global Department of Environment, South Asia Region, World Bank
E-mail: mchowdhury6@worldbank.org; shahadbd@yahoo.com

Abstract

Marine Spatial Planning (MSP) is essential for sustainable ocean management, particularly in Bangladesh, which relies heavily on coastal and marine resources. This paper explores the challenges and opportunities of MSP in Bangladesh, focusing on its potential to enhance sustainable ocean management. Bangladesh's coastal and marine ecosystems face pressures from overfishing, pollution, and habitat destruction. The Sustainable Coastal and Marine Fisheries Project (BSCMFP) emphasizes integrated approaches, stakeholder engagement, robust data collection, and adaptive management strategies to address environmental changes and human activities[1]. A major challenge in implementing MSP in Bangladesh is the high level of political and governance risks, which can impede policy development and enforcement. Institutional capacity for implementation and sustainability is also a concern, requiring investments in capacity-building and technical support[2]. The BSCMFP's support missions have identified critical areas for improvement, including monitoring, data collection, and inter-agency coordination, highlighting the need for strengthened governance frameworks[3]. Limited institutional coordination, with multiple agencies managing marine resources without a centralized authority, and the absence of integrated data systems are significant challenges. While various agencies collect marine data, the lack of interoperability and accessibility hinders informed decision-making. Strengthening the National Spatial Data Infrastructure (NSDI) and creating a centralized marine data repository are essential for evidence-based MSP implementation. Establishing an inter-ministerial MSP coordination body is crucial to streamline governance and align sectoral policies. Additionally, policy and legal frameworks require strengthening, as Bangladesh lacks a dedicated MSP law. A legally binding MSP framework is urgently needed to enhance compliance and enforcement[4]. Despite these challenges, there are significant opportunities for advancing MSP in Bangladesh. The government's commitment to a sustainable blue economy, as evidenced by initiatives like the Bangladesh Delta Plan 2100, provides a strong foundation for progress. By fostering multi-stakeholder collaboration, leveraging technological advancements, and integrating adaptive management strategies, MSP can catalyze sustainable ocean governance in Bangladesh. International support and collaboration among stakeholders can enhance MSP efforts, leading to improved environmental and socio-economic outcomes[5].

In conclusion, while the path to effective MSP in Bangladesh is challenging, the potential benefits for sustainable ocean management are substantial. Continued efforts to address governance, capacity, and coordination issues will be crucial in realizing the full potential of MSP in the country.

[1] World Bank. (2023). *Bangladesh - Sustainable Coastal and Marine Fisheries Project: Blue Economy for Sustainable Growth*. Retrieved from documents1.worldbank.org

[2] World Bank. (2023). *Disclosable Version of the ISR - Bangladesh Sustainable Coastal and Marine Fisheries - P161568 - Sequence No: 10*. Retrieved from documents1.worldbank.org

[3] World Bank. (2023). *Bangladesh - Sustainable Coastal and Marine Fisheries Project (BSCMFP): Eighth Implementation Support Review Mission - October 29 to November 9, 2023*. Retrieved from documents1.worldbank.org

[4] World Bank. (2023). *Bangladesh - Sustainable Coastal and Marine Fisheries Project: Blue Economy for Sustainable Growth*. Retrieved from documents1.worldbank.org

[5] Bangladesh Delta Plan 2100. (2018). *The Bangladesh Delta Plan: Navigating the Future for a Sustainable and Prosperous Delta*. General Economics Division (GED), Government of Bangladesh. Retrieved from bsmrmu.edu.bd

Maritime Shipping Routes in Bangladesh: Status, Challenges and Opportunities

Md. Kamruzzaman

Bangladesh Inland Water Transport Authority (BIWTA), Government of the People's Republic of Bangladesh
Email: mdksaiful12@gmail.com

Abstract

Marine Spatial Planning (MSP) is a pivotal tool for advancing the sustainable blue economy, particularly in ecologically sensitive and economically vital maritime regions. This study focuses on the Sandwip Channel, Hatia Channel, Kutubdia Channel, and Mongla-Ghashi-Ghali Channel in Bangladesh, which are crucial for maritime shipping, biodiversity, and local livelihoods. These channels face significant challenges, including sedimentation, environmental degradation, and competing resource uses, which threaten their sustainability. By integrating MSP frameworks, this research explores the potential of sustainable dredging practices to optimize shipping routes while minimizing ecological impacts and supporting long-term environmental health. The study emphasizes the importance of ecosystem-based management, stakeholder engagement, and data-driven decision-making to balance economic growth, environmental conservation, and social equity. Sustainable dredging routes are proposed to ensure safe and efficient navigation, reduce habitat disruption, and enhance sediment management. Additionally, the research highlights the integration of renewable energy projects, habitat restoration, and climate resilience measures within these channels. The findings underscore the need for adaptive governance, regional cooperation, and innovative policies to harmonize maritime activities and ensure the sustainable use of these critical waterways. This study provides a roadmap for leveraging MSP and sustainable dredging to foster a resilient and inclusive blue economy in the region.

Assessment of Blue Carbon Habitats with Tourism Potentials to Support MSP in the Coastal Region of Bangladesh

A N M Samiul Huda[1*] and Ceaser Wasela[2]

[1] Cosmos Foundation, Cosmos Group, Malibagh, Dhaka 1217
[2] Cosmos Capital Asset, Cosmos Group, The Avalon, Singapore 259986

*Email: samiul.huda@cosmosgroup.com.bd

Abstract

The coastal region of Bangladesh, rich in diverse ecosystems such as mangroves, peatlands, and wetlands, holds significant potential for both blue carbon sequestration and sustainable tourism development. This study synthesizes existing literature to analyze the spatial distribution of blue carbon habitats and assess their tourism potential in Bangladesh's coastal areas. The conservation and restoration of these habitats are crucial for carbon sequestration, climate change mitigation, and supporting biodiversity. Utilizing high-resolution spatial data, the study highlights the current state and future prospects of blue carbon storage in these ecosystems. The findings highlight the substantial carbon sequestration potential of mangroves, seagrasses, and salt marshes, and their critical role in mitigating atmospheric greenhouse gas emissions. The economic implications of preserving these habitats are also considered, emphasizing their contribution to sustainable development goals. In addition, the study explores the interlink between blue carbon ecosystems and sustainable tourism, drawing on case studies from regions like the Philippines and China. It examines local communities' perceptions of tourism impacts and the necessity of integrating long-term blue carbon management with tourism strategies to enhance both environmental and economic outcomes. The research aims for a transformative approach to managing blue carbon habitats in Bangladesh, combining conservation efforts with community engagement and sustainable tourism practices. Recommendations include policy interventions, investment in nature-based solutions, and collaborative projects between government, local communities, and international organizations to ensure the longevity and health of these vital coastal ecosystems.

Environmental Assessment and Growth Performance of Green Mussels (*Perna viridis*) on the Southeast Coast of the Bay of Bengal in Bangladesh

Kanij Fatema Eti[*], N. F. Hoque and M. Asaduzzaman

Department of Marine Bio-resources Sciences, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh

[*]Email: monikanij1995@gmail.com

Abstract

Green mussel farming is becoming a popular trend in aquaculture due to its global acceptance as a delicacy and affordable protein source. The coastal waters of Bangladesh are among the richest ecosystems in the world, thanks to their tropical climate, high rainfall, and nutrient-rich waters from the expansive Gangetic river system. This study aims to evaluate the feasibility of green mussel (*Perna viridis*) farming along the southeast coast of the Bay of Bengal, with a focus on coastal landlocked channels and estuaries. A site capability rating system was used to assess potential sites based on biophysical parameters and natural food requirements. Monthly variations in environmental parameters and plankton composition were recorded at seven potential sites: Moheshkhali Channel, Reju Khal, and Naf River. Reju Khal was deemed unsuitable or less suitable for green mussel farming due to shallow water depth, high turbidity, low food availability, and significant salinity fluctuations caused by monsoon freshwater runoff. However, Moheshkhali Channel and Naf River were rated as medium to good sites, indicating their suitability for commercial green mussel farming. High levels of chlorophyll-α and plankton abundance in these areas suggest sufficient natural food availability. The findings of this study are relevant for planning and developing sustainable green mussel farming systems in Bangladesh and beyond.

Relationship of Body Mass Index and Nutritional Status of Adolescent Youths in and around South-Eastern Coast of Bangladesh

Prabal Barua[1*] and Chaiti Barua[2]

[1]Department of Environmental Sciences, Jahangirnagar University, Dhaka, Bangladesh
[2]Department of Zoology, Gachbaria Government College, Chattogram, Bangladesh

*Email: prabalims@gmail.com

Abstract

The objectives of the study were to ascertain the factors that contributed to the nutritional condition of the adolescents and how those factors related to the traits that they had selected. The information required for this survey was provided by about 384 respondents, and the research was conducted in the South-Eastern coastal area of Bangladesh. The authors collected the household survey based data from January 2024 to April 2024. Correlation analysis revealed that the following variables showed positive significant correlations with the Body Mass Index (BMI) towards nutritional status: age, MUAC, respondent's education, respondent's mother's education, family income, food intake, and nutritional understanding. The respondent's dietary status was inversely correlated with the disease information character. The BMI and nutritional status of the respondents showed positive, non-significant relationships with the other five factors: gender, religion, family size, father's educational background, and hygiene behaviours. There were negative, non-significant associations found between children's age, BMI, and nutritional status and their physical activity, transportation, leisure, and participation in nutrition programs. The majority of subjects did not engage in any physical activity due to their low calorie intake. Just 2.5% of respondents were active in their calorie intake, while approximately 90% of respondents were inactive. Malnutrition affected the majority of the adolescents. A multiple linear regression study revealed a positive correlation between food intake, nutritional awareness, and annual household income and teenage nutritional status. The parents of the interviewees did not understand nutrition. Adolescents living in the study areas should have their nutritional status, nutrient consumption, and eating habits corrected through the implementation of appropriate intervention programs. Government and Non-Governmental organisations may take the necessary steps to develop a variety of revenue-generating activities at the home level, encouraging women to participate in them in order to raise the family's yearly income.

