



Ocean University of Sri Lanka
Ministry of Education, Higher Education and
Vocational Education



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(6th Research Symposium of the Ocean University of Sri Lanka)

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16th January 2025 at Ocean University of Sri Lanka, Crow Island, Colombo 15, Sri Lanka

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Foreword

The Ocean University of Sri Lanka (OCUSL) is honored to present the proceedings of its First International Symposium for Ocean Research – 2024 (iSOR ‘24) under the theme “Ocean Research for Blue Growth”. This symposium serves as a distinguished platform to highlight the latest research contributions in the fields of Blue Economy, Blue Growth, and Blue Justice.

Since its inception, the symposium has aimed to foster collaboration and knowledge sharing among researchers, academics, and industry experts. With Sri Lanka being an island nation, the sustainable use of marine resources is integral to our economic development and environmental resilience. This year’s theme underscores the urgent need to balance innovation with sustainability, focusing on solutions that address contemporary challenges such as climate change, biodiversity conservation, and sustainable fisheries and aquaculture practices focusing Coastal and Marine Environmental Management, Fisheries and Aquaculture, Seafood Science and Technology, Marine Engineering and Technology, Oceanography and Hydrography, GIS and Remote Sensing applications for Marine Sciences, Maritime Transportation and Logistics, and Sustainable Supply Chain Management.

The Editorial Board meticulously reviewed and selected 53 exceptional research articles for this year’s proceedings after a rigorous double-blind peer review process. These contributions reflect the diverse expertise and dedication of both local and international researchers. In addition to the research articles, this symposium also features a plenary session led by renowned experts who bring invaluable insights into emerging trends and challenges in ocean sciences.

On behalf of the Editorial Board, I extend my heartfelt gratitude to the authors for their dedication to advancing knowledge in these critical areas and to the reviewers for their tireless efforts in maintaining the academic rigor of this symposium. I am confident that the proceedings will inspire meaningful discussions and provoke innovative ideas for sustainable ocean futures.

The Editorial Board wishes all participants great success and looks forward to a productive symposium.

Dr. W.A.A.D.Lanka Wickramasinghe

Editor-in-Chief

International Symposium for Ocean Research – 2024 (iSOR ‘24)



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Message from the Vice Chancellor, Ocean University of Sri Lanka



It is my privilege to welcome you to the First International Research Symposium of Ocean University of Sri Lanka with the theme of “Ocean Research for Blue Growth”.

The Ocean University of Sri Lanka (OCUSL) is a special purpose government University established by a parliament act with an aim of developing the human resources requirement to achieve the economic benefits of Marine, Maritime, Fisheries and allied technology sectors.

The Research Symposium is the most remarkable forum for the scholars and scientists from different ocean related fields around the world.

During the symposium we will have many opportunities to network and learn from some of the brightest leaders in the fields of fisheries, maritime, marine and allied sectors in all over the world.

Within the University domain new knowledge comes through research and through the research findings we will be able to find innovative solutions to emerging issues and challenges in the ‘Blue Economy’ sector. We have identified nine research tracks covering the academic and research fields of coastal and marine resources management, oceanography, fisheries and aquaculture, maritime transport and logistics, and socio economic and marketing. Therefore, this achievement will be helpful the university to showcase how the university is performing as a teaching and research university in our university history.

I take this opportunity to thank all well-known keynote speakers, distinguished guests and academics for their valuable contribution to the conference. Also, I express my heartfelt gratitude and appreciation to all young researchers who have produced excellent research papers and who have stepped up to explore and present their significant findings at this research platform.

I also take this opportunity to extend my deep appreciation to the conference chair, secretary, and other members of the organizing committee for their commitment to ensure the success of this conference.

Prof. Wasantha Rathnayake, PhD

Vice Chancellor

Ocean University of Sri Lanka



Message from the Chairperson of the Symposium



The Ocean University of Sri Lanka (OCUSL) takes immense pride in hosting its first International Symposium for Ocean Research – 2024 (iSOR '24), which serves as a premier platform for showcasing research and innovation in the concepts of Blue Economy, Blue Growth, and Blue Justice. This event not only highlights the academic excellence of our students and faculty but also fosters collaboration and knowledge sharing with professionals from across the globe.

The theme for this year's symposium, "Ocean Research for Blue Growth", reflects our commitment to address the pressing challenges faced by marine ecosystems in the face of climate change, biodiversity loss, and resource depletion. With a focus on sustainable aquaculture, ocean health, and the blue economy, this symposium emphasizes solutions that balance environmental conservation with economic development.

We are proud to present 53 research abstracts, covering a range of technical sessions on topics such as Coastal and Marine Environmental Management, Fisheries and Aquaculture, Seafood Science and Technology, Marine Engineering and Technology, Oceanography and Hydrography, GIS and Remote Sensing applications for Marine Science, Maritime Transportation and Logistics, Sustainable Supply Chain Management. Each submission underwent a rigorous double-blind peer review process, ensuring the highest standards of academic quality.

I would like to extend my deepest gratitude to our esteemed keynote speakers, Professor Dongxiao Wang for his insight on "Multiscale variability of the tropical Indian ocean circulation and its climatic effects as revealed by observations in the last decade" and Senior Professor Pathmalal M. Manage for his insightful presentation on "Sustainable mariculture development in Sri Lanka for a promising blue economy" will undoubtedly inspire and guide future research in this field. I also express my heartfelt thanks to our valued sponsors, collaborators, and stakeholders for their unwavering support in making this event a reality.

A special note of appreciation goes to the Vice chancellor, Professor Wasantha Rathnayake, for his guidance and support all through. Also, my sincere thanks go to the organizing committee of iSOR '24, and the editorial team for their dedication and hard work in ensuring the success of this symposium. To all the authors, reviewers, and participants, thank you for your contributions to advancing the frontiers of marine science and sustainability. I hope this symposium serves as a catalyst for innovative ideas and collaborations, paving the way for a resilient and sustainable future for our oceans.

Dr. W.A.A.D. Lanka Wickramasinghe
Chairperson of the Symposium/ iSOR-2024
Ocean University of Sri Lanka



Keynote Speech I

Multiscale variability of the tropical Indian ocean circulation and its climatic effects as revealed by observations in the last decade



Professor Dongxiao Wang
Dean, School of Marine Sciences, Sun Yat-sen University, China

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Abstract

The tropical Indian Ocean circulation system is an organic whole composed of the equatorial circulation system, the circulation and eddies in the near-equatorial sea, and the marginal sea, the dynamic adjustment process of which is driven by the Indian monsoon and the Indian Ocean basin mode. Therefore, the tropical Indian Ocean circulation has complex multi-scale variation characteristics. In the past decade, multi-scale evolution characteristics of the tropical Indian Ocean circulation and its control mechanism has been revealed through in situ observations and numerical simulation studies. The oceanic wave processes driven by the equatorial wind pattern plays an important role in regulating the formation and evolution of the circulation system in the tropical Indian Ocean and links the changes of the extratropical current. The ocean current's variation affects the ocean basin mode in the tropical Indian Ocean through the ocean dynamic feedback processes. In addition, the Pacific and Atlantic Ocean can influence the tropical Indian Ocean basin mode through the "atmospheric bridge process" which in turn regulates the changes in the tropical Indian Ocean circulation system.



Keynote Speech II

Sustainable mariculture development in Sri Lanka for a promising blue economy



Senior Professor Pathmalal M. Manage
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A blue economy has attracted wider global attention in a world where fertile and cultivable land is getting limited daily, and the global population is exponentially increasing. As most of you in this audience know, a blue economy is associated with the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems. It includes sectors that can be categorized into harvesting living resources such as fisheries and aquaculture, extracting non-living resources such as oil, gas, and minerals, generating new resources such as ocean energy, water desalination, marine bioeconomy, and trading marine resources such as marine transportation and tourism.

As an island nation blessed with living marine resources, mariculture is one of the key sectors that will facilitate sustainable growth and employment opportunities in a blue economy in Sri Lanka. Mariculture or marine aquaculture is the cultivation, management, and harvesting of marine organisms in their natural environment, ranging from estuarine, brackish, and coastal to offshore waters. The cultivation can be done in cages, rafts, or bottom cultures. Marine fish, crustaceans, molluscs, seaweeds and sea cucumbers are among the vast array of marine organisms farmed around the global coastlines. In addition to seafood, mariculture produces non-food products, including fish meal, agar, pharmaceuticals, jewellery (cultured pearls) and cosmetics.

According to statistics, mariculture is the fastest-growing food system in the world. Moreover, seafood has been recognized as the only alternative that can be produced on a large scale to face the diverse challenges of the food industry in the 21st century. Considering the global population growth and the patterns of aquatic food consumption, it is estimated that the world will demand approximately 83 million tonnes of aquatic foods in 2030, an increase of 37.5 million tonnes compared to 2004. Mariculture currently contributes approximately 51% of the global farmed aquatic production. However, a future demand of 42 million tonnes of global mariculture production is forecasted, leaving a great challenge globally.

Global mariculture production

In addition to meeting the global demand for seafood, mariculture systems will also meet the conventional objectives of aquaculture by supporting the alleviation of pressure on wild fish stocks,



which were under threat due to overfishing, marine pollution and habitat destruction. The ever-increasing global demand for seafood has driven the mariculture industry towards more intensive practices.

Opportunities, challenges and threats associated with mariculture

Mariculture operations can be re-defined as socio-economic activities that empower the coastal communities in rural regions by contributing to livelihoods and employment, poverty alleviation, and food security through local resources. On a large scale, mariculture operations can threaten marine biodiversity by destroying and degrading natural marine habitats. They may result in the accumulation of fish waste and excess feed (nutrient loading) leading to eutrophication and subsequent fish mortality outbreaks, accumulation of antibiotic residues in marine wastes leading to antibiotic resistance in pathogenic microbes, accidental escape of selectively bred and genetically improved farmed fish stocks to the natural marine environments creating genetic pollution and displacement of local and endemic fish stocks, and transmission of exotic diseases to wild fish stocks. In addition to these direct threats, the attraction of wild fish fauna to mariculture operations, such as mussel farms, has resulted in the attraction of commercially important large pelagic fish to fish farms, subjecting them to heavy fishing pressure. Marine aquaculture operations and their associated infrastructure can negatively affect the scenic beauty of the natural marine environments where they are located.

Having discussed the negative environmental impacts of mariculture operations, diseases are the greatest threat to global mariculture production. In most instances, they cause a massive economic loss to the industry. The spread of most infectious disease agents (e.g. marine viruses) through water currents has made it quite challenging to control contagious diseases despite stringent quarantine measures. Specific pathogen-free (SPF) and genetically improved stocks, enclosed, reduced water exchange, and increased water recirculating culture systems coupled with suitable biosecurity measures have been identified as more effective in disease control.

Potential for future development through research

Mariculture is an emerging industry with a greater scope for improvement through continuous research and technical development. In a context with an ever-increasing demand for seafood products, research is mainly focused on increasing mariculture production by enhancing the productivity and improving the quality of seafood products by identifying and combining production traits in fish and shellfish. Numerous applications of biotechnology are being researched and subsequently used to achieve this objective. This includes various genetic modifications such as the introduction/manipulation of additional genes other than the growth hormone (GH) to regulate the process of muscle growth, chromosome engineering to induce polyploidy (triploidy and tetraploidy) for better growth, endocrinological control of reproduction (sex control of fish), and uniparental chromosome inheritance (gynogenesis and androgenesis).

Furthermore, biotechnology has enabled the use of DNA barcoding for species identification and seafood labelling and the development of increased disease resistance through the use of DNA vaccines, rapid pathogen detection through conventional PCRs, real-time PCRs and monoclonal antibodies (mAbs), stimulation of non-specific defence mechanisms using microbial immunostimulants, use of DNA sequencing for characterizing pathogens (different species and strains of pathogens) and developing higher tolerance to abiotic changes.



Mariculture industry in Sri Lanka

In a recent post-war era and economic crisis, Sri Lanka has demonstrated promising progress in its emerging mariculture industry. With a coastline comprising mangrove ecosystems, shallow lagoons, bays and shallow areas that can be used for the mariculture industry, there is ample scope for future development and expansion of the mariculture industry in Sri Lanka. Mariculture will not only help Sri Lanka secure a stronger position in the global seafood export trade. Still, it will also strengthen the country's food security and will be a promising solution for the prevailing protein malnutrition in children in Sri Lanka.

Currently, the industry involves the mariculture of marine species dominated by shrimps, marine fish, seaweeds, oysters, fattening sea cucumbers, and mud crabs. According to the proposed Aquaculture and Culture-based Fisheries Sector Development Plan (2021-2025) of the National Aquaculture Development Authority of Sri Lanka (NAQDA), the expectation was to increase the mariculture production from 20,000 tonnes in 2020 to 60,000 tonnes in 2025.

Shrimp culture: The inability to meet the increasing demand of the seafood export market led to the initiation of mariculture in Sri Lanka, starting with brackish water penaeid shrimp culture. While shrimp farming in Sri Lanka was mainly concentrated in the North-Western coastal belt during the North-Eastern war, it was again expanded to the coastal areas of the Eastern Province of Sri Lanka with the conclusion of the civil war in 2009. While *Penaeus monodon* (black tiger shrimps) dominated the shrimp industry at the beginning, the white spot disease that significantly damaged the shrimp industry led to the introduction of *Litopenaeus vannamei* (Pacific white shrimp) by the National Aquaculture Development Authority (NAQDA) in the recent years to resuscitate the shrimp farming sector. The shrimp industry in Sri Lanka has developed into a stage where some shrimp farmers are now involved in organic shrimp farming.

Finfish culture: Since the initiative taken by NAQDA, a large-scale sea cage culture operation of sea bass farming has been happening in the Trincomalee Sea, creating livelihoods for the coastal communities through direct employment and reducing the pressure on wild stocks. In addition, milkfish fingerlings are produced as live bait for long-line tuna fishery.

Sea cucumber farming: NAQDA and the private sector are involved in sea cucumber farming. Currently, sea cucumber farming is operational in Mannar, Kilinochchi and Jaffna.

Seaweed farming: NAQDA and the participation of coastal communities facilitated seaweed farming in the Northern Province of Sri Lanka. The private sector is facilitating commercial operations through a buyback system. Currently, seaweed (*Gracillaria* spp.) culture is being carried out in the Northern part of the country.

Farming of edible oysters: Oyster farming (*Crassostrea madrasensis*) commenced in early 2000 at a tiny scale and has turned into a commercial-scale operation that exports cultured oysters. Despite natural oyster beds in Sri Lanka, studies carried out by NARA have identified the need for an efficient 'value chain' to develop the industry. At present, researchers from the University of Sri Jayewardenepura and researchers from the University of Sydney, Australia, are working closely with the industry to improve the market quality of oysters in order to expand the export market.

Recent developments in the mariculture industry in Sri Lanka



A recently concluded pilot project on **Marine Aquaculture Development in Sri Lanka (MADS)**, funded by Aus-Aid under the Knowledge and Linkages for an Inclusive Economy (KLIE) Grant Programme, prioritized farming of Indian backwater oysters, seaweeds, and Asian sea bass in Sri Lanka. The project positioned oysters as a top priority for value chain development.

Towards a sustainable mariculture industry in Sri Lanka

Sustainability is a dynamic concept that varies depending on the aquatic species farmed, the location of the aquaculture operation, etc. In general, there are key areas that need to be considered to ensure the sustainability of an aquaculture operation while making it profitable.