Single-Use Plastics: A Threat to the Aquatic Systems of Bangladesh

Hasiba Binta Nasrin and Shilpi Rani Sikder*

Aquatic Zoology Research Group's Plastic Pollution and Mitigation Research Unit, Department of Zoology, University of Dhaka, Dhaka 1000
Email: sikdershilpi1@gmail.com

Abstract
Single-use plastics (SUPs), a widespread environmental concern, pose a significant threat to aquatic systems due to their extensive production and careless disposal, persisting in the environment without natural decomposition. In this review, 18 papers were selected that specifically focused on the critical theme of SUPs and their threats to aquatic systems. Covering the years from 2016 to 2023, papers are carefully chosen to provide a perspective on the multifaceted issues associated with the environmental effects of SUPs, mainly in aquatic environments. This review emphasizes the anticipated dangers posed by single-use plastics to aquatic systems, highlighting the vital need for heightened awareness and effective mitigation strategies. However, it also reveals research gaps, indicating the need for further studies to fill these gaps and deepen our understanding of the impact of single-use plastics on aquatic systems. This review suggests exploring alternative options and strategies for remediation and taking the essential steps toward eliminating SUPs.

Spatial Distribution and Health Risks of Arsenic (As), Iron (Fe), and Manganese (Mn) in Accreted Lands of the Greater Noakhali Coast Region, Bangladesh: Implications for Sustainable Blue Economy Development

Tabarok Bhuiyan[1], Fahmida Akter[1*], Mohammad Abdul Momin Siddique[1,2]

[1]Department of Oceanography, Noakhali Science and Technology University, Noakhali-3814, Noakhali, Bangladesh
[2]University of South Bohemia in Ceske Budejovice, Faculty of Fisheries and Protection of Waters, South Bohemian Research Center of Aquaculture and Biodiversity of Hydrocenoses, Research Institute of Fish Culture and Hydrobiology, Zatisi 728/II, Vodnany, 389 25, Czech Republic

Abstract

Over the course of the years, Bangladesh's coastal soils have become increasingly contaminated with arsenic (As) and related metals (iron and manganese) from a variety of anthropogenic causes. In this study, we examined the spatial distribution features, source, fate, and possible risks to human health and the environment of As and related metals from 25 sites spread around the Noakhali coastline region. Utilising energy-dispersive X-ray fluorescence (EDXRF), the concentration of the heavy metals was determined. The study reveals that the As, Fe, and Mn concentrations in the surface soil samples varied from 0.1-5.16, 12,000-23,810, and 50.6-1,025.12 mg/kg, respectively, where As concentrations are lower than in some districts of Bangladesh but Fe and Mn are higher than southern coastal soil of Bangladesh. Higher concentrations of metals were found in the southern belt which is along the Meghna river estuary. Furthermore, a slight carcinogenic risk was detected, and the levels of As, Fe, and Mn didn't solely have any non-carcinogenic impact on human health. The results of this study highlight the necessity of comprehensive coastal management plans that put public health and environmental sustainability first. This study helps Bangladesh's blue economy grow sustainably by tackling the contamination issues in the Noakhali region and preserving the resilience and welfare of the country's coastal residents.

Application of spatial analysis for assessing heavy minerals prospect in Cox's Bazar Seabed

Talbia Jahir Chowdhury*, Muhammad Saki-A-Kausar, Mahir Abrar and Md. Numan Hossain[*]

Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh.

[*]Email: talbiajchowdhury@gmail.com; m.numan-pme@sust.edu.

Abstract

The Cox's Bazar region has been identified as a promising resource of heavy minerals. Heavy minerals are dense, resistant minerals with a specific gravity greater than 2.9. Refined geochemical analysis suggests the presence of nineteen types of these minerals, among which ilmenite, zircon, rutile, magnetite, and hematite are dominant. There have been identified 17 mineral sand deposits in Cox's Bazar area by the Bangladesh Atomic Energy Commission (BAEC). This area contained about 4.35 million tonnes of reserves with 23% heavy mineral content. This study aims to integrate ArcGIS spatial analysis techniques to assess the potential for heavy mineral extraction from Cox's Bazar Sea beach, Bangladesh. This method involves applying statistical techniques, geometric calculations, and geographic modelling to investigate spatial relationships, patterns, and trends within geographically referenced data. The research outcome will be useful to support the accurate determination of the locations, estimation of the reserves, and assessment of the economic feasibility of the heavy mineral deposits in the Cox's Bazar seabed. This work will help prepare marine spatial planning that incorporates an emerging approach to the sustainable management of resources around the study area. It will also help design ecological and environmental management around coastal areas of Bangladesh.

Role of NGOs in supporting sustainable blue economy through marine spatial planning in Bangladesh

Mohammad Toufiqur Rahman

BRAC, Bangladesh

Email: trmarine06@gmail.com

Abstract

Non-Governmental Organizations (NGOs) play a crucial role in fostering a sustainable blue economy in Bangladesh through marine spatial planning (MSP). Bangladesh hosts a significant number of NGOs, with several focusing specifically on coastal and blue economy issues, as well as conservation efforts. This study explores the contributions of these NGOs in addressing key challenges and advancing sustainable practices in the marine sector. The NGOs operating in Bangladesh are diverse, with many dedicated to environmental conservation, sustainable development, and the promotion of a blue economy. Notably, organizations such as the Bangladesh Centre for Advanced Studies (BCAS), Coastal Development Partnership (CDP), and the International Union for Conservation of Nature (IUCN) Bangladesh have been at the forefront of initiatives related to marine spatial planning. These NGOs work in various domains, including habitat conservation, pollution control, sustainable fisheries, and climate change adaptation. NGOs contribute to MSP by conducting research, raising awareness, and advocating for policies that balance ecological sustainability with economic development. They collaborate with government agencies, local communities, and international partners to implement projects that protect marine ecosystems, enhance coastal resilience, and promote sustainable livelihoods. Issues such as overfishing, habitat degradation, and pollution are central to their efforts, and they employ strategies such as community-based resource management, habitat restoration, and sustainable tourism promotion. However, several challenges impede the effective implementation of MSP and the realization of a sustainable blue economy. These include limited financial resources, insufficient data and research, inadequate stakeholder engagement, and policy enforcement gaps. To overcome these challenges, the study suggests enhancing collaboration between NGOs, government bodies, and the private sector. Strengthening institutional frameworks, increasing funding for conservation projects, and improving data collection and sharing are essential steps forward. Additionally, promoting community participation and building local capacities can ensure the long-term success of MSP initiatives. This study underscores the vital role of NGOs in driving sustainable blue economy practices in Bangladesh through marine spatial planning. By addressing the identified challenges and leveraging the strengths of NGOs, Bangladesh can pave the way for a resilient and prosperous blue economy that benefits both the environment and its people.

A short review on Integration of Geographic Information Systems (GIS) in Marine Spatial Planning

Noushad Ahmed Khan Mahi, Zahidul Islam, Md. Numan Hossain[*]

Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh.

[*]Email: m.numan-pme@sust.edu

Abstract

Geographic Information Systems (GIS) is a useful tool for analyzing, visualizing, and concluding decisions based on spatial information. It has the potential to offer a comprehensive understanding of marine environments and pertinent human activities. This study aims to bring together recent advancements in GIS technology and its application in Marine Spatial Planning (MSP). Based on existing literature, this study will evaluate the effectiveness of GIS in conserving ecosystems, allocating resources efficiently, and resolving conflicts among different marine activities. This study will also help find challenges associated with marine spatial planning. The outcome of this research will incorporate the role of GIS in advancing MSP and managing the blue economy and marine ecosystem. This review study will identify the best practices and creative solutions to address data accuracy and the complexity of integrating diverse industries. This review paper suggests ways to better integrate GIS into MSP and the need for cross-disciplinary collaboration and technology advancement. GIS is essential in balancing marine ecosystem health and resilience in the face of rising human activity and environmental changes sustainably. In summary, the integration of GIS in MSP has the potential to enhance marine governance and achieve sustainable ocean management significantly. To fully realize this potential, combining effective policy frameworks, stakeholder involvement, and ongoing advancements in GIS-related technology is imperative.

Livelihood analysis of people involved in fish drying practices in the South-West coast of Bangladesh

Fayzur Rahman and Md. Mostafa Shamsuzzaman [*]

Department of Coastal and Marine Fisheries, Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh

Email: shamsuzzamanmm.cmf@sau.ac.bd

Abstract

The south-west coast, specifically the Khulna region, of Bangladesh has seen a substantial increase in the production of dried fish, involving marginalized coastal people. This study uses mixed methods approach and the sustainable livelihood approach (SLA) to assess the socio-economic profile, livelihood strategies, and resilience of these fish-drying communities. The research outcomes indicated that the communities engaged in the drying process were economically disadvantaged due to their lower literacy, unstable earnings, and labor-intensive occupations. Male workers exhibited a relatively higher participation rate compared to females. However, it was observed that females had less control over their wages and earned less USD 2.74-3.65 per day than male USD 3.65-5.48 per day. Despite the presence of livelihood opportunities, the study revealed that only a small percentage of workers, producers and traders were identified as self-sufficient. Apart from facing different shocks and constraints, dried fish processors, workers, and dried fish traders, as well as off-season income, diverse fish species, drying infrastructure, trader's association, and social interrelationship played an important role in maintaining community resilience. The research suggests implementing suitable measures to diversify alternative sources of income and emphasizes the importance of fostering strong collaboration among the communities, local management authorities and the government. These interventions are crucial for enhancing community resilience and ensuring long-term sustainability.

Evaluating Phytoplankton Diversity and Seasonal Trends in Chaufaldandi Khal, Bangladesh: A Step Towards Sustainable Mariculture

Kazi Mohammad Reduanul Islam Shakil[a], Md. Imran Hossain Khan[a], Md. Shafiqul Islam[a] and Shaibal Bhattacharjee[a*]

[a]Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries, University of Chittagong, Chattogram-4331, Bangladesh
Email: shawonimsfcubd@gmail.com

Abstract

Phytoplanktons are the fundamental food source for higher tropic levels. They play a crucial role in the food chain and food web as well as in the mariculture sector by providing direct food for zooplankton, fish, and other dependent animals. Considering the importance of the mariculture sector, this study was conducted to assess the composition of phytoplankton species, biodiversity, and abundance of the Chaufaldandi khal at Cox's Bazar coast and to explore their relationship to hydrological factors. All samples were collected using the transect method from the seven different stations covering four seasons: winter (December-February), pre-monsoon (March-May), monsoon (June-August), and post-monsoon (September-November). We identified a total of 33 genera of phytoplankton under 4 divisions during the study period: Bacillariophyta (23), Chlorophyta (5), Cyanophyta (3), and Pyrrophyta (2). Some dominant genera found during the present study were *Biddulphia,* followed by *Coscinodiscus, Rhizosolenia,* and *Nostoc*. During the winter, the abundance of phytoplankton varied between 17098 and 24832 cells/liter, followed by pre-monsoon 12030–18292 cells/liter, post-monsoon 10631–14472, and monsoon 7676–12914 cells/liter, respectively. The values of the Shannon-Weiner diversity (H'), evenness (J'), and species richness (d) varied respectively from 2.58 to 2.96, 0.92-0.95, and 1.53-2.39 in different seasons and ranged from 2.67 to 2.82, 0.92-0.96, and 1.78 to 2.15, respectively, at seven stations. Pearson rank correlation found a relationship between the phytoplankton community and hydrological factors. Understanding the dynamics of phytoplankton communities from this study will provide fundamental primary data for developing fixed management strategies that support sustainable mariculture practices, improve aquatic ecosystem health, and optimize resource utilization in this region.