Proper zonal planning: According to feasibility studies conducted by distinct groups and organizations on sustainable mariculture development in Sri Lanka, zoning of coastal areas is essential for conducting sustainable mariculture operations. The zoning exercise should not be merely limited to a mapping procedure based on physical and geographical data. Still, it should consider information on other stakeholders' activities in the same areas. The planning should consider all potential sources of 'nutrient loads' such as agricultural operations and aquaculture operations that will affect the coastal area concerned and estimate the area's carrying capacity based on the maximum nutrient load that can be permitted without any adverse environmental impact. Moreover, it is essential to obtain information on water quality and its seasonal dynamics, environmental carrying capacities, present use and allocation of coastal resources, and existing conflicts pertaining to the area of concern.

Environment practices: Environmental practices are of top priority in maintaining sustainable aquaculture operations.

All efforts should be made to conserve mangroves and other wetlands that can be affected by the aquaculture operation. Measures taken to restore mangroves are critical when mangrove ecosystems are affected. Mangroves can absorb pollutants, purify water and enhance the environment's carrying capacity for the sustainability of the aquaculture operation. Establishing buffer zones, green belts, etc., alongside aquaculture operations, can improve resilience to sea level rise with additional benefits such as reducing soil erosion pressure on the environment.

Management and proper disposal of effluent of farming operations and water quality control, management of sediment and sludge, adequate use of fish feeds, integrated culture practices, and control of escapes from the farmed fish stock are factors that can minimize the damage created to the environment by farming operations. Studies conducted in Sri Lanka have indicated urgent revision of effluent quality standards for coastal water bodies to realize the objectives of sustainable mariculture development. While maintaining the water quality, problems related to sediment loading should also be prevented using suitable technology. Practising better management practices (BMPs) in all aspects of farm operations is essential. Adhering to BMPs from the site selection stage and pond construction will reduce the future negative impacts of the aquaculture operations and ensure their sustainability and profitability.

Community practices: It is equally important to adopt proper practices concerning the farming environment and the workers' community. The rights of the community need to be well-defined, and the workers of the farms should be made well aware of these rights and the sound management practices they need to adopt. The aquaculture operations should adhere to the laws and regulations,



consider workers' safety, and observe effective biosecurity and disease control systems while minimizing the use of antibiotics and pharmaceuticals.

Non-fed aquaculture vs. fed aquaculture: As discussed earlier, finfish cage cultures may accumulate fish waste and excess feed, leading to eutrophication. However, non-fed seaweed cultures and shellfish cultures do not produce waste organic matter and are not associated with any additional cost of feeding. Moreover, shellfish and seaweed production may contribute to controlling carbon emissions through carbon sequestration in shell production in shellfish and photosynthesis in seaweeds.

Use of biotechnology: Genetic engineering and selection of nitrifying and denitrifying bacteria in enclosed, recirculating marine culture systems benefit the sustainability of mariculture operations. Research has shown that using probiotics in hatchery and grow-out facilities for fish and shrimp facilitates maintaining a healthy environment. Commercial probiotics are used in mariculture to treat the culture water before and during stocking. Ozone applications are used for disinfection and general disease control in smaller hatcheries. Specific pathogen-free (SPF) and genetically improved stocks, biosecure systems such as enclosed, reduced water exchange and systems that increasingly re-use water also facilitate disease control in aquaculture operations.

Organic mariculture: In response to the consumer demand for more "natural" products with traceable ingredients that avoid additives, organic farming systems that address the negative environmental and social consequences of modern farming methods are gaining more popularity in global mariculture.

Integrated Mariculture and Integrated Multi-Trophic Aquaculture (IMTA)

The recent trend towards the development of Integrated Multi-Trophic Aquaculture, combining fish cultures with extractive aquaculture (seaweed and shellfish farming) is a promising approach to reducing mariculture's negative environmental impacts, thereby ensuring sustainability. IMTA makes farms more sustainable by providing secondary crops. Effluent resulting from land-based and open-water aquaculture operations can be utilized to give nutrients to seaweed cultures. Integrated mariculture operations support the increase of income, making them cost-effective and sustainable. Moreover, it removes significant nutrients from the oceans, reducing the harmful environmental impacts. *Ulva* and *Gracillaria* are two such commonly used biofilters. Aquasilviculture is another multi-purpose production system that allows fish production in a mangrove reforestation project.

Regulating the carrying capacity: Keeping stocking density and nutrient loading under the carrying capacity of water will promote the sustainability of the mariculture industry. Reducing feed wastage by increasing the stability, reducing the sinking rate of feed, and providing fish with an optimal feed size at different stages of development are all factors that will facilitate the reduction of nutrient loads in water.

Summing up, mariculture can contribute towards achieving several Sustainable Development Goals (SDGs) declared by the United Nations (UN) Organization, especially the goals of ending hunger, achieving food security, improving nutrition, ending poverty, ensuring healthy lives, promoting inclusive and sustainable growth, ensuring sustainable consumption and production and sustainable use of ocean and marine resources.



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Rapid survey on the diversity of macro invertebrates and avifauna in selected sites of the coastal zones of Dikkowita and Uswetakeiyawa, Western province of Sri Lanka

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Abstract

The intertidal zones of coastal regions represent highly diverse ecosystems that maintain ecological equilibrium. The study focused on assessing avifaunal and invertebrate diversity in selected sites of the coastal zones of Dikkowita and Uswetakeiyawa coastline and data were collected in September 2024. Avifaunal diversity was assessed from 6 am to 10 am using the point count method along 50 m long perpendicular transects while macroinvertebrate diversity was quantified at a depth of 30 cm through quadrats measuring 0.5 × 0.5 m, randomly placed within the transects. During the study period, 11 invertebrate species from the Dikkowita (7° 0'38.02"N 79°51'54.86"E, 7° 1'27.44"N 79°51'45.29"E) and 14 species from Uswetakeiyawa (7° 2'38.00"N 79°51'27.45"E, 7° 1'47.60"N 79°51'39.10"E) sampling locations were recorded with a high composition of Goose-barnacles (*Lepas sp*) in both locations utilizing various macroinvertebrates guides. Macroinvertebrates classes recorded from Uswetakeiyawa were, Gastropoda (4 environmental (4 species), Anthozoa (1 species), Maxillopoda (1 species), Malacostraca (1 species), and Bryozoa (1 species) with $H' = 1.4095 \pm 0.15$ while Dikkowita site recorded a diversity comprising Gastropoda (2 species), Bivalvia (5 species), Anthozoa (2 species), Maxillopoda (1 species) and Bryozoa (1 species) with $H' = 0.462 \pm 0.11$ with a community dominated by Little black horse mussel (*Xenostrobus pulex*) with a total of 1100 individuals becoming resilient to the environmental and anthropogenic disturbances. This low diversity could be attributed to heavy pollution, as plastics and polyethene deteriorate marine habitats, alter food webs, and cause physical and chemical stress to marine organisms. The Avifaunal species composition was higher in Uswetakeiyawa than in Dikkowita, with a Shannon-Wiener index of 1.44 ± 0.13 and Simpson index of 0.71 ± 0.03 with a greater prevalence of Large-billed crow (*Corvus macrorhynchos*) of family Corvidae. The higher bird species composition of Uswetakeiyawa is attributed to the presence of more prominent vegetation patches near the observation sites leading to an ecological dependency between avifauna and invertebrates with a well-established predator-prey association. This rapid assessment suggests long-term monitoring to evaluate the biodiversity status of coastal communities for further studies to safeguard the marine ecosystem

Keywords: Bivalvia, Dikkowita, Gastropoda, Macroinvertebrates, Uswetakeiyawa



**Stranding events of short-finned pilot whales (*Globicephala macrorhynchus*):
Morphological and molecular identification in Sri Lankan waters**

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Abstract

Marine mammals are highly significant, playing vital ecological roles in aquatic habitats around the world. Their body plans have undergone several structural alterations as a result of their adaptation to aquatic existence. Short-finned pilot whales (*Globicephala macrorhynchus*) are found primarily in tropical and temperate oceanic zones and known as one of the most social creatures in the world. The short-finned pilot whales move at greater speeds with groups of few individuals. However, this social life behaviors the biggest threat to their population declines and global mass stranding. Notable strandings have been reported in Sri Lanka; in 2020, a mass stranding of about 120 pilot whales near Panadura resulted in two fatalities. More recent events include the October 2023 at Kudawa Beach, Kalpitiya, where 11 whales were successfully rescued, but three died. Reports of single fatal strandings in 2023 and 2024 have been made. These incidents may be due to seasonal fishing patterns. The morphological and molecular-based techniques were used for the identification of stranded specimens. The morphological analysis was based on characteristics such as size and colouration. Key traits including shorter dorsal fins made distinguishing them from long finned pilot whales easier. Tissue samples were taken for molecular analysis, which require careful dissection because of the underlying layers of fat. A total of six genetic samples were collected: one from Panadura (2020), three from Kalpitiya (2023), one from Waskaduwa (2023), and one from Panadura (2024). Molecular identification was achieved through the generation of cytochrome b sequences, analyzed via the NCBI BLAST facility and confirming the presence of *Globicephala macrorhynchus*. Phylogenetic analysis of these sequences revealed four distinct haplotypes, with a high haplotype diversity ($Hd = 0.800$) and significant nucleotide diversity ($\pi = 0.32197$), showing considerable genetic variation within these sequences. This study highlights the value of molecular-based identification of stranded short-finned pilot whales and shows the necessity for ongoing monitoring to understand the factors contributing to stranding events. Further, data collection and analysis of information will be useful for future studies and conservation efforts which will be required for protecting this species.

Keywords: Cytochrome b gene, *Globicephala macrorhynchus*, Molecular identification, Short-finned pilot whales



Antioxidant and cytotoxic effect of methanol extract of *Xylocarpus granatum* seeds

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Abstract

Xylocarpus granatum is used as a medicinal plant in several countries from ancient times. *X. granatum* has been valued for its vast spectrum of therapeutic qualities. In traditional medicine, various parts of *X. granatum* are used to treat dysentery, cholera, fever, malaria, viral infection and cancer. Therefore, the present study aimed to assess the antioxidative and cytotoxic properties of methanol extract of *X. granatum* seeds. Approximately 50 grams of fresh seeds of *X. granatum* were collected from National Aquatic Resources Research and Development Agency (NARA) regional research center, Negombo, Sri Lanka and air-dried fully before grinding into coarse powder, then soaked in absolute methanol for 24 h. Residual methanol was removed using rotary evaporator by maintaining temperature below 40°C to yield 150 mg of extract from 50 g of plant material. Total polyphenols and flavonoids contents, free-radical scavenging capacity (1,1-diphenyl-2-picryl hydroxyl or DPPH assay) and total antioxidant capacity (2,2'-azinobis-3-ethylbenzothiozoline-6-sulfonic acid cation or ABTS⁺ assay) of the methanol extract were determined. The cytotoxic effect of the seed extract was assessed on MCF-7, a human ER-positive breast cancer cell line using Sulforhodamine B (SRB) assay. Results showed that the total polyphenol and total flavonoid contents of seed extract of *X. granatum* are 49.09±0.56 mg/mL and 151.50±1.76 mg/mL, respectively. Further, the extract exhibited the highest free-radical scavenging activity of 86% at 100 µg/mL and total antioxidant capacity with IC₅₀ value of 981 µg/mL for ABTS radical cation assay. However, the methanol seed extract exerted very low cytotoxic effect with IC₅₀ value of 1163 µg/mL on MCF-7 cells at 24 h post-treatment. In conclusion, the methanol extract of *X. granatum* seeds demonstrated promising free-radical scavenging and antioxidant capacities with mild cytotoxic potential on breast cancer cells, that could be contributed by the elevated levels of polyphenol and flavonoid contents. Further investigations are required to assess the cytotoxic potential of *X. granatum* seeds on different types of cancer cells throughout a range of exposure times.

Keywords: ABTS, Breast cancer, Free-radical scavenging capacity, Total polyphenols, *Xylocarpus granatum*



**Assessing sulfur pollution and ecological impact in marine ecosystems:
A case study of Crow island beach wetland park, Mattakkuliya in Sri Lanka**

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Abstract

This research investigates sulfur levels in water as part of a biogeochemical cycle study, focusing on the impact of sulfur pollution on coastal ecosystems at Crow Island Beach Park in September 2024. Two locations were selected considering accessibility, significant human activity, and various habitats, including small mangrove forests and coastal vegetation. The study documented diverse coastal habitats, plants, and animals such as water hyacinth, beach morning glory, and the Asian water monitor (*Varanus salvator*), all serving as indicators of high pollution levels. STAS 8601-70 standard titration method was applied to assess sulfur content and pollution levels. Several water samples were taken from two sites in the canal, from a closed water body (Site 1) and from an area near the sea (Site 2). The highest sulfur content was observed in the Site1 canal sample at the concentration of 2463mg/L. Further analysis revealed sulfur concentration of 2244 mg/L at site 2 indicating similar sulfur levels to site 2. This is likely due to human activities, particularly wastewater discharge, which introduces harmful sulfur compounds to the environment. These sulfur concentrations of 2463 mg/L & 2244mg/L in water represent a significant environmental threat, with potential consequences including acidification, toxicity to aquatic life, eutrophication, and contamination of soil and water. Typical freshwater holds about 20 to 630 mg/L of sulfur, and high concentrations of sulfur in water have significant environmental impacts health problems, mangrove habitat degradation, decreased biodiversity, and the production of hydrogen sulfide, which contributes to water acidification and nutrient overload, leading to eutrophication. These findings underscore the delicate balance of sulfur in coastal ecosystems and the urgency of conservation efforts. Immediate actions, such as reducing sulfur emissions, treating affected water to neutralize acidity, and restoring oxygen levels, are recommended to mitigate these harmful effects. The study stresses the importance of continuous monitoring and pollution control measures to preserve ecosystem health. Overall, it highlights the need for sustainable practices to protect coastal wetlands and maintain the sulfur cycle's balance. Further research is recommended to enhance understanding and develop effective strategies to mitigate sulfur-related pollution impacts.

Keywords: Coastal ecosystems, Ecological balance, Ecosystem pollution, Eutrophication, Sulfur cycle



Abundance and diversity of macrobenthos in selected dune slacks of the Manalkaadu sand dunes, Jaffna peninsula, Sri Lanka

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Abstract

Macrobenthic organisms play a crucial ecological role across diverse ecosystems, including wetlands, estuaries, marshlands, mudflats, and dune slacks. Their presence influences nutrient cycling, sediment stability, and trophic interactions, making them key indicators of ecosystem health and biodiversity. The present study was conducted to assess the diversity of the macrobenthos in the dune slacks in Jaffna Manalkaadu. Samples were collected in May 2024 from four distinct sampling locations, designated as Site A, Site B, Site C, and Site D. The area of slacks ranges from 100 m² to 2,250 m², with depths varying between 0.3 m and 1 m from the water surface. Samples were collected using a core sampler at a depth of 20 cm from the bottom of the slacks. Collected sediment samples were washed, sieved, and preserved in 10% formalin and Rose-Bengal for further laboratory analysis. Water quality parameters, including temperature, pH, electrical conductivity, total dissolved solids (TDS), and sodium chloride (NaCl) concentration, were measured using field water quality meters. A total of 1231 macrobenthos individuals/m² of five families were identified those were namely Planorbidae, Viviparidae, Ampullariidae, Neritidae and Thiaridae. At site A, 278 individuals of *Melanoides tuberculata* (family Thiaridae) were recorded, along with 762 unidentified juveniles. Site B contained 3 individuals of *Clithon oualaniense* and 131 of *Melanoides tuberculata*. Site C included 14 *Indoplanorbis exustus*, 12 *Bellamyia dissimilis ceylanica*, 3 *Pomacea canaliculata*, and one juvenile. At Site D, 6 *Indoplanorbis exustus*, 12 *Bellamyia dissimilis ceylanica*, 2 *Pomacea canaliculata*, and 7 juveniles were observed. A comparison of the study sites revealed that Site D exhibited the highest Shannon-Wiener diversity index (1.24), followed by Site C (1.07), Site A (0.58), and Site B (0.11). Additionally, Site D recorded the highest values for species evenness (0.87) and species richness (2.10). The results demonstrated significant variation ($p < 0.05$) in the total abundance of macrobenthos among the four sites. The measured water quality parameters across sites indicated NaCl concentrations ranging from 0.95% - 4.75%, pH levels between 6.56 and 7.97, TDS ranging from 76 to 1152(mg/L), and conductivity ranged from 395.5 to 2237.5(μ s/m). This study offers baseline data on the macrobenthos present in the Manalkaadu dune slacks.