Assessing Heavy and Trace Metals in Key Fish and Shellfish Species of Bangladesh: Implications for Human Health Standard

Shaibal Bhattacharjee [a*], Shuvo Ghosh [a], Mofazzal Hossain [a], Mitu Ranjan Sarker [a], Jewel Das [a]

[a] *Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries, University of Chittagong, Chattogram- 4331, Bangladesh*

Email: shawonimsfcubd@gmail.com

Abstract

Fish and shellfish are the prime and valuable protein sources for humans and aquatic animals. They play an essential role in supporting the livelihoods of rural households as well as contributing to the economy of Bangladesh through local and foreign currency earnings. This study focused on the heavy (HM) and trace metal concentrations of seven commercially important fish and shellfish species collected from the four different fish markets in Chattogram City, Bangladesh, to assess potential risks to human health. Heavy metals of cadmium (Cd), lead (Pb), and chromium (Cr), along with trace elements such as copper (Cu), zinc (Zn), manganese (Mn), nickel (Ni), and cobalt (Co), were measured in the muscle tissue of fishes viz., Nile Tilapia (*Oreochromis niloticus*), Bata (*Labeo bata*), Thai Pangas (*Pangasius hypophthalmus*), Loitta (*Harpodon nehereus*), Hilsha (*Tenualosa ilisha*), Poa (*Otolithoides pama*), and shellfish of Giant Freshwater Prawn (*Macrobrachium rosenbergii*). An atomic absorption spectrophotometer was used for the analysis following a standardized method. The trace metal concentrations in wet weight varied for copper (Cu): 1.12-7.52 mg/kg, zinc (Zn): 4.11-18.24 mg/kg, and manganese (Mn): 0.38-3.14 mg/kg. In contrast, the levels of lead (Pb), cadmium (Cd), nickel (Ni), chromium (Cr), and cobalt (Co) were below detectable limits across all species tested. The current heavy and trace metal levels of this study were within the safety limits recommended by FAO, WHO, EU, and the Bangladesh Ministry of Agriculture, Fisheries, and Food (MAFF) for consumption. In essence, our study emphasizes the need for continued monitoring and regulation to protect public health.

Microplastic Pollution in the Sangu River Bangladesh: Occurrence, Abundance and Physiochemical Features

Sintia Chowdhury Payel[1*] and Sk. Ahmad Al Nahid[1]

[1]Department of Fisheries Resource Management, Chattogram Veterinary and Animal Sciences University, Khulshi-4225, Chattogram, Bangladesh

*Email: sintia.payel@gmail.com

Abstract

Micro plastics (MPs) have been found in aquatic ecosystems as a result of the widespread non-biodegradable trash generated by the varied usage of numerous synthetic polymers, mostly plastics. The objectives of this study were to check the abundance of MPs, variation among different sites and the characteristics of MPs in the water at Chattogram's Sangu river. The findings reveal that in Juidondi, the water of Sangu river had the largest micro plastics abundance, whereas the water of Sangu river of Chandanaish, the mean abundance was low. Thus, it is evident that Juidondi's sampling locations have a higher pollution index than Chandanaish. Micro plastics were found in four different shapes such as irregular, elongated, angular, and rectangular. Among all of those types, filament and fragment were the most dominating types. Besides, four different size categories were determined from the identified MPs where 100 μm to < 500 μm and 500 μm to < 1000 μm sizes dominated over 1000 μm to < 2mm and 2mm to < 3mm. The micro plastics sized between 100 μm and less than 500 μm accounted for majority of the total, making them the most prevalent size category. Four different group of micro plastics color were identified in this study. Black color micro plastics was more prominent in those study areas. In order to begin mitigation efforts, the concerned departments and stakeholders will find great value in knowing the degree of micro plastic pollution in the study region, which is indicated by the identification and quantification of micro plastics. Quantifying and identifying MPs using a single method is quite challenging. It is advised to use a variety of approaches in combination to identify MPs. It is also recommended to use modern and standard method while sampling of MPs and further research studies are needed badly.

Nutritional composition of seven commonly available seaweed species in Bangladesh and their potential contribution to public health nutrition

Nafisa Naoar[1], Md Shahedul Islam[2], and Abdullah-Al Mamun[1]

[1]Department of Fisheries and Marine Science, Noakhali Science and Technology University, Noakhali-3814, Bangladesh
[2]Department of Food Technology and Nutrition Science, Noakhali Science and Technology University, Noakhali-3814, Bangladesh

*Email: naoarnafisa99@gmail.com

Abstract

Seaweed, rich in protein, micronutrients, and vitamins, could be a sustainable solution addressing existing micronutrient deficiencies and can contribute significantly to the daily recommended allowance of the key nutrients as a useful dietary supplement. This study aimed to evaluate the macro and micro-nutritional profile of seven selected seaweed species from Bangladesh in ready-to-use (RTU) form, including two red seaweeds (*Gracilaria tenuistipitata, Hypnea musciformis*), three green seaweeds (*Ulva lactuca, Enteromorpha intestinalis, Caulerpa racemose*), two brown seaweeds (*Sargassum oligosystum, Padina tetrastromaica*) and their potential contribution to public health nutrition. Each seaweed species was processed using Standard Operating Procedure (SOP) for RTU seaweed powder development. The proximate composition, minerals, fatty acids, heavy metals, non-carcinogenic and carcinogenic risks, and recommended dietary allowance (RDA) were assessed from the developed seaweed powder. The protein concentration (g/100g) varied between 4.75±0.07 and 22.95±0.64 g/100g highest in *Gracilaria tenuistipitata*. Other nutrients were total dietary fiber (15.6±1.13 to 50.6±0.99 g/100 g) and ash (10.85±1.06 to 55.45±1.06 g/100 g), which were the other abundant components, while the concentration of lipid was comparatively low (0.57±0.14 to 1.62±0.42 g/100 g). Macro minerals viz., Na, P, K, Mg, and Ca and the micro minerals Fe, Se, I, Mn, Cu, and Zn were present in an excellent amount in all seven seaweeds. Due to the risks of a few hazardous heavy metals such as As, Pb, Cd, and Cr may pose health risks if consumers consume in high dosages as supplements for a longer period. The possible RDA results show seaweed powder would provide a much greater contribution to daily micronutrient requirements, for instance, 0.75g of *Hypnea musciformes* powder, can fulfill up to 30.14% and 47.93% of RDA of iron and iodine of females (14-18 years) respectively. Therefore, the findings of this present study disclose that edible seaweed powder could represent a potential nutrient-rich supplement for the vulnerable population to combat particular micronutrient deficiencies.

Freshness quality and shelf-life assessment of three commonly available ready-to-use (RTU) seaweed powders in Bangladesh

Israt Jahan Sumaiya[1], Md Shahedul Islam[2], Shuva Bhowmik[1, 3], Nahid Sultana[4] and Abdullah-Al Mamun[1]

[1]Department of Fisheries and Marine Science, Noakhali Science and Technology University, Noakhali-3814, Bangladesh
[2]Department of Food Technology and Nutrition Science, Noakhali Science and Technology University, Noakhali-3814, Bangladesh
[3]Centre for Bioengineering and Nanomedicine, Faculty of Dentistry, Division of Health Sciences, University of Otago, Dunedin-9054, New Zealand
[4]Senior Scientific Officer, Biological Research Division, BCSIR, Dhanmondi, Dhaka-1205, Bangladesh

*Email: israt2009f@gmail.com

Abstract

Globally, the popularity of ready-to-use (RTU) food products is getting attention and RTU seaweed could be accessible throughout the years for consumers; hence, the shelf-life study of RTU seaweed is necessary to ensure its quality and safety. The study was designed to predict the shelf-life of seaweed powders (fabricated from *Ulva lactuca, Gracilaria tenuistipitata, Enteromorpha intestinalis*) using the accelerated shelf-life approach in a controlled condition in consideration of reducing the experimental time and cost. The RTU seaweed powder was prepared following the standard operating procedure (SOP) and stored in elevated thermal conditions at 45°C and 55°C. The proximate composition (moisture, protein, fat, ash, fiber and carbohydrate), spoilage indicators (TVB-N, pH), microbial proliferation (TVC, *Escherichia coli*, total coliform, *Staphylococcus aureus, Salmonella* sp*., Vibrio* sp., *Bacillus* sp. and yeast and molds), and sensory characteristics such as appearance, colour, odour, texture were measured fortnightly up to 30 days. After that, the predictive shelf-life evaluation model was applied using the Q_{10} value to detect RTU seaweed powder storage quality. The changing of proximate compositions and spoilage indicators markers during storage time demonstrated significant ($p<0.05$) quality loss; however, TVBN ranged between 9.12±0.2 to 20.48±0.1 mg N/100g, indicating its good quality and acceptability for consumers. Additionally, all sensory attributes were within acceptable preferences over the study periods. Also, the total viable count (TVC) did not exceed the permissible consumption limit (10^5 cfu/g) and tested specific microbes were absent or below the detection limit. Maintaining freshness biomarkers, microbial load, and sensory properties for up to 30 days at 55°C ensures the 8-month shelf life of RTU seaweed powders under normal storage conditions. The small-medium enterprise (SME) of RTU seaweed powders may benefit from putting best-before-date labels, which information will be helpful for producers and consumers.

Transmission of Microplastics in the Aquatic Systems of Bangladesh

Farzana Afruz Sriti

Researcher at the Aquatic Zoology Research Group's Plastic Pollution and Mitigation Research Unit, Department of Zoology, University of Dhaka, Dhaka 1000

Email: farzanaafruz-63-2016314058@zoo.du.ac.bd

Abstract

Microplastics (MPs) pollution has emerged as a global environmental concern, with its ubiquitous presence in aquatic ecosystems raising questions about its potential impacts on aquatic ecosystems. To identify and quantify the level of accumulation and dissemination of MPs in different feeding groups of aquatic systems, an understanding of the movement of MPs within the food web is essential. This review investigates the routes and processes of transmission of MPs involved with the intake and accumulation of these ubiquitous contaminants by aquatic species at the global scale and indicates the areas of future research to address the ecological impacts and abundance. A total of 63 studies relevant to MPs transmission were published from 2014 to 2023, of which 20 were selected for this study based on the selection criteria. Out of the twenty research findings, seventeen were scientific papers and three were review papers. Among 17 scientific papers, 15 dealt with marine areas one on estuaries, and another on freshwater. There were no published data on MPs ingestion in actual freshwater habitats, and only a few research have attempted to track the transmission of MPs through a complex marine food web using environmentally relevant MPs concentrations to determine the true amount of risk. This lack of research demonstrates a need for further work to monitor and quantify MPs transport in aquatic systems, as well as to detect potential health risks.

Establishing a Comprehensive Fisheries Diversity Checklist in Cox's Bazar Coastal Region: Exploring New Potential for Mariculture Development in Bangladesh

Md. Imran Hossain Khan[a], Kazi Mohammad Reduanul Islam Shakil[a],
Md.Shafiqul Islam [a] , Shaibal Bhattacharjee[a*]

[a] Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries,
University of Chittagong, Chattogram-4331, Bangladesh
[a*] Institute of Marine Sciences, Faculty of Marine Sciences and Fisheries,
University of Chittagong, Chattogram-4331, Bangladesh,

Email: shawonimsfcubd@gmail.com

Abstract

Studying fish ecology is crucial for understanding and maintaining aquatic ecosystems. In this regard, this study was carried out in the Chaufladandi Khal, a subtropical river catchment in Bangladesh, to study the composition and diversity of fish species. The sampling was carried out from March 2022 to January 2023, covering four temporal segments in three selected stations representing the upper, middle, and lower streams of the catchment. A total of 4208 individuals of fish were collected, including 40 species of fish belonging to 25 families. *Glossogobius giuris* (10.43%), *Acentrogobius viridipunctatus* (6.69%), *Ambassis dussumieri* (6.54%), *Taenioides anguillaris* (5.57%), *Escualosa thoracata* (4.87%), *Awaous grammepomus (4.73%), and Chanda nama* (4.71%) were found to be the most dominant species. The Shannon-Weiner diversity index (H'), Margalef richness index (d), Pielou's evenness index (J'), and Simpson dominance index (c) ranged from 3.16-3.43, 5.89-6.27, 0.88-0.95, and 0.91-0.97, respectively. Overall spatiotemporal fish diversity indices and their composition, including some marine juveniles, clearly indicate the suitability of the site as breeding, spawning, and nursing grounds. This catchment is important for the local estuarine aquatic ecosystem and local fisheries. However, there is no record of previous studies for this catchment. So, the current study would be used as a reference for future exploration, mariculture establishment, and management strategy development in this site and other coastal regions of Bangladesh.

Analysis of the shoreline dynamics and land use-land cover changes on Kutubdia Island, Bangladesh

Mahima Ranjan Acharjee[a]*, Subeda Newase[a], Hrishika Barua[b], Avijit Talukder[c]

[a] Department of Aquaculture, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh
[b] Department of Fishing and Post-Harvest Technology, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh
[c] Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh

*Email: mahimaranjan@student.cvasu.ac.bd

Abstract

The shoreline of Kutubdia island was analyzed to estimate the change dynamics along with the digital shoreline analysis system (DSAS). The purpose of this study was to evaluate the accuracy of medium resolution satellite data for mapping shoreline positions and estimating historical rates of change. Six shoreline positions were extracted on 1972, 1980, 1990, 2000, 2010, and 2020 covering a long term of 48 years' period using remote sensing data and images were proceeed on ArcGIS 10.8. Subsequently, all three statistical methods—weighted linear regression (WLR), end point rate (EPR), and linear regression rate (LRR)—were validated using DSAS and the correlation coefficient (R) and land use land cover (LULC) classification to estimate shoreline changes. With a few exceptions, the island has been impacted by erosion and accretion over the past 48 years, as evidenced by shoreline changes. The average rates of changes estimated using EPR, LRR, and WLR are 4.89 m/yr, 5.15 m/yr and 4.95 m/yr, respectively. The land area of this island reduced 11.10% during the period of 1972 to 2020 (53 km2 to 47.67 km2). The findings of this investigation have significant value for future Kutubdia Island planning and management. However, statistical modeling can also be used to predict where the shoreline will shift in the upcoming future.

Exploring Machine Learning Applications in Sea Wave Forecasting: Implications for Marine Spatial Planning

Mohammed Joobayear Hossain, Md. Numan Hossain*

Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh.

Email: m.numan-pme@sust.edu

Abstract

Marine spatial planning (MSP) is essential for the sustainable management of coastal and marine ecosystems. Predicting the amplitude of sea waves is an important part of MSP for ensuring navigation safety, coastal facilities, and handling marine resources. Therefore, it necessitates precise and prompt data regarding sea wave dynamics. In recent years, machine learning (ML) has become a useful instrument for predicting sea wave characteristics, such as wave height, period, and direction, offering improved accuracy compared to traditional numerical models. This review examines the applications of ML in sea wave forecasting, emphasizing its potential in advancing MSP initiatives. Relevant machine learning techniques, such as gradient boosting methods (XGBoost and LightGBM), support vector machines (SVM), linear regression, and artificial neural networks, are examined for their advantages and drawbacks in wave prediction applications. The analysis utilizes multiple data sets that include factors such as maximum wave height, significant wave height, wave times, wave direction, and sea surface temperature. The comparative results will elucidate the strengths and limitations of each strategy in various marine scenarios. Critical insights are derived about model selection for applications including aquaculture zoning, offshore renewable energy site planning, and navigation route optimization. In the end, the research will offer recommendations for improving wave forecasting precision and enhancing multidisciplinary Marine Spatial Planning frameworks in response to evolving climate conditions.

Spatio-temporal Diversity of Macrobenthic Communities and their Implications for Spatial Planning and Management in the Naf River Estuary, Bangladesh

Syeda Nowshin Ahmed

Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh

Email: prithuenowshin@gmail.com

Abstract

Macrobenthos play a fundamental role in marine ecosystems, contributing to biodiversity, nutrient cycling, and fisheries productivity which is key components of the Blue Economy. However, their spatial and temporal distribution in the coastal waters of Bangladesh remains largely unexplored. This study investigates the diversity and abundance of soft-bottom macrobenthos in the Naf River Estuary, focusing on seasonal variations and their relationship with environmental parameters such as temperature, salinity, dissolved oxygen, and chlorophyll levels. Macrobenthos samples were collected from seven stations in October (dry season) and November (post-monsoon) 2023. The results revealed minimal spatial variability but significant seasonal fluctuations in abundance, with higher richness and abundance observed in October due to stable environmental conditions. In contrast, heavy rainfall in November contributed to a decline in macrobenthic abundance and diversity. Dominant species identified include *Neanthes arenaceodentata*, *Alitta succinea*, *Edwardsiodea andres*, and *Pilargis maculata*. Co-occurrence matrix analysis identified 253 species pairs, with 188 pairs exhibiting positive co-occurrence, indicating strong interspecies associations, while 37 pairs displayed negative interactions. The Shannon Diversity Index further illustrated variations in species richness and evenness, emphasizing the estuary's ecological complexity. Given their sensitivity to environmental changes, macrobenthos serve as bioindicators, providing critical insights into habitat health and ecosystem resilience. Understanding macrobenthic diversity is essential for advancing Marine Spatial Planning (MSP) in the context of the Blue Economy. As Bangladesh aims to optimize its coastal resources for sustainable fisheries, aquaculture, and ecosystem-based management, monitoring macrobenthic communities can support data-driven conservation efforts. This study underscores the importance of biodiversity conservation in maintaining marine productivity and ensuring long-term economic benefits from coastal and estuarine resources.

Building Resilience in Small Island Developing States: The Role of Ecosystems in Disaster Risk Reduction and Climate Adaptation

Sourav Chowdhury[1*], Israt Jahan[1] and Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh
*Email: sourav.chowdhury1971@gmail.com

Abstract

Small Island Developing States (SIDS) are among the most vulnerable countries to climate change and natural disasters due to their geographic location, limited land area, and dependence on natural resources. Even though SIDS contribute less than 1% of global greenhouse gas emissions, rising sea levels, extreme weather events, environmental degradation, and natural disasters disproportionately affect them. In recent decades, disasters have occurred more frequently and caused greater damage in SIDS than in other vulnerable regions, with enormous economic losses, averaging 2.1% of GDP per year over the two-decade period, well above the global average of 0.3%. This study demonstrates the relevance of the SIDS ecosystem to disaster risk reduction (DRR), through seagrass beds, mangroves, and coral reefs. These ecosystems provide valuable services, such as coastal protection, biodiversity and economic stability, which are fundamental to increasing resilience against slow-onset processes such as sea level rise and sudden-onset disasters such as cyclones. High-cost nature-based solutions and lack of technical expertise for DRR inhibits effective DRR mechanism. Moreover, the geographic isolation of many SIDS makes it more challenging to access international aid and regional disaster management networks. In consideration of these and other challenges, SIDS are exploring adaptive pathways, including Ecosystem-Based Adaptation (EbA) and Nature-based Solutions (NbS) for increased resilience to the impacts of climate change. This paper emphasizes the urgency of DDR in SIDS, including international cooperation, and sustainable development strategies. Results show that marine and coastal ecosystems are crucial to the economies and communities of SIDS and highlights the need for integrating natural solutions into climate resilience planning.