Keywords: Diversity, Dune slacks, Jaffna, Macrobenthos, Water quality



Introducing an eco-friendly and biodegradable plastic spoon made from red seaweed *Gracilaria edulis*

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Abstract

Research is underway worldwide to develop edible cutlery as an eco-friendly, bio-degradable, and nutritious alternative to highly demanded single-use plastic cutlery, a major application of single-use plastic products (SUPPs), to reduce global plastic waste. The rising demand for plastic cutlery has caused the disposal of larger quantities of plastics, leading to contamination of natural ecosystems resulting in plastic pollution. Moreover, the SUPPs significantly contribute for global warming potential, triggering climate change. *Gracilaria edulis* is an ideal alternative for SUPPs due to its high agar content, nutritional value, biodegradability, and composability. This research focused on producing an edible yogurt spoon from red seaweed *G. edulis*, as an ecofriendly alternative to a single use plastic yogurt spoon. *G. edulis* is rich in nutritional content including dietary fiber, amino acids, carbohydrates, fatty acids, vitamins and minerals. The wet *G. edulis* seaweeds were collected from coastal waters of Jaffna, which were well washed and then dried in the sunlight. The prepared methodology involves extracting agar by boiling dried *G. edulis* seaweeds, creating bioplastic films from the extracted *G. edulis* agar, which are then layered to achieve the necessary hardness for cutlery, and finally the combined sheets are cut into appropriate yogurt spoon shape. The resulting spoons are both biodegradable and edible, suitable for consuming yogurt or other desserts. The spoon made from *G. edulis* is hard, durable, less soluble and can be consumed or disposed after use, with rapid biodegradation if discarded. In conclusion, this research proves applying seaweed-based bioplastics for the production of edible and eco-friendly cutlery. The product shows great potential for reducing plastic pollution and enhancing consumer health.

Keywords: Bioplastics, Edible spoon, *Gracilaria edulis*, Plastic pollution



A comparative study of floral diversity and abundance of salt marshes in four coastal sites-Chavakachcheri, Thanankilappu, Mandaitivu, and Baththalangunduwa in Sri Lanka

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Abstract

Salt marshes, although are vital for providing essential ecosystem services, frequently overlooked in conservation efforts, especially in Sri Lanka. The aim of this study was to assess and compare the floral diversity and species composition of salt marsh ecosystems across four coastal sites in Sri Lanka, namely Chavakachcheri (Site A: 9.65262499 N 80.1608955 E), Thanankilappu (Site B: 9.6258161 N 80.1413012 E), Mandaitivu (Site C: 9.631111 N 79.978861 E) in the Northern Province, and Baththalangunduwa (Site D: 8.499643 N 79.780505 E) in the North Western Province in Sri Lanka during September 2023 – August 2024. Data were collected using Belt Transects and Shannon-Weiner and Simpson Diversity Indexes were calculated. Analysis of Variance (ANOVA) test was conducted on the Shannon-Weiner Index values. Six salt marsh species were identified across all sites using available keys: *Suaeda maritima*, *Salicornia branchiata*, *Halosarcia indica*, *Sesuvium portulacastrum*, *Suaeda vermiculata*, and *Suaeda monaica*. All species were recorded in the Northern Province, while only *Suaeda maritima* and *Sesuvium portulacastrum* were recorded in the Northwestern Province. *Suaeda maritima* was the most prevalent species, found across all four sites in both provinces. *Suaeda maritima*, *Salicornia branchiata*, and *Halosarcia indica* were recorded at both Sites A and B, while Site C contained all six species. Site D, however, contained only *Suaeda maritima* and *Sesuvium portulacastrum*. Site C exhibited the highest Shannon-Weiner Index value of 1.608, indicative of diverse species composition, further supported by a relatively low Simpson Index of 0.3773, reflecting low dominance by any single species and suggesting that Site C has a more equitable distribution of species. Site A demonstrated a Shannon-Weiner Index of 0.8347 and a Simpson Index of 0.6892. In contrast, Site B recorded a lower Shannon-Weiner Index of 0.3247, accompanied by a high Simpson Index of 0.9056. Site D showed low diversity, with a Shannon-Weiner Index of 0.951 and a Simpson Index of 0.5334, reflecting limited species presence and lower evenness compared to the Site C. The results of the ANOVA test revealed a highly significant difference in biodiversity across the four sites (F-value = 7093.90, p-value < 0.0001). Protecting these habitats is essential for preserving biodiversity and maintaining the ecological services they provide, which contribute to the resilience of coastal communities. This study highlights the need for targeted conservation efforts to protect these valuable ecosystems.

Keywords: Belt transects, Biodiversity, Conservation, Salt Marshes



Tourist perceptions and development needs for sustainable tourism at Thalpe Beach, Sri Lanka: A pilot study

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Abstract

Being an island, coastal tourism in Sri Lanka (SL) plays a major role in its economy. Thalpe is an emerging tourist destination, located in the southern coast of Sri Lanka near Galle (5.9952°N, 80.2879°E) has a greater potential to be developed as a world-famous coastal destination and promote sustainable tourism practices. Thalpe area has rock pools which were carved by people to soak coconut husks for the coir industry during earlier periods. Eventually, the pools were abandoned, reclaimed by nature and colonized by diverse flora and fauna. However, there is a serious shortage of available scientific data which is crucial for informed decision-making and policy development in Thalpe. This research was done to fulfill the gap on available scientific data by investigating tourist perspectives and associated tourist activities at Thalpe beach, using a structured questionnaire with 22 questions. Data were collected through volunteer participation of tourists (n = 50) from 28th July 2024 to 4th August 2024. The data revealed that the majority (60%) of tourists visit the area was from the 20-30 age group and they visited mostly as family travelers (50%). Both local and foreign tourists are highly satisfied (100%) with the natural beauty of the destination, but most (62%) of them have lower satisfaction about the infrastructure facilities available within the destination. According to the results, 68% of them have spent below Rs. 10,000 which makes it a budget-friendly destination. Considering the results of this survey, this destination need to be developed to attract visitors willing to spend more, enhancing their experience while supporting local businesses and growth. This research is a part of an ongoing study and further investigations needed to broaden the findings.

Keywords: Blue economy, Coastal tourism, Sustainable tourism practices



Antioxidant potential of methanolic leaf extract from *Xylocarpus rumphii*, a critically endangered halophytes specie of Sri Lanka

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Abstract

This study investigates the antioxidant properties of the leaf extract of the halophyte *Xylocarpus rumphii*, also known as "Kontalam" or "Mudu delun", which is a member of the Meliaceae family and identified as a critically endangered mangrove species which primarily inhabits sandy natural rocky shores in the tropics. Generally, this halophyte plant displays unique adaptations to survive in harsh coastal environments and traditionally has been used for several medicinal purposes. The soft leaves are chewed and then swallowed, which is said to promote general well-being and strength to the body. Also, the leaves are boiled then the liquid is cooled and used as a wash to cure strong coughs. *X. rumphii* has been reported to possess many pharmacological potential bioactive compounds. The present study focused on the antioxidant activity of the methanol extract of the *X. rumphii* leaves using the 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. The samples were extracted using the rotary evaporator. Antioxidant activity is examined in the halophyte's methanol extracts using the DPPH assay across varying concentrations: 250 µg/ml, 125 µg/ml, and 62.5 µg/ml. The highest DPPH scavenging activity of the extracts were recorded as 73.95% at the concentration of 62.5 µg/ml. The extracts have demonstrated significant scavenging activity compared to controls and ascorbic acid, resembling the potential of the *X. rumphii* to be used as a natural source of antioxidants.

Keywords: Scavenging activity, DPPH assay, Antioxidant properties, *Xylocarpus rumphii* leaves



Isolation and morphological identification of microorganisms present in an activated sludge sample from a wastewater treatment plant

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Abstract

Activated sludge, a semi-solid material by product of wastewater treatment, consists of organic matter, microorganisms, and inorganic compounds. The microbial community within the sludge plays a crucial role in the treatment process. The study aimed to isolate and morphologically identify the microorganisms present in a sludge sample collected from the secondary clarifier tank of a Brewery wastewater treatment plant in Kaduwela, Sri Lanka. A sample of activated sludge was collected aseptically for microbial analysis, which included the isolation of bacteria, fungi, and cyanobacteria. Physiochemical parameters, such as pH, temperature, electrical conductivity, total dissolved solids, and salinity, were tested onsite. Microbial isolation was performed using the serial dilution method, followed by selective plating on Nutrient Agar (NA) for bacteria, Blue-Green (BG-11) agar for cyanobacteria, and Potato Dextrose Agar (PDA) for fungi. The spread plate technique was used to evenly distribute 100 μ L of sludge samples. The plates were incubated at 37°C, with BG-11 plates exposed to a light intensity of 2000 lux. After colony formation, pure cultures were obtained using the streak plate method. Bacterial isolates were classified based on Gram staining, while fungal isolates were identified using Lactophenol Cotton Blue staining. Cyanobacteria were observed directly under a compound light microscope due to their inherent blue-green pigmentation. The results showed a diverse microbial community, including both gram-positive and gram-negative bacteria, which is typical in wastewater systems where microorganisms degrade organic and inorganic compounds. The fungal population mainly consisted of *Saccharomyces spp.*, a yeast species capable of fermenting sugars and contributing to the breakdown of organic matter in the sludge. However, no cyanobacteria were observed, likely due to the anaerobic and/or low-light conditions in the secondary clarifier tank, which are unfavorable for their survival. The findings highlight the importance of microbial diversity in wastewater treatment systems, where bacteria and fungi play a significant role in pollutant degradation. The absence of cyanobacteria aligns with the environmental conditions in the sludge sample, suggesting that their growth is limited by light availability and competitive interactions within the microbial community. This study provides valuable insights into the microbial community of sludge in a brewery wastewater treatment plant. Further studies are needed to molecularly identify these microorganisms and analyze their biochemical mechanisms in wastewater treatment.

Keywords: Microbial isolation, Sludge, *Saccharomyces spp.*, Brewery wastewater treatment, Gram staining



Preliminary Study on zooplankton abundance and diversity in Pallikkudawa Bay, Southern Sri Lanka

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Abstract

This study assessed the zooplankton assemblages in Pallikkudawa Bay, Sri Lanka, during the northeast monsoon to understand spatial variations in zooplankton abundance, taxonomic composition, diversity, and richness. Zooplankton samples were collected horizontally, using a plankton net (mesh size = 150 μm) from six stations with an outrigger canoe equipped with an outboard motor (at ~ 2 knots speed) during daytime hours, then preserved in 4% formalin. Diversity indices, including the Shannon-Weiner diversity index (H'), Margalef richness index (D), and Pielou's evenness (E), were used to analyse community structure and distribution of different zooplankton orders. Twelve zooplankton orders were identified through morphological characteristics, with Cyclopoida (50.56%) dominating the population, followed by Calanoida (70.45%), and other notable groups such as Sessilia (7.09%), Decapoda (3.09%), Cladocera (2.36%), and Harpacticoida (2.11%). Station 3 recorded the highest zooplankton diversity ($H' = 1.73$), likely due to favorable ecological and environmental conditions, while Station 1 showed the greatest richness ($D = 0.95$). Station 4 consisted with the highest evenness ($E = -1.86$) while Station 1 recorded the lowest evenness ($E = -25.81$). Findings from this study provide baseline data for future research. Further studies could improve accuracy by identifying zooplankton to lower taxonomic levels through molecular methods, in addition to morphological identification. Incorporating physico-chemical parameters and seasonal monitoring across monsoon and inter-monsoon periods would further enhance the ecological understanding of zooplankton dynamics in Pallikkudawa Bay.

Keywords: Zooplankton, Pallikkudawa Bay, Shannon-Weiner index, Morphological identification, Sri Lanka



Integrating community-based conservation and technological interventions for sustainable coastal and marine environmental management: A Sri Lankan perspective

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Abstract

The administration of coastal and marine ecosystems in Sri Lanka faces significant challenges arising from rapid urbanization, climate change, and overfishing practices, thereby necessitating comprehensive strategies that harmonize ecological sustainability with economic progress. This research initiative aims to examine the effectiveness of combining community-led conservation efforts with technological advancements to enhance sustainable management practices. The objectives include evaluating existing management frameworks and identifying socio-economic and environmental factors influencing coastal areas in Sri Lanka. The qualitative approach was adopted, incorporating interviews with stakeholders, including local inhabitants, fishermen, and conservation practitioners. Geographic Information Systems (GIS) and remote sensing technologies were employed to identify vulnerable coastal zones and assess environmental changes over time. Principal findings suggest that, although current regulatory frameworks lay a foundation for coastal management, challenges in execution, such as inadequate enforcement, limited community engagement, and financial constraints, hinder effective conservation efforts. The research underscores the importance of integrating traditional ecological knowledge with modern technological tools to foster informed decision-making and enhance community participation in conservation undertakings. Moreover, capacity building is essential to enable local communities to adeptly utilize these technologies, thereby ensuring resilience against environmental changes. The implications of this research are critical for policymakers, offering actionable insights into the development of targeted environmental policies that promote sustainable coastal management. By emphasizing the relationship between community involvement and technological innovation, this study contributes to a more profound understanding of sustainable practices that can be replicated in similar contexts worldwide. The research highlights the necessity for integrated management strategies that combine community engagement with technological innovations to address the challenges faced by Sri Lanka's coastal ecosystems. The study recommends enhancing capacity building for local communities to utilize modern technologies effectively and fostering collaboration among stakeholders to ensure sustainable practices and improved biodiversity conservation. Ultimately, fostering collaboration among stakeholders will enhance biodiversity conservation while strengthening local livelihoods, thus paving the way for a more sustainable future for Sri Lanka's coastal ecosystems.

Keywords: Community-based conservation, Technological interventions, Sustainable management, Coastal ecosystems, Sri Lanka.



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Preliminary study on sea turtle nesting patterns in the coastal areas of Colombo district, Sri Lanka

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Abstract

Sea turtles face numerous threats to their survival, including natural predators, environmental factors and human-induced impact such as poaching. The objectives of this research were to analyze the common nesting locations at the three key sites and assess the influence of natural and human induces on sea turtles. The sea turtle patrolling spanned over 79 days with exceptions made for adverse weather conditions. Turtle patrolling was conducted nightly along the beach and recorded nesting attempts, identified species and collected data on nest size, success rates and hatchling emergence. The sampling and conservation of turtle eggs and hatchlings were handled with care and adherence to strict protocols, under coast guard supervision and followed best practices in ex situ conservation to minimize disturbance. *Lepidochelys olivacea* were the only species encountered during the patrols. The total number of collected nests for each patrolling area includes 6803 eggs in Dehiwala North and South, 6230 eggs in Mount Lavinia and 1171 eggs in Wellawatte. Turtle nesting did not consistently depend on lunar Phases. In January, a high number of nests were found during the full moon and new moon periods while in February, turtle nesting was evenly distributed, with fewer nests observed during the full moon. By March, there was a dramatic decline in nesting following a spike during the third quarter moon phase. In January, the average number of eggs per nest in Dehiwala, Mount Lavinia, and Wellawatte were 106.26, 110.32, and 125.71, respectively. In February, the average slightly decreased in Dehiwala (104.43) but it increased in both Mount Lavinia (112.81) and Wellawatte area (145.5). However, in March, the average number of eggs per nest in Dehiwala decreased to 99, while in Mount Lavinia, the value slightly increased up to 113.75. However, there was no data recorded at Wellawatte area in March. Additionally, urbanization, coastal light pollution and coastal erosion were found to reduce nesting activity. These findings will underscore the importance of mitigating human impacts and enhancing conservation strategies to protect sea turtle populations providing a framework for future conservation efforts.

Keywords: Sea turtles, Nesting, Conservation, Environmental factors, Human induces



Effects of *Terminalia catappa* leaf powder suspension on growth, survival rate and water quality of *Labeo rohita* fish fry

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Abstract

The application of *Terminalia catappa* leaves is a well-known eco-friendly approach in the aquaculture industry. Low survival rate and poor growth are major challenges during the fry stage of *Labeo rohita* production. Application of *Terminalia catappa* leaves on the production of *Labeo rohita* fry is scarce in Sri Lanka. The present study aimed to identify the effects of introducing leaf powder suspension to the rearing tanks on survival rate, growth and water quality enhancement in an intensive hatchery process. Study was conducted at the research facility of the Udawalawa National Aquaculture Development Authority of Sri Lanka (NAQDA). Nine cement tanks (0.86 m×0.70 m×0.26 m) were used for an experimental setup with two treatments and control, each stocked 15 fries and fed with commercial feed. Fallen leaves were oven-dried, grounded and sieved to obtain leaf powder (below 0.5 mm in diameter). Leaf suspensions were prepared as treatments 1 (T1) and 2 (T2) by mixing dried leaf powder in water for five minutes at 100^oC and room temperature respectively. Considering the water volume powder suspensions were introduced to the rearing tanks to maintain the concentration at 0.05 g/L for the period of 5 weeks. The body weight, total and standard body length were measured weekly, and the survival rate of fry was determined at the end of the experiments. Water quality parameters (pH, DO and temperature) were recorded daily. Significant changes were found in body weight, total length and standard length with time and treatment. The time × treatment interaction was significant. (repeated measure ANOVA, $p < 0.05$). Significant differences were found with time ($p < 0.05$), The time × treatment interaction was not significant in all water quality parameters (repeated measure ANOVA, $p > 0.05$). Growth was significantly higher in T1 and T2 compared to control. This study demonstrates the positive impact of *Terminalia catappa* leaf powder suspension on the growth and survival of *Labeo rohita* fry, with T1 showing the highest survival rate (93.3%). The methodology is well-designed, with statistically significant results validating the findings. However, exploring the optimal concentration of leaf powder and its long-term effects on water quality would provide more comprehensive insights for sustainable aquaculture practices.

Keywords: *Terminalia catappa* leaf, *Labeo rohita*, Kottamba, Rohu, Growth and Survival



Influence of water quality on inland fish production: A case study in the Magalla reservoir in the Northwestern province of Sri Lanka

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Abstract

The study was conducted in a freshwater reservoir called Magalla in Nikaweratiya, Northwestern Province, Sri Lanka. When talking with fishermen they said that the present fish catch is lower than the past. There are lots of pollution sources associated with the reservoir. Therefore, the study aimed to assess how the water quality directly affects the fish abundance in each sampling site. Four sampling sites, site 1 with domestic waste, site 2 with soap and detergents, site 3 with urban runoff, and site 4 was the area with minimum disturbances (reference site) were selected to conduct the study from May to December 2023. Standard methods were used for in situ water quality parameters; water temperature by mercury-in-glass thermometer. Dissolved oxygen concentration (DO), pH, total dissolved solids (TDS), electrical conductivity (EC), and salinity by calibrated multi-parameter. Water transparency by Secchi disk (20 cm diameter). 6 replicates were taken for each parameter. Fish species and abundance data were obtained from a questionnaire survey given to 39 fishermen. Data was analyzed using appropriate statistical tests. During the study period, 18 fish species belong to 9 families; 1 in Anabantidae, Gobiidae, Heteropneustidae, Mastacembelidae, Siluridae, and Osphronemidae, 2 in Cichlidae and Channidae, and 8 in Cyprinidae were observed based on fishermen catch. The fish abundance at sites 1, 2, and 3 significantly differed from the reference site with each site showing unique abundance levels and Water quality parameters across sites 1, 2, and 3 significantly differed from the reference site, except for temperature at site 2 and pH at site 3 (Kruskal Wallis test followed by Mann-Whitney U test, $P < 0.05$). According to the results of PCA transparency, TDS, and temperature were high in sampling sites 1 and 2 where the fish abundance was average, conductivity and salinity were high in sampling site 3, where the fish abundance was lowest, DO and pH were suitable range in the site 4 where the fish abundance was highest. The present study provides baseline data on the water quality and fish abundance in the Magalla reservoir, Sri Lanka. Therefore, continuous reservoir water quality monitoring is important for sustainable fish production.

Keywords: Domestic waste, Fish abundance, Freshwater, Pollution, Urban waste



Selection of suitable culture medium to enhance the propagation of *Taxiphyllum barbieri* (Javamoss)

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Abstract

Java moss (*Taxiphyllum barbieri*) is a popular aquatic plant used in terrarium and aquascaping. Optimizing growth conditions for Java moss is critical for improving its commercial viability and use in aquariums. Java moss is a slow-growing aquatic plant. Which has a high demand in the local market but a lack of supply to meet the high demand. Hence, the scope of this study was to identify the most effective culture medium for enhancing the propagation of Java moss. The study was assigned three treatments and a control, (T1-dried *Azolla*, T2-dried Duckweeds and T3- activated Charcoal) under controlled light and temperature conditions with three replicates. The experiment was conducted over 60 days, Growth rates were measured every week, and the health of the moss was assessed through chlorophyll content. The moss was sprayed with artificial liquid fertilizer fortnightly. Significantly high plant height was shown by dried Duckweeds (0.80 ± 0.05 cm) followed by T1, T3 and C. The highest chlorophyll concentration is also observed in T2 (0.95 ± 0.01) and it is numerically different from other treatments and control (0.65 ± 0.02). Results indicated that Javamoss propagated most effectively in the dried Duckweed medium, showing a 15% increase in dried duckweed compared to the other media. The dried *Azolla* provided moderate growth, while the activated charcoal substrate resulted in the slowest propagation. These findings suggest that dried duckweed mediums offer a more favorable environment for Java moss propagation compared to dried *Azolla* and activated charcoal substrates. This study provides insights for aquarists and commercial growers aiming to optimize Javamoss cultivation, ultimately contributing to more efficient production methods.

Keywords: *Taxiphyllum barbieri*, *Azolla*, Aquascaping, Terrarium



Comparisons of territorial behaviors of *Pomacentrus similis* allen, 1991; (Similar Damsel) in captive conditioned maintained in marine mesocosms and natural reef environment

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Abstract

Reef fish display a range of complex behaviors in natural habitats, yet direct observation is often challenging, making mesocosm systems essential for behavioral studies. This study examined the territorial behaviors of *Pomacentrus similis* Allen, 1991 (similar damselfish), an inquisitive species known for behaviors such as hiding, aggression, and defense. The study compared the territorial behavior in both a controlled marine mesocosm aquarium and a natural reef environment in Hikkaduwa. A mesocosm system was conditioned for one month before introducing four *P. similis*, allowing two weeks for adaptation and allowing them to establish individual territories within the mesocosm. In the natural setting, ten randomly selected *P. similis* were observed, with territories marked by dropping lead weights every 30 seconds over 20-minute sessions to delineate their boundaries. Analysis revealed a positive correlation ($p < 0.05$) between fish length (cm) and territorial area (cm²) across both environments, with high regression fits ($R^2 = 93.51\%$ in mesocosms; $R^2 = 81.01\%$ in the wild). The mean territory size \pm SD was nearly two times significantly smaller in the mesocosm environment (2450 ± 806 cm²) the natural habitat (4319 ± 1774 cm²), likely due to resource limitations and lack of adequate space. However, they maintained non-overlapping territories within the mesocosm. Results indicate that the territorial area expands with fish size in both settings, reflecting environmental constraints and spatial resource availability. The study of damselfish territorial behaviors is essential for understanding and preserving the intricate balance of coral reef ecosystems since this behavior helps to keep the good health of coral reefs as fish protect some corals from predators and manage algae growth supporting the biodiversity and its aesthetic view.

Keywords: *Pomacentrus similis*, Mesocosm, Captive, Territorial behavior, Hikkaduwa



Contribution of co-management platforms to address issues related to sustainable management of resources in small-scale fisheries

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Abstract

Sri Lanka's fisheries sector plays a crucial role in nutrition, food security, employment generation, foreign exchange earnings, and poverty alleviation. Co-management, a collaborative approach of partnership involving fishermen, government agencies, and other stakeholders, has been widely recognized as an effective strategy for ensuring sustainable fisheries management. This study investigates how existing co-management platforms established by the Department of Fisheries and Aquatic Resources contribute to addressing the challenges associated with sustainable resource management in the coastal fisheries sector. Key issues of sustainable fisheries management as identified in a previous study conducted during 2018- 2019 by the Sri Lanka Forum of Small-Scale Fisheries formed the major foundation of this study, i.e.; destructive fishing practices, coastal pollution, poor post-harvest fish handling, inadequate resource conservation efforts, and increased fishing pressure. In the present study, a structured questionnaire was administered to 115 fishermen from six Fisheries Management Committees in the Chilaw and Puttalam Fisheries Management Areas. Fishermen's responses were rated on a Likert scale of 1-5, with 5 indicating the highest contribution. Both descriptive statistics and parametric hypothesis tests were employed to assess the effectiveness of Fisheries Management Committees in addressing these challenges. The Z score was calculated and compared with the tabulated Z score for the 0.05 significance level to test the hypothesis. The study found that co-management programs have had a moderate overall impact (around 62.9 %) in addressing challenges associated with sustainable resource management. However, the contribution towards controlling the use of destructive fishing gear and preventing coastal pollution has been relatively higher with mean Likert score values of 3.7 and 3.5 respectively. The contribution has been low in respect of controlling the increase in fishing pressure and dealing with poor concerns in protecting resources with lower mean Likert score values of 2.5 and 2.8 respectively. These results suggest that the existing co-management platforms do not adequately address the issues associated with the sustainable management of resources, which is the most important expectation of co-management. The study recommends initiating awareness campaigns to educate participants of co-management programs on the importance of addressing major sustainability issues.

Keywords: Sustainable resource management, Co-management, Small-scale fisheries,



Heavy metal pollution and its awareness among fishing communities in Matara district, Sri Lanka

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Abstract

Urbanization and industrialization have made heavy metal contamination in food a global issue. Dietary intake is the primary source of heavy metals entering the human body. Fish are consumed by humans because of their protein content and due to that reason fish can serve as a potential source of heavy metal accumulation in the human food chain. In Sri Lanka, species that are often contaminated with heavy metals, are sold and consumed without any testing. This study aimed to assess the awareness of heavy metal contamination among fishing communities in Matara District. Data were collected randomly from fishermen involved in long-line fisheries (n=72) at three fishery harbors (Dondra harbor, Mirissa harbor and Kottegododa harbor) in Matara District. A semi structured questionnaire was designed to extract data from fishermen regarding market strategies and their knowledge of the effects of heavy metals. Half of the sample respondents had a high level of awareness of ocean pollution and its effects on human health. Despite the knowledge of ocean pollution, the majority of the fishing community (97.22%) was not aware of heavy metal contamination in fish, and nobody knew the potential health effects on human beings due to the consumption of heavy metal-contaminated fish. They were not trained or given information about heavy metal and heavy metal contamination on fish species and the majority of the fishermen (63.89%) showed little interest in participating in heavy metal contamination awareness programs, while 13.89% were moderately interested, and 22.22% were not interested at all. A study revealed that only about 2.78% of the communities surveyed were aware of the heavy metal contamination in fish. Lack of education on heavy metals and their health risks as well as limited information on the subject could be the reasons for that. Therefore, developing legislation, introducing fish testing stations for heavy metals before reaching the market, and implementing educational programs on heavy metal contamination in fish could be recommended to ensure food safety in Sri Lanka.

Keywords: Awareness, Food safety, Heavy metal, Human health risk, Sri Lanka



Use of ex-situ asexual propagation technique for culturing of *Stichodactyla haddoni* (Carpet Anemone)

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Abstract

Sea anemones, fascinating marine organisms found in coral reef areas, hold significant ecological and economic importance. However, their populations are facing a decline due to excessive fishing activities driven by both domestic market demands and exports. To combat this decline, it is essential to implement restocking efforts and promote environment-friendly aquaculture using asexual reproduction methods. Previous experiments on *Entacmaea quadricolor* have shown the effects of feeding on size and recovery, but they have not quantified the survival and growth rates of *S. haddoni* under various factors like cutting terms and living substrate. This study investigates the survival and growth rates of *S. haddoni* using two cutting methods and three substrates: coral sand, live rock, and sand, along with the effect of external feed. Anemones were initially drained for 2-3 minutes, then cut from mouth to pedal disk with a disinfected blade. After a 24-hour antibiotic treatment, they were placed in a specialized tank with the chosen substrates. The first cutting method resulted in a higher number of individuals, with a mean survival rate of 81.25% on coral sand, compared to 75% for the second cut, despite the absence of external feed. Growth rates (g/day) varied by treatment: no cut (0.065 ± 0.148) > second cut (0.044 ± 0.038) > first cut (0.041 ± 0.078). Notably, larger initial weights lead to decreased growth rates. With external feed, the mean survival was highest on coral sand (87.5%), followed by sand (81.25%) and live rock (68.75%). When external feeds were absent, individuals on sand demonstrated superior mean survival percentage (75%) compared to coral sand (62.5%) and live rock (68.75%). Overall mean growth rates of the animal were highest with external feed in the sand (0.138 ± 0.002), then the coral sand (0.101 ± 0.035) and the lowest with live rock (-0.056 ± 0.056). Conversely, without external feeds, sand exhibited higher overall growth (0.052 ± 0.298) compared to live rock (0.041 ± 0.049) and coral sand (0.003 ± 0.078). This study will help to develop strategies for replenishing populations of *S. haddoni* and conserving their habitats, offering valuable insights into the conservation and sustainable management, benefiting both marine ecosystems and the communities that depend on them.

Keywords: Ex-situ propagation, External feeds, Sea anemone, Survival rate, Growth rate.