Seasonal Variations in Water Quality and Microplastic Contamination in the Surma River, Bangladesh: Implications for Aquatic Health and Human Safety

Md Musfikur Rahman[1*], Md Abdullah Al Mamun Hridoy[2], Ekram Mahmud Anik[1], Md Azharul Haque Shakil[1]

[1]Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh
[2]Faculty of Fisheries, Sylhet Agricultural University, Sylhet, Bangladesh

*Email: musfikur3180@my.cvasu.ac.bd

Abstract

Water quality parameters (WQPs) are an important aspect of a significant role in addressing the issue of aquatic animals and human health hazards. There is increasing concern that some microplastics (MPs) are being disadvantaged and directly affected by aquatic organisms and potential health risks. Research has consistently shown that physiochemical parameters are lacking in the Surma River. This study examines the seasonal fluctuation in water toxicology and three effects of MPs on freshwater ecosystems in the Surma River. Data were gathered from three locations during the monsoon, winter, and summer seasons of 2023–2024 at 4-month intervals. The analysis revealed concerning WQPs, water quality index (WQI), and pollution index values, indicating serious threats to aquatic life. FTIR microscopy detected MPs, with fibers being the most common (55%), followed by fragments (28%), films (10%), and foam (6%). The highest pH record was 8.44 at Station 1 during the summer, while the lowest pH fell to 7.02 in winter. Station 3 exhibited the lowest WQPs, reaching a minimum of 0.15 in winter. The monsoon season showed the most pronounced changes, with heightened pollution levels due to flooding, which diminished habitat suitability. The presence of MPs adds complexity to water quality by introducing harmful pollutants that accumulate in fish, threatening both aquatic ecosystems and human health. These results highlight the critical need for robust water quality management strategies and further research into the ecological and health effects of MPs in freshwater environments. This study enhances our understanding of the seasonal variations in water toxicity and the contribution of MPs to water pollution.

Microbial Innovations for Sustainable Pollution Management: Advances in Biodegradation, Bioremediation, and Bioengineering Solutions for Marine Environmental Restoration

Md Musfikur Rahman[1*], Md Abdullah Al Mamun Hridoy[2] and Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Chattogram-4225, Bangladesh.
[2]Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh.

[*]Email: musfikur3180@my.cvasu.ac.bd

Abstract

Marine ecosystems are highly vulnerable to pollutants including plastics, heavy metals, hydrocarbons, and excess nutrients, which disrupt biodiversity and ecosystem services. Conventional pollution management techniques, including physical and chemical methods, are often limited by high costs, low scalability, and environmental damage. Microbial-based solutions, with advancements in biotechnology and synthetic biology, offer sustainable alternatives by utilizing the metabolic capabilities of microorganisms for biodegradation and bioremediation. A systematic review was conducted following PRISMA guidelines. Databases, conference proceedings, and manual searches were used to identify randomized studies published up to December 2024. A total of 231 studies were included in the review. AI and IoT applications were evaluated to assess their integration into microbial technologies. Findings demonstrate the efficacy of microbial technologies in degrading plastics, heavy metals, hydrocarbons, and other pollutants. AI-based predictive models optimize microbial consortia selection, while IoT-enabled systems enhance real-time pollution monitoring and management. Despite these advancements, scalability and methodological inconsistencies remain challenges. The review highlights limitations, including variability in study designs, inconsistent reporting standards, and challenges in scaling microbial technologies for widespread applications. Addressing these issues is critical to maximizing the potential of microbial innovations in pollution management. Future research should focus on developing AI-driven microbial consortia, IoT-based real-time pollutant monitoring systems, and integrating microbial strategies into global environmental policies. These advancements hold promise for sustainable and scalable solutions to marine pollution challenges, ensuring long-term ecological restoration and resilience.

Habitat Suitability of species with aquatic organisms using C4CEM

Md. Al Mamun

Department of Oceanography, Shahjalal University of Science and Technology

Email: mamun.oceanography@gmail.com

Abstract

Habitat suitability assessment plays a significant role in sustainable marine conservation management and habitat restoration. However, collecting oceanic parameters and species diversity data remains challenging in a developing country due to limited access to cutting-edge technologies. Admittedly, the Citizen for Coastal Ecosystem Monitoring (C4CEM) application has provided a crucial opportunity for coastal ecosystem monitoring by collecting various datasets such as fish, water quality, marine litter, ocean resource data, and plankton, with location and timestamp. By using C4CEM, citizens can play a pivotal role in enhancing our understanding of coastal ecosystems and identifying potential solutions for sustainable resource management. The biodiversity dataset has been collected from several coastal areas of Bangladesh using C4CEM. Additionally, we collected data using questionnaire surveys, key informant interviews (KI), and Focus Group Discussions (FGD) with local fishermen and stakeholders to identify potential fishing zones. Furthermore, we conducted monthly surveys to collect data on fish diversity and abundance. Our study aimed to understand the spatial distribution of guitarfish, rays, and sharks and identify their suitable habitats in the coastal areas of Bangladesh. To address this, we applied a citizen science approach using an Android application to collect data on various fish species. The results highlight various suitable locations for these species. Spatial analysis depicts the distribution of elasmobranch species along our EEZ (Exclusive Economic Zone), with evidence of clustering in several areas. Besides, our study provides spatially explicit predictions, which can aid in decision-making for sustainable fisheries management and biodiversity conservation. The findings emphasize the importance of C4CEM in enhancing our understanding of aquatic ecosystem dynamics and highlight a unique approach for future research on species habitat suitability in the Bangladeshi coastal environment.

Environmental Aspects of Mariculture in the Coastal Area of Bangladesh

Md Shamsul Hoque

Department of Oceanography, Shahjalal University of Science and Technology

Email: shamsul.c47@gmail.com

Abstract

Coastal and marine aquaculture in Bangladesh contributes to economic growth, food security, and livelihoods. Climate change, resource overuse, and environmental harm are some of its problems. This study assessed coastal aquaculture's resistance to climate change and the environment. It concentrated on biodiversity, socioeconomic situations, and the quality of the water and sediments. Five coastal districts—Cox's Bazar, Khulna, Bagerhat, Patuakhali, and Satkhira—were the sites of the data collection. Analysis methods included surveys, field observations, and climate models. The findings indicated that phosphate and nitrogen levels were greater at aquaculture sites. Heavy metals and pesticides were found in the sediments at these locations. Aquaculture sites have decreased biodiversity, as indicated by species richness and diversity indices, which suggests habitat destruction. The difficulties were exacerbated by the effects of climate change, including increased temperatures, harsher weather, and shifting salinity. In addition, farmers had to deal with socioeconomic problems like fluctuating market prices and few resources. To minimize environmental harm and increase resilience, the study recommends implementing sustainable techniques like Integrated Multi-Trophic Aquaculture (IMTA). It's also critical to enhance laws and restore habitats like mangroves. For long-term sustainability, a monitoring system is advised. In order to safeguard Bangladesh's coastal aquaculture, this study emphasizes the necessity of sustainable practices, climate-resilient solutions, and improved legislation. Bangladesh can ensure sustainable development while preserving biodiversity and sustaining livelihoods by emphasizing ecosystem-based strategies and community engagement.

Seasonal Distribution of Microplastic Contamination in Sediment from the South-East Coast of Bangladesh

MD Shajjadur Rahman[1], Faisal Sobhan[1], Showmitra Chowdhury[2] and Md. Hasibul Hasan Hridoy[1*]

[1]Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh.
[2]Bangladesh Oceanographic Research Institute (BORI), Cox's Bazar, Bangladesh.

[*]Email: hasibulhridoy15@gmail.com

Abstract

It is a global concern that microplastics (MPs) are increasing in sediment day by day. Therefore, this study aimed to investigate conditions of MPs pollution in sediments at Maheshkhali and Sonadia Island of Bangladesh into two different seasons. A total of 624 MPs were found in the pre-monsoon and 708 MPs during post-monsoon season from the two areas respectively. Three diverse shapes (filament, round, irregular) microplastics were detected in the sediments, filament was found maximum in Maheshkhali (68%) and Sonadia (65%). The types of microplastics were predominantly fibers (64-77%), followed by film, fragments, foams and beads. Else to this, 6 colors of MPs were found in both places; black (27-29%), white/transparent (25-27%), blue (21- 23%), brown (12-15%), red (7-10%) and yellow (1-3%) were the significant of them. Polypropylene was the most abundant polymer followed by polyethylene (PE), polyethylene terephthalate (PET), ethylene vinyl acetate (EVA), nylon6, polyvinylchloride (PVC), polyurethane (PU), acrylonitrile butadiene-styrene (ABS), polymethyl pentene (PMP); polypropylene was found at highest percentage (41-45%) in the Southeast region. Disturbance-induced resuspension and vertical transport have significant effects on small-sized microplastics (0.05 mm–5. 00 mm), indicating their potential to migrate and redistribute via resuspension at different temporal and spatial scales, particularly in estuaries where several river flows meet in the coastal areas, especially discharge from the upper regions. Microplastic abundance in the sediments in the post monsoon were slightly higher than those from the pre-monsoon and the monsoon season promotes the accumulation of smaller microplastics in the sediment along the river-flow direction but not for the pre monsoon.

Habitat Suitability Modeling of Asian Sea bass (Lates calcarifer) in Bakkhali and Naf River Estuary Using GAM (Generalized additive model)

MD Shajjadur Rahman and Md.Nazmus Sakib[*]

Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh

[*]E-mail: nsfahim049@gmail.com

Abstract

This study combines hatchery performance data, satellite-derived oceanographic parameters, and in situ water quality measurements to assess the aquaculture potential and environmental compatibility of Asian sea bass (Lates calcarifer) in Bangladesh's Bakkhali and Naf River estuaries. A multi-method approach was used, integrating biological insights from hatchery records (survival rates, feeding systems) with satellite observations (SST, chlorophyll-a, currents), and field-collected data (temperature, salinity, dissolved oxygen, pH).Estuarine conditions were correlated with hatchery existence and species distribution by Generalized Additive Models (GAMs) and machine learning methods , while geographical suitability mapping was made easier with ArcGIS and R. The primary indicators of Asian sea bass habitat suitability were found to be salinity (23–32 ppt), oxygen concentration in the water (>5 mg/L), tidal-driven, depth. Geographically comprehensive habitat mapping identified a number of high-suitability zones for Asian sea bass aquaculture; yet, seasonal environmental fluctuations require adaptive management strategies. For the Asian sea bass, combining field, satellite, and hatchery data provides a reproducible paradigm for prioritizing nutrient-rich, hydrodynamically stable areas.