Identification of *Enterocytozoon hepatopenaei* (EHP) carrier species in shrimp pond environment in Northwestern province of Sri Lanka

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Abstract

Enterocytozoon hepatopenaei (EHP) is an emerging disease of farmed shrimp in Sri Lanka caused by a microsporidian fungal parasite. Stunted growth, soft shells, lethargy, and white faeces are the common symptoms of the infected animals. The spread of this microsporidian parasite may primarily be associated with the presence of macrofauna that serves as carriers of EHP. The comprehensive evaluation of EHP in potential macro fauna carriers was carried out in the farming ponds of *Penaeus vannamei*. A total of seventy (70) potential macrofauna carriers: crabs (20), krill (20) & gastropods (30), that coexist with shrimp in ponds and surrounding areas were collected & screened by polymerase chain reaction (PCR) assay to identify EHP-positive animals. The commercially available IQ2000™ EHP Detection and Prevention System (Gene Reach/ Taiwan), was used for the PCR assay. The findings revealed 92.85% of the EHP prevalence in all three species confirming them as potential carriers for EHP disease. Among them, 95% of the highest prevalence was reported in crabs and 93.33% of the second highest prevalence was reported in gastropods. In the ponds where shrimp samples tested positive for EHP, the carrier species were also found to be positive for EHP, confirming a link between the presence of specific carrier species (EHP positive) and the occurrence of diseases in the shrimp population. Variations in the water quality parameters such as DO, salinity, and total ammonia influenced the prevalence of EHP among the identified carriers. The findings suggest that macrofauna species: crabs, gastropods and krill in shrimp ponds could be potential transmission vectors for EHP disease in shrimp culture. Thus, it is crucial to develop biosecurity measures such as Utilize strict quarantine procedures for new stock & disinfection of equipment, to control these macrofauna species in the shrimp pond culture system to minimize the disease spread and mitigate the impact of EHP on the shrimp farming system.

Keywords: EHP, Carrier species, PCR, Prevalence, *Penaeus vannamei*.



Possibility of making herbal tea from *Acanthus ilicifolius*

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Abstract

Herbal teas, known for their health benefits and diverse flavors, have garnered significant attention. This study focuses on developing and evaluating a new *Acanthus ilicifolius* herbal tea, enhanced with four distinct flavors—cardamom, cinnamon, ginger, and vanilla—along with a non-flavored control. The objective was to assess the chemical composition, microbiological safety, and sensory attributes of the formulated teas. Standard methods were employed to measure water extract percentage, total ash content, and microbiological safety. The water extract percentage was found to be 30%, and total ash content varied across formulations, with an optimal value of 7%. Microbiological analysis showed an aerobic plate count of 8000 cfu/g, yeast and mold counts of 900 cfu/g, and the absence of *E. coli* and *Salmonella*, indicating that the teas met microbiological safety standards. Sensory evaluation, conducted by 50 participants using a 5-point hedonic scale, revealed that the cardamom and cinnamon-flavored teas were the most preferred, while the non-flavored tea received lower ratings. These results suggest that *Acanthus ilicifolius* herbal tea, particularly with cardamom and cinnamon flavors, holds strong commercial potential due to its favorable sensory attributes and microbiological quality. Further research is recommended to optimize flavor concentrations and explore additional health benefits.

Keywords: *Acanthus ilicifolius*, Herbal tea, Sensory evaluation, Chemical analysis, Microbiological safety, Total ash content.



Enhancing microalgal productivity through probiotic intervention: a study on the impact of probiotics on *Nannochloropsis* sp.

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Abstract

Microalgae play a fundamental role in the aquatic food web and serve as a primary resource for culturing varied aquatic organisms like mollusks, shrimp, and fish across different developmental stages. Bacteria, as crucial components of microbial communities, influence the growth and physiology of microalgae through nutrient cycling, quorum sensing, and the secretion of bioactive compounds. Conversely, microalgae contribute to the microbial consortium by providing organic carbon sources and creating microenvironments conducive to bacterial colonization. Among the several strains available, *Nannochloropsis* spp. are widely used in marine hatcheries as a food source and to maintain water quality. This study aimed to assess the impact of commercial probiotic bacteria on the productive response of *Nannochloropsis* sp. microalgae cultured in Walne's media. Two treatment groups, Treatment 1 [T1] (5 ppm) and Treatment 2 [T2] (10 ppm) were compared to a control [C] group supplemented only with Walne's media. The experiment was triplicated and maintained at 25°C with 150 $\mu\text{Em}^{-2}\text{s}^{-1}$ light intensity with a 24-hour photoperiod. At day 6, T 2 demonstrated a significantly higher ($p < 0.05$) specific growth rate (1.13 ± 0.003), chlorophyll content ($128.89 \pm 6.77 \mu\text{g l}^{-1}$) and absorbance (0.93 ± 0.047) compared to T1 and C. Results revealed that a greater productive response of *Nannochloropsis* sp. cultured with a 10 ppm probiotic concentration. In conclusion, it can be suggested, a positive interaction between probiotic bacteria and *Nannochloropsis* sp., has the potential for enhancing microalgal productivity through probiotic intervention.

Keywords: *Nannochloropsis*, Microalgae, Probiotics, Optical density, Biomass



Assessment of vegetative propagation methods for the mangrove species *Lumnitzera racemosa* and *Rhizophora apiculata*

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Abstract

Mangrove forests are vital ecosystems providing numerous ecological services, including coastal protection, biodiversity support, carbon sequestration, and water quality improvement. However, they face severe global degradation and threats, primarily due to anthropogenic activities. Restoration and propagation efforts are essential for protecting and rehabilitating these valuable ecosystems, ensuring their long-term ecological and socio-economic benefits. This study investigated the effectiveness of two vegetative propagation methods—air layering and stem cuttings, targeting the mangrove species *Lumnitzera racemosa* and *Rhizophora apiculata*. These species were chosen for their ecological and functional importance. *Lumnitzera racemosa*, a rare mangrove species, is crucial for biodiversity conservation, as it supports unique habitats and contributes to ecological balance in coastal zones. *Rhizophora apiculata*, plays an essential role in shoreline stabilization, sediment retention, and carbon sequestration, making it invaluable for climate change mitigation. The propagation methods were selected based on their practical application and potential for large-scale use in mangrove restoration. Air layering, widely used for woody plants, involves making precise cuts on healthy branches, applying the rooting hormone Indole-3-butyric acid (IBA), and enclosing the treated sections in a moist medium to promote root development under controlled conditions. Stem cuttings were chosen for their simplicity, cost-effectiveness, and widespread applicability, involving direct planting of cuttings into a growth medium. Results highlighted significant differences between the methods. Air layering achieved a 50% success rate in *Lumnitzera racemosa*, producing well-developed root systems. In contrast, stem cuttings failed to initiate significant rooting in both species. Additionally, *Rhizophora apiculata* did not respond positively to either method, indicating a need for alternative propagation strategies tailored to its unique physiological requirements. Environmental factors such as moisture levels, rooting stimulant application, and species-specific traits were critical in influencing rooting success. Notably, root formation in *Lumnitzera racemosa* was also observed in control groups without rooting hormones, suggesting the potential for developing cost-effective, hormone-free propagation techniques. In conclusion, air layering proved effective for *Lumnitzera racemosa*, while both methods were ineffective for *Rhizophora apiculata*. Further research is essential to refine these techniques and develop species-specific approaches, ultimately contributing to resilient mangrove restoration efforts and addressing challenges in ecosystem recovery.

Keywords: Mangrove Restoration, *Lumnitzera racemosa*, *Rhizophora apiculata*, Vegetative Propagation, Air layering



Assessment of phytoplankton diversity and abundance of a 5-year-abandoned granite quarry pond: A pilot study in Pokunuwita, Western province, Sri Lanka

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Abstract

The scarcity of freshwater sources poses a significant challenge to extensive aquaculture practices, highlighting the need for alternative water resources. This study explores the potential of a 5-year-abandoned granite quarry pond for aquaculture, evaluating its suitability based on the abundance and diversity of phytoplankton. The quarry, characterized by its impermeable granite lining and basin-like structure with 5 separated ponds that interconnect together in the rain-fed season, has evolved over time into a diverse biological ecosystem. In September 2024, phytoplankton samples were taken from only two accessible locations over three weeks, with three samples taken from each location. Lugol's solution was used to preserve the samples, and phytoplankton was identified at the lowest taxonomic level, counting in a Sedgewick-Rafter chamber under the light microscope. A total of 27 phytoplankton species were identified across six algal classes from both sites: Chlorophyceae, Zygnematophyceae, Bacillariophyceae, Cyanophyceae, Florideophyceae, and Ulvophyceae. Species abundance varied between sites, with *Desmidium* contributing 12.94% at Site 01 and *Gomphosphaeria* dominating Site 02 with 24.33%. Other abundant taxa included *Sphaerocystis* (17.30%) and *Spirogyra* (14.91%), while moderate contributors such as *Scenedesmus* (3.23%), *Microspora* (2.95%), *Pediastrum* (5.49%), and *Cosmarium* (4.50%) were also observed. Less abundant species included *Closteriopsis* (1.83% each), *Euastrum*, *Closterium*, and *Actinastrum* (1.27% each), and rarer taxa such as *Staurastrum* (0.14%), *Mougeotia*, *Haplotaenium*, *Zygnema*, *Audouinella*, and *Chlorococcum* (0.28% each). Site 02 demonstrated the highest total abundance (421 individuals out of 711) and species richness (27 species), with a higher Shannon-Wiener diversity index ($H = 3.14$) and Margalef's species richness index ($SR = 4.30$) compared to Site 01 ($H = 2.12$, $SR = 2.29$). Indicator phytoplankton species like *Cosmarium*, *Sphaerocystis*, *Spirogyra* and *Desmidium*, found in the study suggest that quarry pond harbors a mesotrophic aquatic ecosystem with high phytoplankton diversity and ecological richness, free from heavy metals such as aluminum and zinc, making it a promising candidate for aquaculture that suggests supporting sustainable fish production by leveraging their natural productivity, offering a resource-efficient solution for aquaculture in freshwater-scarce regions. However, since this is a pilot study, it is recommended to do further studies and continuous monitoring of water quality parameters and heavy metals in biota and sediments.

Keywords: Abundance; Aquaculture; Diversity; Granite quarry; Phytoplankton



Bioremediation of synthetic textile dyes using native cyanobacteria & their co-cultures isolated from extreme ecosystems in Sri Lanka

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Abstract

The textile industry, a major global contributor to water pollution, generates vast amounts of dye-laden wastewater that threaten aquatic ecosystems and human health due to their toxicity and persistence in the environment. Physical and chemical treatment methods are costly and inefficient. This study explores the bioremediation of synthetic textile dyes using native cyanobacteria and their co-cultures isolated from extreme ecosystems in Sri Lanka. Cyanobacteria, known for their enzyme production and adaptability, offer a promising solution for dye degradation. This research focuses on identifying effective cyanobacterial strains and co-cultures capable of decolorizing various dyes including Disperse Yellow 211, Disperse Red 73, Disperse Blue 79, Disperse Navy Blue Mix, at concentrations of 30 mg/L and 50 mg/L to study the growth rate of selected cyanobacterial strains & their Co-cultures during the degradation process. Eleven cyanobacterial strains, including seven individual strains and four co-cultures, were tested under optimized laboratory conditions. The selected individual strains were labeled as C1, C2, C3, C4, C5, C6, C7 and the selected Co-Cultures were labeled as C8 = (C1+C2), C9 = (C1+C3), C10 = (C6+C2), C11=(C6+C7). The decolorization was detected by UV-VIS Spectrophotometer. Majority of Cultures grew efficiently in the medium of dye solutions while decolorizing them effectively. The strains labelled as C3, C4, C6, C7, C8, and C10 demonstrated the highest decolorization capabilities. Biological dye decolorization can occur through biosorption, biodegradation, or a combination of both. Cultures that are capable of significantly decolorizing the dye but show a little to no growth are likely involved in biosorption. The study found that co-cultures, particularly C8 and C10, were most effective in dye removal, achieving over 80% decolorization of yellow and blue dyes. C11 showed the highest growth, with over 50% dye removal overall. Yellow dyes were the easiest to degrade, while red dyes were the most challenging. These results highlight the potential of cyanobacteria in treating dye-contaminated water, offering a promising approach for industrial effluent management.

Keywords: Bioremediation, Cyanobacteria, Textile dyes, Decolorization, Spectroscopic analysis



Investigation into the mass fish kill of cage-reared Gift Tilapia (*Oreochromis niloticus*) in Madu ganga, Sri Lanka

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Abstract

Ensuring a balance between aquaculture practices and the health of the aquatic environment is crucial for the sustainability of the aquaculture industry. A case in point is the mass mortality of Gift Tilapia (*Oreochromis niloticus*), reared in cages at Madu Ganga, Sri Lanka, which was investigated on 2nd September 2024. These efforts aim to identify the root causes and underline the significance of maintaining optimal water conditions and responsible aquaculture practices to prevent similar events in the future. Balancing the demands of aquaculture with the preservation of a healthy aquatic environment is essential for ensuring long-term sustainability in the industry. To determine the root causes of this event, informal discussions were conducted with local fishermen and water quality measurements including Dissolved oxygen (DO), pH, temperature and nutrient levels were also measured. Investigations and informal discussions revealed that the cages were set in a shallow area (1±0.2m) covered fringe area without proper mixing since the locations are close proximity to farmers homes. The stocking density of the cages was unknown; however, it was evident that the density was excessively high. At the time of the mass fish kill, the age of the fry was approximately one month, with an average size of 2.5±0.3 cm and a weight around 0.2 g. An investigation of the water quality showed that the DO levels were extremely low, especially in deeper layers (1.2 mg/L) and it is around 4 mg/L in surface while measurements were made. The high DO levels in the surface are due to the mixing of the surface with the winds during the day time. Moreover, feeding was done once a day without following a feeding schedule; hence excess feeds were accumulated on the shallow bottom. Areas with muddy substrates and close to industrial pollution sources experienced higher mortality rates, particularly following heavy rainfall. Key water quality parameters included temperatures in the range (29°C to 30°C), pH levels (8.5–8.7), high phosphate concentrations ranging from 1.5 to 2.5 mg/L. Ammonia concentrations between 0.25 and 0.38 mg/L. The findings indicate that excessive organic matter and nutrient pollution and high stocking density contributed to the depletion of Oxygen levels, especially during the night, leading to fish stress and eventual mortality. Farmers should be advised on appropriate stocking densities tailored to environmental conditions, trained in optimal feeding practices to prevent excess feed buildup and encouraged to site selection with minimal organic material accumulation and sufficient mixing to reduce the risk of future mortality events. In addition, it is crucial to establish regular monitoring of water quality parameters and enforce policies aimed at limiting industrial effluent discharge, particularly during rainy seasons, to prevent nutrient overload in the lagoon.

Keywords: Mass fish mortality, Cage culture, Water quality, Dissolved Oxygen depletion, Nutrient pollution



Identification of measures to improve ornamental fish culture & management course

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Abstract

The present study was conducted to identify measures to improve the Certificate Course in Ornamental Fish Culture & Management offered by the Regional Centers in Mattakkuliya and Negombo, Ocean University of Sri Lanka. The ornamental fish industry is a minor player in Sri Lanka's economy, relatively small contribution to the Gross Domestic Product (GDP) and employment generation. Currently, this sector, along with associated segments such as agriculture, livestock, and fisheries, contributes about 18% to the GDP and 30% to employment. The objectives of the study were to identify the available opportunities and required skill sets for employment in the ornamental fish culture industry and to propose curriculum improvements. The current employability rate in the ornamental fish industry is more than 42% at the supervisory level. However, certificate holders are not directly recruited for this level. Approximately 80% of employees are recruited at the middle-level category, as skilled or semi-skilled employees, in the ornamental fish culture industry in Sri Lanka. Thirty students enrolled in the ornamental fish culture & management course also participated in this study. Of these, 27 % rated the course as excellent, while 73% considered it acceptable. Overall, 22% of respondents expressed satisfaction, while 78% expressed dissatisfaction. The results indicate that the current curriculum of the Ornamental Fish culture & Management course is not aligned with industry needs, suggesting the need for curriculum revision. It is recommended to expand the practical component of the course, incorporating new dimensions of technical knowledge. Additionally, experienced resource persons should be selected to conduct the course. Otherwise, it is essential that all lecturers and instructors are equipped with up-to-date technical knowledge and practical skills. Furthermore, university lecturers and instructors should be encouraged and required to continually update their knowledge and skills.

Keywords: Ornamental fish culture & management course, Ornamental fish industry, Curriculum revision



Effect of black soldier fly larvae (*Hermetia illucens*) fish feed supplemented with soya lecithin for the growth of Siamese fighting fish (*Betta splendens*)

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Abstract

The protein source is a crucial component in fish feed, providing adequate protein and essential amino acids needed for growth and maintaining biological functions. As aquaculture production increases, so does the demand for fish feeds, making the search for alternative protein sources essential to meet current and future needs. This study aimed to evaluate the effect of using black soldier fly (*Hermetia illucens*) larvae meal, supplemented with soya lecithin, as a protein source fat absorption enhancer in the diet of Siamese fighting fish (*Betta splendens*), respectively. Five dietary treatments were prepared: a control diet with fishmeal as the protein source, and black soldier fly larvae meal as the protein source combined with 0%, 2%, 4%, or 6% soya lecithin. To assess the effects of these diets, *B. splendens* were fed the different treatments, and growth performance was monitored by measuring fish weight, with nine replicates per treatment group. The weight data were analyzed using an ANOVA to identify significant differences among the groups. Results showed no statistically significant differences in the growth performance of the fish across all treatments compared to the control treatment (F-statistic = 0.19, $p = 0.905$). These findings suggest that black soldier fly larvae meal could serve as a viable alternative protein source to replace fishmeal in *Betta splendens* diets without compromising growth performance. However, further research is necessary to examine other aspects of fish health, nutrient utilization, and to optimize diet formulations for cost-effectiveness and sustainability.

Keywords: *Betta splendens*, Black soldier fly larvae meal, Growth performance.



Assessing the growth performance of Rohu fry (*Labeo rohita*) fed with cinnamon and fenugreek seeds

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Abstract

Aquaculture faces challenges in feeding and disease management, affecting sustainability. Natural growth promoters in fish feed enhance growth, health, and feed efficiency while addressing environmental concerns, offering a sustainable alternative to conventional additives. Cinnamon (*Cinnamomum verum*) and fenugreek (*Trigonella foenum*) have shown promising benefits owing to their bioactive principles and promoting growth. There is a notable gap in research on natural growth promoters and their effectiveness. This study aims to examine the impact of cinnamon and fenugreek feed on the growth of Rohu fish (*Labeo rohita*) in aquaculture. The study was conducted at the NAQDA Carp Breeding Center, Udawalawa, using 120 Rohu fry (*Labeo rohita*) with an initial body weight of 0.144 ± 0.096 g and standard lengths of 1.51 ± 0.159 cm. The fry was acclimated in recirculating tanks for one week before the experiment. Three diets were tested with each diet evaluated in three tanks (0.5 m³ each). The experimental diets consisted of cinnamon feed (T1), fenugreek feed (T2), and a standard fish feed/control (T3). Feeds prepared from sun-dried, ground ingredients mixed with wheat flour and extruded into pellets. The fry was fed 8-10% of their body weight daily in powder form, three times a day. Data collection involved weekly measurements of fish weight and length within five weeks. Data were analyzed using the Repeated Measures ANOVA test in SPSS software. According to that, there are significant increases in both body weight and standard length across tanks (T1, T2, T3) over five weeks. Body weight differed significantly among tanks ($P = 0.000$), and their interaction ($P = 0.001$), with T1 showing the highest growth (0.370 ± 0.0322 g), T2 the second highest (0.320 ± 0.0311 g), and T3 the lowest (0.320 ± 0.0311 g). Similarly, standard length varied significantly among tanks ($P = 0.000$), and their interaction ($P = 0.000$). T1 reached the highest value (2.85 ± 0.311 cm), T2 the second highest (2.83 ± 0.324 cm), and T3 the lowest (2.73 ± 0.373 cm). Cinnamon and fenugreek as natural growth promoters improved Rohu fry's growth. Among the two, cinnamon feed showed the most significant enhancement in growth parameters, highlighting its effectiveness as a growth-promoting supplement in aquaculture.

Keywords: Growth promoters, Cinnamon (*Cinnamomum verum*), Fenugreek (*Trigonella foenum*), Rohu fry (*Labeo rohita*),



Factors influencing the consumption of seaweed

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Abstract

Seaweeds are classified as algae and it is a main component of the diet in East Asian countries but not popular in Sri Lanka. Over 400 species of edible seaweeds are identified in Sri Lanka. Due to its nutritional and health benefits incorporating seaweed into diets has become a global trend. Besides that, availability of diverse cousins is important in promoting tourism in Sri Lanka. Therefore this study aimed to analyze the relationship between the products attributes (quality, taste, nutrition, and food safety) with the willingness to consume seaweed and the differences of the product attributes between local people and foreigners. This research was conducted as a case study in the Galle Fort area which is a popular tourism destination among both native and foreign travelers. A Quantitative research approach was used. Primary data were gathered through a questionnaire comprised of close-ended questions. Socio demographic information and five product attributes namely Quality, Taste, Nutrition, Food safety and Willingness to consume. Responses were taken using five-point Likert Scale ranging from Strongly disagree (1) to Strongly agree (5). Data were collected from 102 respondents both local and foreign travelers. The results revealed that there is a significant positive relationship with all four product attributes. Further, it was found that only quality and taste attributes were significant predictors of willingness to consume seaweed. The results indicated significant differences in the perceptions of quality, taste, and safety, between local travelers and foreign travelers while foreign travelers given higher ratings than local travelers. These findings suggest that improving quality and taste of seaweed will be a positive implication for the demand in seaweed as a food item.

Keywords: Seaweed consumption, Product attributes, Quality, Taste, Nutrition



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Sustainable Supply Chain Management



Addressing port congestion at port of Colombo: Potential of Hambantota international port as a strategic solution

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Abstract

Port congestion at the Colombo port has been a significant challenge for Sri Lanka's maritime sector, affecting the port's efficiency and the country's competitiveness as a major transshipment hub in south Asia. Colombo port's strategic location along key East-West maritime routes has facilitated its growth, making it a preferred destination for the transshipment cargo. However, the rapid increase in container volumes, with a 23.6% growth rate in the first half of 2024, has surpassed the port's capacity, leading to operational bottlenecks such as prolonged berthing delays (up to 20 days for transshipment containers), extended truck turnaround times, and crowded storage yards. These issues have forced a 20% decline in ship calls, resulting in lost transshipment opportunities and financial implications for the port. This research addresses the causes of congestion at Colombo port and assesses the potential of Hambantota port as a complementary facility to alleviate these challenges. Hambantota, located on a key maritime route, has been underutilized since its development due to strategic missteps, including insufficient hinterland connectivity and a lack of complimentary services. However, recent efforts to attract major shipping lines, alongside infrastructural developments, presents an opportunity to leverage Hambantota as a secondary hub. The study employs a mixed-methods approach, combining qualitative analysis from industrial reports and quantitative data from port traffic records to understand operational dynamics. Findings suggest that while Colombo remains a critical node for transshipment, its throughput capacity (approximately 7 million TEUs) necessitates a strategic shift. The analysis of traffic patterns, berth utilization rates and cargo handling efficiency highlights the importance of developing Hambantota as an alternative gateway to ease the burden on Colombo. Policy recommendations include enhancing road and rail connectivity to Hambantota, offering tax incentives to attract shipping lines, and improving port infrastructure and technology to streamline operations. By addressing these factors, Sri Lanka can optimize its port network, boost overall efficiency, and strengthen its role in global maritime trade.

Keywords: Port congestion, Port of Colombo, Hambantota International Port, Transshipment, maritime trade



Green Shipping: Transformation for A Robust Maritime Environment

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Abstract

The maritime sector is essential to the world economy. It accounts for 90% of the world's trade volume, and demand for seaborne shipping is still rising. It is impossible to ignore environmental issues linked to several violations of economic and human development. Marine pollution is the harmful effect of chemicals or particles getting into the ocean. Land, air, and traffic pollution are the three categories of marine pollution that have been identified. The green shipping idea focuses on lowering the energy and resources required to transport people and goods by ship to safeguard the environment from greenhouse gas emissions and other pollutants released by ships. The benefits of the green shipping idea and its prospects for further investigation are extensively discussed through the current study. Thus, the current study used a qualitative methodology that included a literature content analysis for twelve months. Making the switch to eco-friendly shipping methods has benefits for the environment and the economy. It raises consumer knowledge of environmental issues, improves a company's brand image by using sustainable shipping practices, and produces customers who are more environmentally sensitive. Furthermore, improving fuel efficiency, traffic congestion, ship design and lowering the various costs associated with regulatory compliance and investments based on green technologies can result in long-term economic savings. The development of intelligent technologies is growing. The continuous developments in information technology, such as cloud computing, artificial intelligence, and big data, will propel ships toward more reliable, secure, and environmentally friendly applications, and ship intelligence will grow along with them. The goal is for many industries to work together to develop the fundamental technologies of smart ships, promote their growth and adoption, and provide high-quality and efficient shipping services to communities throughout the world. Green shipping has many benefits for society and is a constructive, transformational strategy. Enhancing the management of marine environmental resources through in-depth research will lead to sustainability.

Keywords: Green transport, Resource management, Environmental conservation



**The impact of sustainable supply chain practices on financial performance:
with special reference to five-star hotels in Dambulla area**

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Abstract

The foundation of corporate expansion and development has historically been the desire for profit. Modern sustainability supply chain concerns, however, need a paradigm change toward actions that strike a balance between environmental and social well-being and economic development. There is an argument that following sustainable practices will result in increasing cost and finally, reduce the profit. Therefore, the purpose of this study is to ascertain how sustainable supply chain practices affect the bottom line of five-star hotels in Dambulla, Sri Lanka. Sustainable supply chain practices are identified with specific to the hotel industry. “Sustainable supply chain practices” is a multifaceted term with environmental, social and economic facets. Accordingly, the study aims to identify the impact of sustainable supply chain practices (Independent variable) on financial performance (Dependent variable). Profitability, Return on Equity, Return on Assets, and Earnings per Share are the metrics used to assess financial performance. Data is gathered from three five-star hotels in the Dambulla area using a questionnaire. The study employs quantitative research approach and used the regression analysis. The population is the employees work in three managerial levels. The sample size is also same as the population size. The results show a strong and positive relationship between sustainable supply chain practices and the financial performances which means the financial performance of the five-star hotels in the Dambulla area is positively and significantly impacted by the environmental, social and economic sustainable supply chain practices. Organizations can be encouraged to implement more sustainable supply chain practices by knowing this relationship, which will improve their financial performance and facilitate in creating a more sustainable future for the hotel industry and beyond.

Keywords: Sustainable Supply Chain Practices, Financial Performance, Five-Star Hotels, Hotel Industry



The impact of sustainable procurement practices on organizational performance of the food manufacturing industry in Sri Lanka: A case study on Premier Food Solutions (Pvt) Limited

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Abstract

The modern corporate world is marked by intense competition across all industries. Historically, a company's primary objective was to earn profits, even at the expense of environmental and social considerations. However, as competition intensifies across industries, most organizations realize that long-term survival demands more than just economic aspects. They should also consider the broader impacts of their operations on society and the environment. Therefore, many organizations are shifting towards sustainability beginning with more responsible and ethical procurement practices. Accordingly, the main objective of the current research was to identify the impact of sustainable procurement practices on the organizational performance of the food manufacturing industry in Sri Lanka. To explore this, Premier Food Solutions (Pvt.) Limited (PFS) was chosen as the case company. Employing the quantitative deductive approach, a structured questionnaire was distributed to 103 staff members at the company to gather primary data. Data was analyzed through correlation analysis, descriptive statistics and multiple linear regression analysis to achieve research objectives and test the hypotheses. The findings of the study accentuate the significant positive impact of sustainable procurement practices on the organizational performance of PFS. The results indicate that by integrating sustainability into procurement processes, organizations can enhance their operational and financial efficiency, strengthen their market position, and ensure long-term viability. The findings of this research contribute to the growing body of knowledge on sustainability in supply chain management and provide valuable insights for companies in the food manufacturing industry aiming to align their procurement practices and strategies with broader sustainability goals.

Keywords: Sustainability, Sustainable Procurement Practices, Food Manufacturing Industry, Organizational Performance



Supply chain disruption management: Lessons learnt from the covid-19 pandemic

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Abstract

The COVID-19 pandemic significantly disrupted global supply networks, highlighting the limitations of conventional methods in managing such crises. Effective supply chain disruption management requires proactive planning and preventive measures to minimize impacts. This study reviews recent multidisciplinary research on disruption strategies, emphasizing the importance of knowledge generation and experience consolidation. Using the Systematic Literature Review (SLR) method ensures a comprehensive and rigorous approach to article selection. The research applies the SLR method through a mixed-methods approach, and the study is structured on the PRISMA flow chart that characterizes the different phases of the SLR. The research uses a mixed-methods approach with the SLR method, structured around the PRISMA flow chart to outline the SLR phases. The process began with a comprehensive search of academic databases and relevant papers. Selected articles were assessed for relevance using clear inclusion and exclusion criteria, ensuring consistent evaluation and minimizing subjectivity. The literature review methodology demonstrated its capacity to compile and evaluate the body of evidence regarding supply chain disruption to develop strong mitigation strategies based on field-researched literature. The solutions were developed by compiling the existing literature on real-world examples and balancing analysis with a discussion of practical implementations. A total of fifty-one publications were examined, and consequently, six strategies were determined to be the most effective in surviving the disruption, and these strategies have been suggested by previous research. These strategies are empirical-descriptive, and the literature indicates that they can be applied effectively in supply chain disruption management, namely supply chain resilience, developing the new supply chain partnership, risk-mitigating strategies, contingency planning, employee care & well-being, and incentivised people. Consequently, it is learned that the supply chain can profoundly reduce the impact of disruptive events with the right strategies. Supply chain operation managers can effectively apply these strategies to mitigate disruption during a pandemic. According to analysis, 51% of the literature found that risk mitigation strategies effectively prevent supply chain disruption in the pandemic situation; meanwhile, 74% of the literature stated that supply chain resilience is effective in managing the pandemic situation, and 40% found contingency planning is effective as a disruption management tool. 78% recommended developing the new supply chain partnership, 82% stated that incentivised people and 74% recommended employee care and their well-being. This study was significant in identifying the most effective strategies for disruption management deployed by different supply chain firms, demonstrating a thorough and all-encompassing approach for the supply chain to identify possible disruption management strategies. Finding countermeasures for supply chain disruption in the COVID-19 pandemic situation can be considered a positive meaning for supply chains in disruption management efforts because these measurements have a pivotal role in mitigating disruptive risk and transforming it into an innovative strategy. The lessons that COVID-19 taught us supply chains gained knowledge and awareness of disruption management strategies during the pandemic, which helped them prepare for potential future negative events.