Population Discrimination of *Polynemus paradiseus* in Southern Bangladesh Using a Multivariate Approach to Body Shape Variation

Md Yeaminur Rahman[1][*] and Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Khulshi-4225, Chattogram, Bangladesh

[*]Email: yeaminur18fmb010@gmail.com

Abstract

The paradise threadfin (*Polynemus paradiseus*) is a commercially and ecologically important euryhaline fish inhabiting diverse coastal and estuarine habitats. Understanding body shape divergence and population discrimination is essential for fisheries management and conservation. To assess morphological differences among populations, 366 individuals (198 males, 168 females) were collected in November 2022 from five locations across three zones in southern Bangladesh: Cox's Bazar (Bakkhali River) and Chattogram (Karnaphuli River) in the southeast, Noakhali (lower Meghna River) in the southcentral, and Khulna (Shibsa River) and Borguna (Bishkhali River) in the southwest.The truss networking and geometric morphometric analysis (GMA) indicated variations in body shape among P. paradiseus individuals induced by sexual dimorphism. Wireframe graphs demonstrated that female individuals had wider dorsal-abdominal parts than males. Using the truss networking dataset for five coastal habitats, multivariate analyses revealed two overlapping clusters: southwest (Borguna and Khulna) populations in one cluster, while central (Noakhali) and southeast (Chattogram and Cox's Bazar) populations form separate clusters. The GMA also illustrated that the Khulna-Borguna population was located near the opposite end of the Chattogram-Cox's Bazar population axis, and the Noakhali populations were somewhat in the middle, with a high degree of overlap. Wireframe graphs displayed a significant body shape variations among populations, mainly in the snout shape, the width of the dorsal-abdominal part, the tail shape, and the head shape. The Discriminant Function Analysis revealed that there were pronounced variations in body shape between two populations located in distant regions, while there were minimum variations between two populations located close to each other. This study underscores the effectiveness of landmark-based truss networking and geometric morphometrics in discerning morphological variations across different habitats. These variations likely hold adaptive significance and are critical for informed population management and conservation strategies in the population structure of euryhaline P. paradiseus.

Comparative Growth Assessment of Culture Species Between Monoculture and Integrated Multitrophic Aquaculture (IMTA) in Near Shore System.

Md Zohir Hossain[*] , Md. Shakib Hossain , Md Asaduzzaman

Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh

[*]Email: zohir3324@my.cvasu.ac.bd

Abstract

Bangladesh holds significant potential for mariculture expansion with its 710 km coastline. Integrated Multi-Trophic Aquaculture (IMTA) is a sustainable approach that optimizes space utilization, minimizes waste, and enhances productivity. However, no research has been conducted on IMTA in nearshore waters in Bangladesh. This study aimed to compare the growth performance of cultured species between monoculture and IMTA systems in a nearshore environment. The experiment was conducted on the southeastern coast of Bangladesh, specifically in the Moheshkhali channels, where IMTA and monoculture treatments were established. The IMTA system integrated seaweed (*Gracilaria* sp.), fish (*Mystus gulio*), and green mussel (*Perna viridis*), while the monoculture system maintained separate rafts for each species. Each fish raft contained four cages stocked with Nuna Tengra (*Mystus gulio*). Seaweed rafts (10 × 3 m) utilized a floating long-line culture system. Green mussel rafts (10 × 8 m) were designed for vertical suspension of spats to optimize growth. Results indicated that the IMTA system significantly outperformed monoculture, yielding higher production across all cultured species. Fish exhibited improved growth, while seaweed and green mussels demonstrated higher productivity in the IMTA system compared to monoculture at Moheshkhali channels. The superior performance of IMTA was attributed to its favorable physicochemical water parameters. Despite its potential, large-scale adoption remains limited due to a lack of spatial planning and commercial investment. This study gives basic information to help IMTA grow. It also suggests a long-term plan for mariculture that could help Bangladesh's aquaculture industry, boost seaweed and mussel exports, and add to the country's blue economy.

Production performance and ecological factors of *Gracilaria* sp. in different farming systems along the southeast coast of the Bay of Bengal, Bangladesh

Israt Jahan[1]* and Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Khulshi-4225, Chattogram, Bangladesh

*Email: israt3337@my.cvasu.ac.bd

Abstract

The effects of agar-enriched *Gracilaria* sp. on production performance and biochemical composition were evaluated under three farming systems (off-bottom net, floating long-line, and off-bottom long-line) from October 2021 to April 2022. Twenty-five off-bottom long-line (14 m × 5 m), 20 off-bottom net (1.8 m × 3.5 m), and 10 floating long-line (10 m × 3 m) systems were established and managed in a participatory farming approach with coastal communities at the south-east coast of the Bay of Bengal, Bangladesh. *Gracilaria* sp. were collected every 15-30 days after growing to a length of 30-40 cm. The floating long-line system produced 135% and 67.2% more biomass than the off-bottom long-line and off-bottom net systems, respectively. The color of *Gracilaria* sp. collected from the floating system was clear, with little encrustation, and bright reddish. Multivariate analysis showed that high salinity, dissolved oxygen, and nutrient availability positively affected growth performance, whereas high temperature, turbidity, and total suspended solids had negative effects. Biochemical composition analysis showed that the content of protein, lipid, and essential amino acids in *Gracilaria* sp. in the floating long-line system was higher, with essential amino acids being 18.4% and 13.3% higher ($p < 0.05$) than in the off-bottom long-line and net systems. The n6-PUFA level was 11.2% higher in the floating long-line system than in the off-bottom long-line system, and the mineral contents of Ca, K, and Zn were significantly higher ($p < 0.05$). Furthermore, the content of heavy metals (Cr, Cd, Pb, and As) in the floating culture was much lower and the agar content was 18.8-21.3% higher. According to these results, the raft-based floating long-line system provides an effective and sustainable way to cultivate high-quality, agar-rich *Gracilaria* sp. in a wide range of coastal areas and similar environments in Bangladesh.

Reproductive biology of the Indian threadfin (*Polynemus paradiseus*) from the southeast coast of Bangladesh

Md Musfikur Rahman[1*] and Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Chattogram-4225, Bangladesh

[*]Email: musfikur3180@my.cvasu.ac.bd

Abstract

Polynemus paradiseus, the paradise threadfin, is a commercially important brackish water finfish of the Perciformes family in Bangladesh. This study aimed to investigate the reproductive biology of paradise threadfin from the Southeast Coast of Bangladesh from September 2021 to August 2022. A total of 613 specimens (293 males, 320 females) were collected, ranging from 10.4 to 23.8 cm in total length and 9.66 to 97.57 g in total weight. The overall sex ratio (0.915:1, male: female) did not significantly deviate from 1:1. Length-weight relationship analysis yielded growth coefficients (b) of 3.377 for males and 3.354 for females, with R^2 values of 0.8183 and 0.8659, respectively ($p<0.001$), indicating positive allometric growth (b > 3). Relative condition factor (KR) values ranged from 0.548 to 1.507 in males and 0.664 to 1.373 in females, while Fulton's condition factor (KF) ranged from 0.298 to 0.763 and 0.393 to 0.786 in males and females, respectively. Relative weight (WR) values, near 100 for both sexes, suggested a suitable habitat condition. Length at first sexual maturity was estimated at 14.1 cm for males and 16.6 cm for females. Peak gonadosomatic index (GSI) values were observed from April to June, coinciding with the largest mean oocyte diameter in May (778.5 ± 19.7 μm) and numerous spermatids in males. These findings strongly suggest a primary spawning peak for *P. paradiseus* between April and June in the study area. This information will be valuable for conservation efforts, sustainable fisheries management, and potential artificial breeding programs for this species.

Environmental drivers of growth of *Hypnea musciformis*: A comparative study of off-bottom long-line and net farming in the Bay of Bengal

K. M Ekram Mahmud Anik[1*] and Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Khulshi-4225, Chattogram, Bangladesh

[*]Email: ekram3313@my.cvasu.ac.bd

Abstract

There is significant potential for seaweed farming in Bangladesh, especially along the southeastern coast of Cox's Bazar. This study investigated the effects of environmental parameters on the growth of *Hypneamusciformis* cultivated in two different systems: off-bottom long-line and off-bottom net. Cultivation was carried out for nine months (September 2021-May 2022) in the intertidal zone of Nuniachara, where five plots (14 m × 5 m) were established for the long-line system and five plots (3.5 m × 3.5 m) for the net system. Seaweed was collected in batches at 15-30 days intervals, depending on the growth cycle. The off-bottom net system functioned better than the long-line method, according to the data, with a daily growth rate (DGR) that was 33% higher and around double the gross weight biomass (GWB). According to correlation analysis, temperature, turbidity, and total suspended solids (TSS) all showed significant negative connections ($p < 0.001$) with GWB and DGR, whereas salinity and nutrient concentrations (NO_3-N, NO_2-N, and PO_4-P) showed positive associations. Principal component analysis (PCA) also showed that optimal growth occurred from December to February, corresponding to high salinity and nutrient levels. These results indicate that the off-bottom net system is a promising method for increasing commercial cultivation of carrageenan-rich *H. musciformis* in the Bay of Bengal.

Morphometric differentiation and stock discrimination of *Scylla* sp.: A multivariate approach in the coastal region of Bangladesh

Md. Azharul Haque Shakil[*] and Md Asaduzzaman

Department of Marine Bioresource Science, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University, Khulshi-4225, Chattogram, Bangladesh

[*]**Email:** azharul3318@my.cvasu.ac.bd

Abstract

Mud crab species (genus *Scylla*) play a significant role in coastal aquaculture and artisanal fisheries; however, the understanding of their species diversity and stock structure for sustainable management in the coastal region of Bangladesh remains ambiguous. This study aimed to clarify the diversity and stock structure of mud crab species using 24 morphometric length measurements and 27 morphometric ratios based on data collected from three coastal regions of Bangladesh: Chittagong, Cox's Bazar, and Bagerhat. The taxonomic keys indicate that approximately 82.4% of the species were classified as *S. olivacea*, while the remaining 17.6% were identified as *S. serrata*. Preliminary research indicates that both univariate proportion and multivariate analysis of the collected morphometric lengths and ratios effectively distinguish the mud crab population into two multivariate categories: *S. serrata* and *S. olivacea*. Data were analyzed using univariate ANOVA, multivariate ANOVA, Canonical Variate Analysis (CVA), and Principal Component Analysis (PCA) to further examine the stock structure of these two species based on their collection sites. Scatter plots of CVA scores between CV1 and CV2, alongside PCA scores between PC1 and PC2, indicated that individuals from both species formed distinct clusters within three multivariate spaces, exhibiting minimal overlap, which corresponded to their collection sites. The Linear Discriminant Function Analysis (LDFA) demonstrated a 100% average percentage of correctly classified (PCC) individuals into the original groups of *S. olivacea* and *S. serrata* based on morphometric features. The average PCC for stock discrimination was 100% for *S. olivacea* and 99% for *S. serrata*, according to their original collection site groups. The dendrogram, constructed using Euclidean distances, reliably differentiated *S. olivacea* from *S. serrata*, displaying stock structures similar to those observed in previous multivariate analyses. Our research indicates that *S. olivacea* is the predominant mud crab species, whereas *S. serrata* is the minor species. Management and conservation policies for species in the coastal region of Bangladesh must incorporate stock differentiation for each species.