Keywords: Supply chain management, COVID-19 pandemic, Disruption management strategies, Literature review.



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Impact of climate change on coral reefs: An analysis of sea surface temperature and coral bleaching trends in the Indian Ocean (1985-2023)

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Abstract

This research investigates the impact of rising sea surface temperatures (SST) on coral bleaching across 14 locations in the Indian Ocean from 1985 to 2023. It presents a method to predict coral bleaching events 2-3 weeks in advance, functioning as an early warning system, based on the analysis of SST trends and thermal stress indicators. The study analyzes the correlation between increasing SST and the intensification of coral bleaching events, focusing on long-term trends and their implications for coral reef ecosystems. The satellite-based data from NOAA's Coral Reef Watch program was used to study Degree Heating Weeks (DHW) and Hotspot models to evaluate thermal stress on coral reefs. Time-series analysis and regression methods were used to identify trends and predict future coral bleaching risks. The results revealed a strong link between rising SSTs and severe coral bleaching, particularly in regions such as Hikkaduwa in Sri Lanka, Reunion Island, and Breueh Island in Northwestern Sumatra. The results also showed that coral bleaching events have increased in frequency and intensity over the past four decades, with rising SST in the Indian Ocean increase by approximately 0.6°C during the study period. Additionally, local factors such as pollution and overfishing might have contributed to the severity of bleaching in these areas. In conclusion, this research highlights the severity of coral bleaching in the Indian Ocean over the past four decades and the urgent actions need for better monitoring and management strategies to protect coral reefs from the effects of climate change. The predictive model developed in this study could be a valuable tool for future conservation efforts.

Keywords - Sea surface temperature, Coral bleaching, Indian Ocean, Degree heating weeks, Thermal stress



Variability of primary productivity in relation to monsoon off south coast of Sri Lanka

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Abstract

The off south coast of Sri Lanka exhibits dynamic seasonal variations in primary productivity (PP), which is driven by the powerful influence of monsoons. This study investigates the seasonal and annual fluctuations in PP in relation to key environmental factors such as chlorophyll-a (chl-a) concentration, sea surface temperature (SST), and mixed layer depth (MLD) from 2016 to 2022. Leveraging satellite data from Aqua MODIS and Copernicus Marine Service, validated against in-situ observations, the study provides a comprehensive analysis of the spatial and temporal patterns in PP and associated oceanographic conditions. The PP was estimated using Howard's 1995 model, which incorporated chl-a, SST, photosynthetically active radiation (PAR), and MLD as input parameters. The analysis revealed significant seasonal variation in PP, as confirmed by a One-Way ANOVA ($p < 0.05$), which identified statistically significant differences in PP across seasons. The study area encompassed satellite based 100 sampling locations on the off southern coast of Sri Lanka, spanning latitudes from 2°N to 6°N and longitudes from 78°E to 83°E. Results revealed pronounced seasonal variations, with PP peaking during the Southwest Monsoon (SWM, May–September) at 4.74 g C/m²/day, driven by strong upwelling and deeper MLD. Conversely, the Northeast Monsoon (NEM, December–February) exhibited reduced PP, with a minimum of 0.69 g C/m²/day due to nutrient depletion and downwelling processes. Inter-monsoonal periods showed that the lowest PP and limited nutrient availability. A strong positive correlation ($r = 0.892$, $p < 0.001$) was observed between Chl-a and PP, while SST exhibited a negative correlation with PP ($r = -0.519$, $p < 0.001$), indicating the influence of cooler, nutrient-rich waters during upwelling. Validation of satellite-derived chl-a and SST data yielded high correlations with in-situ data ($r = 0.826$ and $r = 0.640$, respectively), underscoring the reliability of satellite measurements. This research aligns with broader studies on monsoon-influenced systems, underscoring the pivotal role of nutrient dynamics in driving PP patterns. Further, this study highlights the significance of understanding monsoon-driven PP dynamics and their implications for seasonal variability off southern coast of Sri Lanka.

Keywords: Chlorophyll-a concentration, Monsoon dynamics, Off south coast of Sri Lanka, Primary productivity, Sea surface temperature



Trends in ocean acidification over past three decades in the Arabian Sea

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Abstract

pH reduction caused by anthropogenic CO₂ emission affects ocean chemistry due to atmosphere-ocean interactions. Knowledge of past pH data is crucial for assessing the role of atmospheric CO₂ sinks including other greenhouse gases in ocean acidification. The aim of study was to evaluate the climatological distribution of surface pH in the Arabian Sea. Sea water pH hindcast data from Copernicus marine data store were used and time series data from 1993 to 2023 at a monthly frequency were extracted. The monthly mean surface pH values ranged from 7.97 to 8.09 and the mean pH was found to be 8.04 ± 0.02 (mean \pm SD), during the last 30 years. Comparing data from 1993 to 2023, the western Arabian Sea exhibited the lowest pH levels, indicating significant spatial heterogeneity in ocean acidification patterns across the region. The monthly variation of surface pH reflected a clear seasonal pattern associated with the monsoon cycle. pH levels were highest during January-February. It was notable that pH reached their lowest during May and October coinciding with the inter-monsoon periods. This inter-monsoon dip in pH is likely driven by elevated pCO₂ levels at the surface, due to upwelling. One-way ANOVA revealed a significant difference in the monthly mean pH ($p < 0.01$) over western, southern, northern and central parts of the Arabian Sea. Relatively higher monthly mean pH was reported in eastern Arabian Sea (8.06 ± 0.01) compared to other regions in Arabian Sea. Time series trend indicated a steady decline in surface pH from 8.06 to 8.00 between 1993 and 2023, reflecting a 0.06-unit decrease in pH over the 30 years, implying long-term surface ocean acidification due to invasion of anthropogenic CO₂ from the atmosphere and climate change. The study demonstrated that surface pH in the Arabian Sea had undergone a consistent decline over the past three decades, with the most pronounced decrease observed in recent years, particularly in 2023. Future research investigating the biological and ecological impacts of acidification on marine organisms, particularly in sensitive areas like the western Arabian Sea, is essential for ecosystem management.

Keywords: Arabian Sea, Sea surface pH, Ocean acidification, Climate change



Exploring offshore combined wind-wave harnessing sites with marine spatial planning

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Abstract

This study investigates the possibility of installing offshore combined wind-wave energy converters on the North-Western coast of Sri Lanka, covering both floating and fixed-bottom turbine technologies. The main objective is to find optimum wind turbine installation locations by using weighted overlay analysis. The datasets of wind speed, water depth, distance from the power grid, distance from the port, distance from the shoreline, tourism density, distance to airports, and sediment thickness were considered for the analysis. Shipwreck locations, coastal fishing landing sites, petroleum wells, shipping routes, submarine cables, and marine protected areas were excluded with a buffer zone based on the case. Moreover, a shoreline of 1 km towards the sea was excluded as restriction zones. When considering the above factors, three potential sites were identified. Site 1 was the most promising site. Sites 2 and 3, though having somewhat lower wind speeds, are also feasible being proximate to the coast and overlap with priority areas for fixed-bottom wind turbines already identified by the World Bank's study. In addition, wave energy converters integration with combined wind turbines were considered for potential viability. Results show maximum wave energy potential considering both swell and wind wave power in the region is 5-10 kW/m, far less than commercialized technology. The distance between turbines ranges from 495 m up to 1650 m, minimizing impact on local fisheries. The results show that theoretically 1,791 turbines can be installed, practical considerations such as cabling costs and energy losses necessitate a reduction of these numbers. More refined estimates are required to assess the commercial feasibility studies. The report recommends the use of advanced computational models to simulate wind flow and wake interactions and optimize turbine siting for maximum energy production with minimum interference. Further feasibility studies on combining wave energy converters with wind power turbines would be needed for commercial operation.

Keywords: Offshore wind turbines, Floating turbine and fixed-bottom turbines, Wind energy, Wave energy converters, Feasibility study



Evaluating the accuracy of satellite-based precipitation products against gauge-based measurements in the Indian Ocean

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Abstract

Several earth observation remote sensing satellites are equipped with radiometers, which ability to capture microwave and infrared radiances, and various retrieval algorithms are employed to estimate surface rain rates on these observations. Due to sensor capabilities and algorithm performances, the satellite-based precipitation products (SBPP) experience different amounts of rainfall over the same oceanic region. The objective of this study is to evaluate the accuracy of widely used SBPP in capturing rainfall over oceanic regions. Four SBPP [Tropical Rainfall Measuring Mission Multi-Satellite Precipitation Analysis (TMPA), NOAA Climate Prediction Center morphing technique (CMORPH), Integrated Multi-satellite Retrievals for Global Precipitation Measurement (IMERG) and Global Precipitation Climatology Project (GPCP)] are compared with data obtained from 20 Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA) buoys mounted rain gauges in the Indian Ocean for the period 1st of January 2014 to 31st December 2016. The evaluation was conducted for daily and monthly temporal scales and utilized the Pearson correlation coefficient, mean absolute error, root mean square error, bias and Kling-Gupta efficiency (KGE) coefficient as statistical indices to measure the accuracy. Across Indian ocean, most of SBPP were displayed overestimation of RAMA buoys mounted rain gauges at both daily and monthly temporal scales. Of these SBPP, CMORPH is the most accurate in estimating mean precipitation over the Indian Ocean, but it is less accurate over the capturing small amount of rainfall, while IMERG measurements experienced lowest KGE values. The monthly measurements of SBPP exhibited a better fit than the daily measurements in the Indian Ocean, as indicated by the KGE. CMORPH has higher KGE values over most gauges, which indicated the higher capability of measuring Indian Ocean precipitation, than other SBPP. It is recommended that future SBPP incorporate more advanced retrieval techniques to better represent small-scale rainfall events in the Indian Ocean.

Keywords: Rainfall, Satellite based precipitation products, Accuracy assessment, Indian Ocean, RAMA buoys



GIS-based modelling of habitat suitability for yellowfin tuna in waters around Sri Lanka

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Abstract

The study utilized a Geographic Information System (GIS) to model habitat suitability for yellowfin tuna (*Thunnus albacares*) in waters around Sri Lanka, a species that is economically vital and ecologically significant. The primary objective is to map areas favorable for yellowfin tuna based on environmental factors such as sea surface temperature (SST) and chlorophyll-a (CHL-a) concentration, which influence tuna distribution and abundance. Fish catch and coordinates were gathered using long-line vessels operating primarily from southern harbors, supplemented with secondary data sources, including vessel monitoring systems and remote sensing data (SST and CHL-a) from Moderate Resolution Imaging Spectroradiometer (MODIS). The study area encompasses Sri Lankan territorial waters and parts of the Arabian Sea, with a particular focus on zones within the Exclusive Economic Zone (EEZ) where yellowfin tuna is frequently observed. Data processing was conducted using ArcGIS, where spatial analyses were employed to identify SST and CHL-a ranges most conducive to yellowfin tuna presence. Results indicate that tuna are predominantly found in waters where SST ranges from 26°C to 31°C, with the highest catch frequency occurring at 28-30°C. CHL-a concentration further highlights productivity zones, with tuna aggregation most prominent in regions where CHL-a levels are between 0.3–0.4 mg/m³, suggesting areas of high phytoplankton activity favorable for tuna feeding. Hotspot mapping identified specific regions off the southwest and southeast coasts of Sri Lanka as critical habitats, where targeted fishing efforts could enhance catch efficiency while preserving less productive zones. The study highlights the need for marine protected areas (MPAs) to conserve critical habitats and support sustainable fisheries. It emphasizes adaptive fisheries management in response to potential shifts in tuna distribution due to climate change. Using GIS-based habitat modeling, the research provides valuable insights for balancing sustainable fishing with conservation, ensuring the long-term health of yellowfin tuna populations and the livelihoods of local fishing communities.

Keywords: Habitat suitability, Yellowfin tuna, GIS modelling, Sea surface temperature, Chlorophyll-a concentration



UAV-Based coastal monitoring: A cost-effective solution for high-resolution change detection

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Abstract

Coastal monitoring is crucial for mitigating hazards and erosion risks, but developing nations face challenges accessing reliable and cost-effective technologies. Traditional monitoring methods require intensive resources and time. This study implemented unmanned aerial vehicle (UAV) technology to address those limitations by utilizing its capacity for high-resolution spatiotemporal data acquisition. The primary objectives were to assess UAV effectiveness as a cost-efficient monitoring solution and establish a standardized methodology applicable for developing countries. Red Beach (6.015835° N, 80.786970° E) in Tangalle, Sri Lanka, was selected for this study. A DJI Mavic Air UAV equipped with a 12MP camera (1/2.3" CMOS sensor) was used to capture images from 60 m altitude. Front and side overlap was 75% and 70% and Ground sampling distance was 2 cm. Multiple flights were conducted throughout December. Ground control points were used to enhance spatial accuracy. Agisoft Metashape Pro 2.0.3 software was used to generate orthomosaics and Digital Elevation Models (DEMs) with the elevation data extracted from Google Earth Pro. ArcGIS 10.5 facilitated the digitization of orthomosaic models. A ground truthing survey was carried out to validate DEM accuracy. To analyze beach morphology, the beach was segmented based on geomorphological features. Two shoreline breaking points were identified to divide the beach into three segments. The analysis revealed significant differences across the three beach segments ($p < 0.05$; One-way ANOVA). The right segment consistently dominated with the highest measurements, showing vegetation coverage of 5,330 m² and surface area of 4,088 m². In contrast, the mid and left segments displayed relatively similar but notably lower values. Results from the Repeated Measures ANOVA indicated significant main effects for both time and site ($p < 0.05$) on beach width, with a significant interaction effect between time and site ($p < 0.05$). The interaction effect between time and site suggests location-dependent temporal changes. DEM accuracy assessments showed wide variation, with accuracy ranging from 9.84% to 67.92% when compared to ground-truth data. This study demonstrates that UAVs provide an efficient and cost-effective approach for continuous coastal monitoring while emphasizing the need for careful consideration of elevation data sources.

Keywords: UAV, Photogrammetry, Cost-effective, Coastal monitoring, Change detection



Modelling surface water of the Kalu river basin by developing SWAT hydrological model

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Abstract

The Kalu River is an important water resource and is useful for agricultural purposes, drinking water, industries, hydropower generation, and maintaining a healthy ecosystem. So, identifying the volume of surface water for each period is forthcoming. In this study, Soil and Water Assessment Tool (SWAT) was used to simulate surface water of the Kalu River Basin. Data preparation includes gathering real-time weather data from gauging stations, preparing land use map and soil map with SWAT codes, collecting Digital Elevation Model (DEM) and existing stream map. GIS techniques were used for hydrological modelling and the watershed was delineated using digital elevation model of the Kalu River basin. By using these data, Hydrological Response Units were created with homogeneous characteristics and they are the building blocks of SWAT modelling. Once the SWAT model was run, it simulated the surface water of the watershed and calculated annual sub-basin parameters such as precipitation, surface runoff, lateral flow, evapotranspiration and water yield. The model was built for the period from 1st of January 2012 to 31st of December 2017. The comparison of simulated discharge with observed discharge at Ellagawa stream gauge station yielded correlation coefficient of 0.81427. This value highlights the reliability of the model outputs. The model estimated that the Kalu river basin gets 2206.8 mm of average annual precipitation. Evaporation is the largest water balance component and it is 42% from precipitation. 31% of precipitation was consumed to percolate shallow aquifers. Return flow contribution to surface water is about 607.49 mm which is gained from the shallow aquifer. Lateral flow and surface runoff contribution to surface water is 237.57 mm and 332.81 mm respectively. Combination of return flow, lateral flow and surface runoff is caused to enrich the volume of surface water. Daily contribution to surface water from other hydrological components was also obtained as outputs. Ultimately, the outcomes of the research support informed decision-making and sustainable water resource management. The model can produce more accurate outputs by utilizing real-time observed data for a long period and by further developing the model in various directions.