Pond-Based Integrated Multi-Trophic Aquaculture in Cox's Bazar: A Sustainable Approach to Coastal Aquaculture

Tamanna Islam[1]*, Sanjilan Chowdhury[1], Md Asaduzzaman[1]

[1]Department of Marine Bioresource Science, Chattogram Veterinary and Animal Sciences University, Chattogram 4225, Bangladesh

*Email : tamannaislam79297@gmail.com

Abstract

The coastal regions of Cox's Bazar, Bangladesh, offer immense potential for sustainable aquaculture, and Integrated Multi-Trophic Aquaculture (IMTA) serves as an eco-friendly approach to optimize resource utilization while minimizing environmental impacts. This study investigates the feasibility of pond-based IMTA using *Gracilaria* sp. (seaweed), *Perna viridis* (green mussel), and *Mystus gulio* (long-whiskered catfish) to enhance production efficiency and ecological sustainability. Conducted in a coastal pond system exceeding 1 hectare in size and with a depth of over 5 feet, the study includes four treatments with four replications: seaweed monoculture on a 5 × 10 ft raft, green mussel monoculture on a 1.5 × 3 m raft, fish monoculture in 4.5 ft cubic cages, and a combined IMTA system integrating all three species. Growth performance, survival rates, and water quality parameters such as dissolved oxygen, pH, ammonia, and nitrate levels are monitored periodically, with statistical analyses applied to compare productivity and environmental impacts across treatments. The study aims to assess species growth performance, evaluate water quality dynamics under different conditions, and determine the ecological and economic benefits of IMTA compared to monoculture. It is expected that the IMTA system will demonstrate higher production efficiency while maintaining water quality and reducing nutrient waste, contributing to sustainable coastal aquaculture models for small-scale farmers. Ultimately, this research highlights the viability of pond-based IMTA in Cox's Bazar as an innovative approach to optimizing aquaculture productivity while ensuring ecological balance, providing insights for broader implementation in coastal aquaculture systems.

Abundance, Diversity and Distribution of Macrobenthic Fauna in the southeast coast of Bangladesh: Implications for Marine Spatial Planning

Omite Ashraf Tihum[*] and Md. Azizul Fazal

Department of Oceanography, Shahjalal University of Science and Technology, Sylhet3114, Bangladesh

*Email: ocgtihum.sust71@gmail.com

Abstract

Macrobenthos holds key significance in coastal food webs and serves as a reliable indicator of aquatic ecosystem health. This study investigated the abundance, diversity, and distribution of macrobenthic fauna in the southeast coast of Bangladesh, providing critical baseline data for Marine Spatial Planning (MSP). Sampling was conducted at three ecologically distinct sites: Bakkhali River, Nuniarchara, and Sonadia Channel, representing different habitats (mudflat, saltmarsh, and mangrove). Sediment samples were analyzed for organic matter (OM %), organic carbon (OC %), electrical conductivity (EC %), and pH to assess their influence on macrobenthic communities. A diverse assemblage of 63 macrobenthic species belonging to 12 class and 37 families were identified. The most abundant macrobenthic taxa were polychaetes, comprising 47.4 % of the total population, followed by Oligochaete (17.56 %), Crustacean (11.27%) and Echinodermata (8.20 %). Sonadia exhibited the highest abundance (7751 ind/m²) at mudflat zone during the monsoon season, suggesting spatial and temporal variability in macrobenthic community structure. The Shannon diversity index (H=2.8238) and evenness index (0.9285) were highest in Sonadia, while species richness (d=4.94) peaked in Nuniarchara. Polychaete abundance was higher (17290 individuals/m²) followed by Oligochaete (6405 individuals/m²), Crustacean (4111 individuals/m²) and Echinodermata (2991 individuals/m²). Organic carbon (OC) content varied from 0.48% to 2.72%, while organic matter (OM) ranged from 0.76% to 4.69%. Electrical conductivity (EC) ranged from 0.30% to 0.98%, and pH varied between 4.05 and 7.75. Sediment parameters exhibited significant correlations with macrobenthic abundance. Strong correlations observed in Sonadia's saltmarsh habitat during the pre-monsoon season (R^2: 0.71−0.91), whereas weaker correlations were observed in Nuniarchara's mangrove habitat during the post-monsoon season (R^2: 0.26−0.51). The Shannon-Weiner index (2.4−2.9) indicated moderate pollution levels, underscoring the need for sustainable habitat management. These findings provide valuable insights for MSP strategies, highlighting biodiversity hotspots, ecosystem connectivity, and pollution impact zones, which are essential for marine conservation, resource allocation, and sustainable coastal development.

Assessment of Surface Water Quality in Estuarine Ecosystems to Support Marine Spatial Planning of the Southeastern Coast of Bangladesh

Md. Shabit Hossain[1*], Muhammad Farhad Howladar[2], Abu Bokkar Siddique[1] and Md. Numan Hossain[2]

[1]Department of Oceanography, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh
[2]Department of Petroleum and Mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, Bangladesh

Email: shabit.ocg@gmail.com

Abstract

Water quality poses significant environmental, social, and economic risks worldwide. Effective monitoring and assessment of water quality is essential in all aspects of environmental management and economic development. Thus, the aims of this investigation were to evaluate and characterize the water quality of the southeastern coast of Bangladesh, utilizing a combination of the water quality index (WQI), machine learning, and GIS approaches. Thirty water samples were collected from various sampling locations. The quality of the water was assessed using the following parameters: water temperature, pH, electrical conductivity, chlorophyll a, DO, turbidity, TDS, TSS, BOD, COD, total coliform, alkalinity, total hardness, nitrate, phosphate, and heavy metals (As, Cd, Cr, Ni, Cu, Pb, Mn, Zn, Fe). These parameters were analyzed following standard laboratory procedures. Most of the samples were classified as having fair to good water quality, as determined by the WHO permitted standards used to construct the WQI. The quality of water is seen to be fair to marginal, where anthropogenic activities are predominant. Finally, this study concludes that while the overall water quality remains within acceptable limits in certain areas, regions experiencing higher pollution levels require immediate attention for effective management. The findings of this research would be of interest to future researchers and regulators in terms of WQI for improving sustainable management plans of water resources.

Importance of Spatial Plan for Mangroves Habitat Conservation in Bangladesh

Farzana Afroz

Department of Oceanography, Shahjalal University of Science and Technology, Sylhet 3114, Bangladesh

Email: bivafarzana12345@gmail.com

Abstract

Mangroves are coastal and riverside plants that thrive at interfaces between land and sea in the tropics and subtropics. Mangroves are also salt-tolerant forest ecosystems. In mangrove ecosystems, litterfall accumulates as organic carbon and nutrients over the sediment surface, where bioturbation profoundly affects the sediment biogeochemistry. Bioturbation processes by these organisms are reported to control nutrients and carbon cycling across the sediments. The global cycling of carbon is intimately tied to biological productivity and consequently to processes controlling atmospheric CO_2 and sediment carbon pools. Mangroves are among the most carbon-rich biomes and on average contain 3,750 tons CO_2 equivalents per hectare. Mangrove forests are a valuable ecological and economic resource, providing essential services such as food and fuel resources; nursery grounds for fish, mammals and other semi-terrestrial and aquatic fauna; depocenters for sediment, carbon and other elements; and, in some instances, offering some protection from coastal erosion due to tsunamis and intense tropical storms. The burrows affect sediment topography and biogeochemistry by modifying particle size distribution, drainage, redox conditions and organic matter as well as nutrient availability. The deposition and degradation of organic matter in coastal estuaries is an important process in biogeochemical cycling that strongly depends on coupled interactions of sediment biogeochemistry and bioturbation by benthic macrofauna. The high primary productivity of mangroves implies a high demand for nutrients essential for plant growth. This high nutrient requirement appears to be met by highly efficient systems of nutrient trapping, uptake and recycling.

Application of satellite data to support MSP in the coastal and maritime area of Bangladesh

Nabanita Das

NANO Research Fellow, Partnership for Observation of Global Ocean
Email: nabanitatinni25@gmail.com

Abstract

Marine Spatial Planning (MSP) is a crucial process for the sustainable management of coastal and maritime resources to accomplish ecological, economic, and social goals. In the coastal and maritime area of Bangladesh, the integration of satellite data can be used to provide valuable insights for MSP development. Therefore, this study aimed to assess the possibility of the use of satellite-derived oceanographic data to develop MSP for the northern Bay of Bengal (BOB) in Bangladesh. There were 15 primary variables that were considered in this study for the assessment. These include Sea Surface Temperature (SST), Sea Surface Salinity (SSS), Sea Surface Height (SSH), Chlorophyll-a Concentration, Sea Surface Wind Speed and Direction, Ocean Surface Currents, Ocean Surface Waves, Ocean Surface pH, Ocean Surface Nitrate Concentration, Sea Ice Concentration and Extent, Sea Surface Roughness, Sea Surface Debris Detection, Primary Productivity, Ocean Turbidity, and Ocean Acidification Indicators. These variables are crucial for understanding the physical, chemical, and biological aspects of the maritime environment, which directly influence the development of MSP. Various sensors are utilized for data collection, which offer diverse spatial and temporal resolutions, ranging from high-resolution daily data to longer repeat cycles. The integration of these satellite data into MSP enhances the accuracy of environmental assessments, which are critical for identifying ecologically significant areas, monitoring pollution, and assessing the impacts of climate change. For example, chlorophyll-a data are vital for monitoring primary productivity and algal blooms, which influence the marine food web. Therefore, the application of satellite derived oceanographic data can be an effective way to support sustainable resource management, environmental protection, and maritime safety, contributing to the overall goals of MSP.

Conserving Sharks and rays in Bangladesh: Ecological Insights and Management Strategies from St. Martin's Island

Kifaet Wahid Polok[1*], M. Shah Nawaz Chowdhury[1]

[1]Institute of Marine Sciences, University of Chittagong, Chattogram – 4331, Bangladesh
[*]Email: kifayetwahid@gmail.com

Abstract

Sharks and rays play a vital role in the marine ecosystem. Still, their populations are under threat in Bangladesh and the global context due to the lack of research, overfishing, habitat destruction, and climate change. This study assesses the species composition, abundance, and dietary preferences of sharks and rays in the St. Martin's Island coral ecosystem. On-board observation and catchment within 1-1.5 km offshore were conducted in this study period to collect the species composition, which revealed that Scalloped hammerhead (*Sphyrna lewini)*, Tiger shark (*Galeocerdo cuvier*), Blacktip reef shark (*Carccharhinus melanopterus*), and Graceful shark (*Carcharhinus amblyrhynchoides*) were dominant. Among the rays, Bluespotted maskray (*Neotrygon kuhlii*), Zonetail butterfly ray (*Gymnura zonura*), Bleeker's whipray (*Pateobatis bleekeri*), Bengal whipray (*Brevitrygon imbricata*), and Honeycomb whipray (*Himantura undulata*) were dominant in this region. The collected and observed samples were mostly juvenile (62% of sharks and 54% of rays) among the 69 specimens of sharks and 114 specimens of rays. The stomach content analysis was assessed based on the Index of Relative Importance (%IRI), which covers 75% frequency of occurrence of fishes, 50% of mollusks, and then teleost and miscellaneous items contributed to the dietary preferences of sharks. In the dissected stomachs of rays, mollusks (41.67%) were the second most common contributor after fish (58.33%) in frequency of occurrence. Social surveys, including Questionnaire surveys, FGD, and KII were conducted to develop a sharks and rays resource management framework. The majority (70%) admitted that they encountered sharks as bycatch, 50% of the responses showed a medium intensity of bycatch, whereas 20% of respondents reported low occurrences. Almost equal numbers of fishers perceived skates and rays to be low (35%) and high (20%) bycatch, respectively. This study contributes for the conservation of these elasmobranchs in different significant coastal ecosystems of the Bay of Bengal.

Taxonomic and ecological insights on a new record of Phyllophorid sea cucumbers (*Thyone* sp.): Contributing new knowledge for Marine Spatial Planning

Sadia Osman[1]*, M. Shah Nawaz Chowdhury[1]

[1]Institute of Marine Sciences, University of Chittagong, Chattogram 4331, Bangladesh
*Email: sadiaosmanlorin42@gmail.com

Abstract

A phyllophorid sea cucumber, *Thyone* sp. has been newly recorded under the Phyllophoridae family from Sonadia coast of south-eastern Bangladesh. Their size ranged from 1.4 – 45 mm including young pentactula to egg-bearing adults that indicated their multiple recruitments in the investigated site. They abundantly occurred (34 – 127 individuals m^{-2}) and lie buried in organically rich sediments (organic matter, 2.97±0.97%), where the soil pH and water salinity was 5.79±0.52 and 20±0.94 ppt respectively. The anterior end of the species has a mouth surrounded by a circle of branching tentacles while the posterior end bears the anus and is bluntly rounded. Under the water, they were found in suspension feeding mood, releasing feeding tentacles to catch food particles floating past. Their stomach content included diatoms, single-cell algae and drifting organic particles, as well as zooplankton such as copepods, ostracods, protozoans, and nematodes. Their abundance and occurrence in such a dynamic coast make them an interesting candidate for investigating their mariculture potential that could bring a new dimension for enhancing marine fisheries production in Bangladesh and aid in making informed decisions regarding marine spatial planning.

Eco-Hydrological Data in Coastal and Maritime Areas of Bangladesh: Current Status, Gaps, and Pathways to Support MSP

Shashowti Chowdhury Riya

Aquatic ecology research group, University of Dhaka

Email: riya.sust811@gmail.com

Abstract

Ecohydrological data are crucial for marine spatial planning (MSP) as they provide insights into ecosystem dynamics, biodiversity conservation, and sustainable resource management. Ecohydrological data in marine spatial planning are used to identify critical habitats that need protection, such as seagrass beds and coral reefs, and to balance conservation efforts with sustainable use by developing zoning plans. By integrating ecohydrological information, planners can ensure the long-term health and resilience of marine ecosystems through informed decision-making. This study aimed to understand the current status of eco-hydrological data in the coastal and maritime area of Bangladesh. Moreover, this study also identified the data gaps to support MSP for this critical ecosystem. Available ecohydrological data, which encompass the interactions between water and ecological processes, include variables such as temperature, salinity, dissolved oxygen (DO), nutrient concentrations (nitrite, silicate, and phosphate), chlorophyll-a, phytoplankton abundance, and hydrodynamic conditions like tide, current, and wind velocity. Data are available from the shallow coastal water. This study found that significant data gaps for the entire exclusive economic zone. In addition, temporal distribution is also missing for the entire coastal and marine ecosystem. Gaps also persist in long-term monitoring, integration of biotic and abiotic data, and understanding human impacts on these variables. Addressing these gaps is crucial for informed decision-making and effective MSP implementation. The findings emphasize the need for continuous and comprehensive data collection to support MSP, highlighting the significant variability in ecohydrological parameters and the necessity for targeted management strategies tailored to specific coastal zones. By addressing the identified data gaps, this research aims to enhance the sustainability of Bangladesh's coastal ecosystem through informed and adaptive marine spatial planning.

Geo-Spatial Seafloor Coverage and Coral Habitat Assessment of Saint Martin's Island MPA Using PIT and SAM For MSP

Sazzad Ahmed Bhuiyan[1*], Mohammed Shah Nawaz Chowdhury[1]

[1] Institute of Marine Sciences, University of Chittagong, Chittagong 4331, Bangladesh
[*]Email: sazzadahmed1758@gmail.com

Abstract

Saint Martin's is a unique island located in the Bay of Bengal characterized by a natural ecological setting of sedimentary rocks, subtidal coral habitat, and seaweed beds. Coral communities are under significant threat because of climate change, coral extraction, boat harbors (i.e., anchoring), and unplanned tourism. Using the Segment Anything Model (SAM) and the Point Intercept Transect method (PIT), this study attempts to figure out the seafloor cover type, identify coral sanctuaries, and present the scenario of corals and associates in the subtidal zones of the island, which provide insights for Marine Spatial Planning (MSP). Seafloor images were collected from 50 sampling stations surrounding the island. The image processing algorithm, SAM, was utilized for spatial seafloor cover, coral colony mapping, and data analysis. SAM generated image masks, and the supervised classification technique using the maximum likelihood decision rule estimated the seafloor coverage. The study results mean algal turf cover of 50.04 ± 27%, 24.8 ± 25.7% bare sand, hard coral 12.156 ± 13.9%, seaweed 5.16 ± 6.63%, rhodolith 3.67 ± 4%, and 0.6 ± 1.8% of soft coral cover in 50 sampling stations of the subtidal zone of the island. The study observed 1061 coral colonies and recorded 54 hard corals and 4 soft corals from 17 genera and 8 families. Mean coral abundance is 1.446 ± 1.55 col/m². Porites, Favites, and Dipsastraea are most abundant in Saint Martin's Island with 40.1%, 21.2%, and 19% of relative abundance, respectively. The outcome demonstrates the status of coral is poor and the presence of few genera in high numbers; this indicates the unfavorable environmental condition for other genera. By integrating these findings into MSP, this study can contribute to strategic zoning of Saint Martin's Island's marine ecosystem and ensure sustainable decision-making for environmental management and biodiversity conservation.

Spatial variations and factors affecting the phytoplankton diversity in the coastal waters of Sundarbans and St. Martin's Island

Md.Talif Mia[1*], M Shah Nawaz Chowdhury[1]

[1]Institute of Marine Sciences, University of Chittagong, Chattogram – 4331

Abstract

This study compares the geo-spatial phytoplankton biodiversity, composition, density, and their relationship with environmental parameters (i.e., temperature, salinity, pH, TDS, Transparency, DO, Nitrate, Phosphate and Silicate) between two unique ecosystems, the Sundarbans and St. Martin's Island. Samples were collected from 32 different stations in the Sundarbans and 30 different stations of St. Martin's Island from September 2023 to January 2024. Phytoplankton communities were analyzed using biodiversity indices, regression and correlation matrices, principal component analysis (PCA), and canonical correspondence analysis (CCA), marine spatial planning techniques like kriging interpolation and hotspot analysis to assess spatial patterns. A total of 211 species from 102 genera and 10 classes were identified in the Sundarbans, with Chlorophyceae (26%), Bacillariophyceae (23%), Coscinodiscophyceae (13%), and Cyanophyceae (11%) as dominant groups. Similarly, in St. Martin's Island 176 species of phytoplankton under 65 genera have been identified, the dominated groups were Bacillariophyceae (56%), Dinophyceae (14%), and Coscinodiscophyceae (13%). Phytoplankton density varied notably: in Sundarbans, the ranged 8,372.17 ± 1,556.49 cells/L to 45,273.13 ± 1,556.49 cells/L (mean: 20,844.79 ± 1,556.49 cells/L), where in St. Martin's Island, the range were 15,602.84 ± 891.62 cells/L to 41,000.13 ± 891.62 cells/L (mean: 27,631.79 ± 891.62cells/L). Bacillariophyceae in the Sundarbans were strongly correlated with salinity showed by CCA analysis, while Cyanophyceae were associated with temperature and nutrients. In St. Martin's Island, Bacillariophyceae and Coscinodiscophyceae showed strong correlations with silicate and other environmental parameters like salinity, pH, and temperature. In both ecosystem, Nitrate was the key driver of phytoplankton density, with a strong positive correlation (r = 0.90 in Sundarbans and r = 0.33 in St. Martin's Island). Silicate also supports diatom growth as positively correlated with phytoplankton (r =0.23 in Sundarbans and r = 0.27 in St. Martin's), while temperature and dissolved oxygen show weak negative correlations, with minimal impact from salinity, phosphate, and depth. This study identified the areas of high phytoplankton density influenced by estuarine processes and nutrient availability, offering valuable insights for area-based conservation and management of those ecosystems.

INTERNATIONAL CONFERENCE ON

MARINE SPATIAL PLANNING

FOR ADVANCING SUSTAINABLE BLUE GROWTH