Keywords: SWAT, Hydrological modelling, Surface water, Simulation, Water balance



Identifying critical key biodiversity areas of Puttalam lagoon considering threats and ecosystem services for conservation priorities

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Abstract

Puttalam Lagoon, situated in Sri Lanka, is a significant coastal ecosystem that faces multiple threats harming its biodiversity and vital ecosystem services. Mangroves are the most extensively distributed habitat in the Puttalam Lagoon area and are found along sheltered lagoons, estuaries, and islands. The rapid and intense development in Puttalam town presents huge challenges to the lagoon, particularly for its conservation of natural resources and biodiversity, as well as ensuring access to critical ecosystem services. This study aimed to identify critical Key Biodiversity Areas (KBAs) within Puttalam Lagoon by considering both existing threats and an ecosystem service focusing on the mangrove biodiversity due to its crucial role in protecting coastal ecosystems and supporting local livelihoods. Through Geographic Information System (GIS) analysis, the interplay between biodiversity, threats, and habitat quality was examined to effectively prioritize conservation efforts. Methodologies such as the Integrated Valuation of Ecosystem Services (InVEST) model and the Multi-Criteria Decision Making (MCDM) approach were employed to pinpoint conservation areas requiring immediate attention. Results revealed that areas such as Manalthivu, Musalpitiya, Kurinjipitiya, Wannimundalama, Anawasala, and Deuch Bay are highly vulnerable to anthropogenic pressures including increasing population density, shrimp farming, and land use changes, alongside the impacts of climate change. Vulnerable areas are identified as particularly susceptible to threats, incorporating community participation and local knowledge underscoring the need for targeted conservation interventions. Conversely, some regions exhibiting higher habitat quality offer opportunities for proactive conservation measures, such as mangrove reforestation or sustainable land use practices. Conclusions emphasize the urgent need for targeted conservation in these critical areas. Recommendations include establishing community based mangrove conservation programs and integrating GIS based monitoring systems. The results of this study provide a strategic focus for preparing a mangrove ecosystem conservation strategy and action plan for the Puttalam Lagoon promoting sustainable development and the well-being of both people and the planet by integrating spatial mapping and environmental models.

Keywords: Puttalam lagoon, Mangrove biodiversity, Threat mapping, GIS, Conservation.



Analysis of shoreline changes using remote sensing satellite data at Crow Island beach in Sri Lanka

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Abstract

Shorelines are dynamic nature occurred due to the oceanic processes such as erosion and accretion, which are directly attached with the anthropogenic and natural induces. It is responsible for the movement of shoreline to landward or seaward in several areas. The aim of this study was examined the shoreline changes along the coast of Crow Island beach using satellite remote sensing data and clarify the phenomenon responsible for the shoreline change. High-resolution Google Earth images were used to extract shoreline along the Crow Island beach during the period from 2008 to 2022. The shoreline analysis was accomplished using Digital Shoreline Analysis System (DSAS) of ArcGIS for long-time shoreline changes. A range of statistical change measures are derived within DSAS, based on the comparison of shoreline using Weighted Linear Regression (WLR) results, the shoreline has been classified into nine categories under rate of shoreline changes (m/year), as very high (above ± 3), high (between ± 3 to ± 2), moderate (between ± 2 to ± 1), low (between ± 1 to ± 0.5) and no change (between 0.5 to -0.5). For further studies, the field survey conducted from month of April to May in 2023 while collected two ground point data samples from the beginning and end of the month for identify the difference between this short time period using GNSS RTK GPS (cube - a V 5.2) machine in a walking distance along the shore. The results generated from the WLR, the area close to the river mouth categorized as high erosion trend (-2.77 m/y) while accretion trend in close to Modara Kovil beach area (9.14 m/y) within the long time period. Comparing the results from beginning of the April to end of May, the data indicates 1469 m² as eroded within the short time shoreline change, in response to 1st inter-monsoon period. The outcomes of this study can be used for further decision making to conservation and management of the coastal zone in the study area.

Keywords: Shoreline, Erosion, Accretion, Satellite images



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Assessing the health impact of beach pollution on school students residing in the Negombo coastal area, Sri Lanka

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Abstract

Large amounts of plastic litter, untreated effluents, oil spills, and factory wastes are the major contributors to beach pollution, which is a serious threat to both the environment and health, especially to at-risk populations such as children. The study estimates the health impact induced by beach pollution on school students living in the Negombo coastal area in Sri Lanka. Doing stratified random sampling within a sample frame defined by school name lists, 200 students between the ages of 11 - 19 were selected for the study. For three months, the data were gathered through pretested, structured questionnaires. The questionnaire included multiple-choice and open-ended questions to assess students' health status, beach use, and their perceptions of pollution types. The results indicated that some health issues, such as respiratory problems (48%), including coughing, wheezing, and shortness of breath, ranked first among the health effects linked to beach pollution. Other health matters included skin problems (22%) and gastrointestinal problems (18%), which were also observed among students exposed to beach pollution. The chi-square statistic ($\chi^2 = 15.32$, $p < 0.05$) showed a significant relationship between pollution exposure and health problems. Furthermore, students who live within a radius of 2 kilometers from the beach were subjected to statistical tests, which further compared them with their counterparts who live some distance away to show the disparity in health outcomes. Most of the respondents (77%) agreed that they encountered pollution whenever they visited the beach, with plastic waste (62%) being the most commonly observed pollutant, followed by sewage or wastewater (18%) and oil spills (11%). Some of the proposed initiatives by respondents to reduce pollution impact include regular beach clean-up drives (42%), improved waste management systems (29%), civic education on pollution prevention (18%), and strict government regulations (9%). These percentages are an indication of priority areas for the community to lessen impacts of pollution. Socio-economic factors also played a role, as many students came from poor households with limited access to healthcare, further exacerbating health challenges. Another compelling reason is the urgency of a combined approach to the management of beach pollution and public health. Thus, coastal resource management in Negombo should incorporate environmental safeguarding measures with public health provisions so that the most vulnerable persons, including school-age children, may not really be affected.

Keywords: Beach pollution, Health impact, Negombo, Respiratory problems, Coastal resource management



Employment status of graduates of the Ocean University of Sri Lanka graduates in 2023

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Abstract

The Ocean University of Sri Lanka, initially established as the National Institute of Fisheries and Nautical Engineering, launched its first-degree programs in 2001 to address the evolving needs of Sri Lanka's fisheries, marine, and maritime sectors. The university offers Bachelor of Science (B.Sc.) Degrees in Marine Engineering, Fisheries and Marine Sciences, Maritime Transportation Management and Logistics, Coastal and Marine Resources Management, and Oceanography, alongside a Bachelor of Technology (B.Tech.) In Aquaculture and Seafood Technology. These programs are designed to equip graduates with industry-relevant knowledge and skills. Additionally, the university operates a vocational division to meet the demand for skilled technical personnel in the sector. This study aims to evaluate the employability of the 2023 graduates of the Ocean University by analyzing their employment status, alignment with fields of study, job satisfaction, and income levels. Data were collected through a descriptive survey design, using an online questionnaire completed by 36 respondents from a cohort of 146 graduates. The findings reveal that 69% of graduates secured employment within a year of graduation. Employment distribution showed a significant presence in the private sector (45%), followed by the public sector (20%), and self-employment (4%). A chi-square test was conducted to examine the relationship between gender and employability, revealing no significant association between these variables. Furthermore, the majority of employed graduates reported that their academic training aligned well with industry requirements, positively influencing their job performance and satisfaction. This alignment underscores the effectiveness of the Ocean University's curriculum in preparing students for careers in fisheries, marine, and maritime industries. The study highlights the importance of fostering the development of human capital to support sustainable advancements in these sectors.

Keywords: Ocean University, Employability, Development of Human Capital, Professional Satisfaction, Maritime Industries



The fish consumption behaviour among elderly people in Gampaha district, Sri Lanka

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Abstract

Existing literature has demonstrated the health benefits of fish consumption in older age, which improves late-life quality. However, less attention has been paid to investigating the determinants of fish consumption in the ageing population and the fish consumption behaviour in elderly people. This study attempted to fill this gap to a certain extent by surveying a convenience sample of 230 elders (130 males and 100 females) aged over 65. Primary data were collected from Wellaweediya (a fishing community) and Kadawatha (a non-fishing community) in the Gampaha district, Sri Lanka from November to December 2023. The majority were aged between 65-75 years (69.1%), married (67%), obtained primary education (68.7%), belonged to 5001-15000 LKR monthly income category (42.9%), and purchased fish from local fish markets (39.5%). Data were analysed using both descriptive and inferential statistics. Most of the respondents consumed fish (77.8%) as their most preferred animal protein source considering its high nutritional value and preferred marine fish (81.3%) prepared with chilli-tasted fish curries (56.5%). Findings revealed that nearly 57.4% consumed 1-2 kilograms of fish per week, more than 3 days per week (44.4%), spending 500-1000 LKR on purchasing fish per week (56.2%). A Mann-Whitney U test results indicated that the fish consumption probability of elders in the fishing village (median=122, n=115) significantly exceeded those of the fish consumption probability of elders in non-fishing village (median=109, n=150, $u=5865$, $z=-2.657$, $p=0.08$). A total of 65% of elderly respondents intended to improve habitual fish consumption. According to the findings of binary logistic regression, the likelihood of enhancing fish consumption intention was high in elderly male adults ($p=0.043$), living in a fishing community ($p=0.013$) with sufficient knowledge about the health benefits of fish consumption ($p=0.047$). Having allergies when consuming fish reduced fish consumption in elderly people ($p=0.008$). In conclusion, present findings offer insights into encouraging the fish consumption of elderly people by improving their knowledge regarding the health benefits of fish consumption.

Keywords: Ageing population, Health benefits, Determinants of fish consumption



Women's participation in Sri Lanka's blue economy: An exploration of the influence of socio-economic factors

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Abstract

The blue economy is crucial in Sri Lanka's coastal regions, offering economic growth and job opportunities. However, female representation in this sector is low, and women's contributions are often undervalued due to socio-economic barriers like limited access to resources, decision-making power, and cultural norms. This study aims to address these barriers and identify opportunities to enhance women's participation, intending to inform policies that promote gender equality and empower women in Sri Lanka's blue economy. The findings are intended to inform the development of targeted interventions and policies that can promote gender equality and strengthen the role of women in Sri Lanka's blue economy. Data were collected from 130 women using structured questionnaires and analysed using multiple linear regression to determine the relationship between women's involvement in the blue economy (the dependent variable) and the following independent variables: education level, income and economic resources, legal and policy environment, and family and social support. The results showed that all four independent variables are statistically significant (at a 5% level) in explaining women's engagement in the blue economy, with education level and family and social support having the highest effect. Education offers women the knowledge and skills required to undertake maritime business while the strong family and social networks give women the support they require. Likewise, income and economic resources and the legal and policy environment also have a positive effect on women's participation, but only to a certain extent. Based on these findings, it can be noted that improving education, economic capital, social capital, and legal capital can remarkably increase women's engagement in the blue economy. This information can, therefore, be helpful to policymakers and other stakeholders to come up with specific interventions that can help address gender discrimination in the marine sector, thus promoting the country's economic growth. Some of the recommended policies include increasing women's literacy, supporting women in maritime activities financially, encouraging women's role in the community and family, and protecting women's rights in the blue economy. Thus, by concentrating on these areas, the blue economy can be more inclusive, and women's contributions can be maximised.

Keywords: Blue economy, Gender equality, Socio-Economic factors, Women's participation, Sri Lanka



Exploring the potential of authentic and Sri Lankan versions of seafood menus in driving gastronomy tourism: Insights from hoteliers in Tangalle, Sri Lanka

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Abstract

Tourism is one of the main external income sources of the Sri Lankan economy. The existing literature on Sri Lankan tourism has emphasized the significance of the multifaceted nature of tourism giving much attention to nature-based tourism. Despite the growing interest in gastronomy tourism worldwide, Sri Lanka has paid less attention to gastronomy tourism. Therefore, an attempt was made to bridge this research gap by exploring the motives and challenges that influence hoteliers' intention toward gastronomy tourism based on authentic and Sri Lankan versions of seafood dishes. A convenient sample of 180 hoteliers in Tangalle was interviewed from November 2023 to January 2024 using a pre-tested questionnaire. Data analysis was done using binary logistic regression and descriptive statistics. Our findings revealed that 77.8% of the hoteliers intended to improve gastronomy tourism in their business. Approximately 92.8% of the hoteliers offered seafood menus for their guests including both foreign and domestic tourists. Seafood rice, seafood *kottu*, grilled fish, prawn curry, cuttlefish deviled, lobster thermidor, fish *ambul thiyal*, crab curry, garlic butter prawns, fish biryani, seafood soup, seafood biryani, and seafood noodles were the most commonly offered seafood menus in Tangalle. The majority of the hoteliers (74%) were aware of the authentic and Sri Lankan versions of seafood dishes and guests were served authentic (47.2%) and Sri Lankan versions of seafood (87%). Most of the hoteliers served seafood menus based on the guest preference (93%) prepared using Sri Lankan spices (76%). Tourists' preference for consuming authentic and Sri Lankan version of seafood menus ($p=0.014$) and their preference in experiencing Sri Lankan style (i.e. eating with fingers) in dining ($p=0.041$) were identified as significant motives whereas no proper propaganda to promote gastronomy tourism among tourists ($p=0.015$) had challenged promoting gastronomy tourism. In conclusion, this study demonstrates the potential of authentic and Sri Lankan versions of seafood menus in driving gastronomy tourism in southern Sri Lanka with a special focus on propaganda on gastronomy tourism by conducting local culinary festivals and trails and offering a special seafood menu that is unique to the Southern coast of Sri Lanka.

Keywords: Hoteliers' perceptions, Challenges, Guest preference, Seafood menus, Tourism sector



Consumer Trends in Online Food Shopping: Insights from the Western Province, Sri Lanka

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Abstract

Online shopping has become an integral part of modern business operations, transforming how consumers purchase goods and services. In Sri Lanka, the global pandemic acted as a catalyst, shifting consumer preferences toward online grocery shopping amidst lockdowns and travel restrictions. Despite extensive global research on online shopping behavior, the domain of online food shopping remains underexplored, particularly in Sri Lanka. This study addresses this gap by investigating consumer behavior, market segmentation, and the factors influencing online food shopping decisions. Data were collected over a six-month period, from January to June 2023, during the post-pandemic recovery phase when online shopping habits were stabilizing. The sample, consisting of 612 respondents, was drawn exclusively from online consumers in the Western Province of Sri Lanka. The conceptual framework was developed to describe the factors that impact towards choice of online or offline decision which include; sociodemographic, inhibiting and encouraging factors. Five types of food products and 11 inhibiting factors on online food shopping was also incorporated to the conceptual framework. Inhibiting factors were measured using a 5-point Likert scale to assess the extent of agreement with various statements. These constructs provide a foundation for understanding the barriers to online food shopping. K-means clustering algorithm was employed to segment consumers based on their online shopping behavior. The optimal number of clusters was determined using the elbow method, ensuring distinct and meaningful groupings. Additionally, chi-square tests were conducted to examine the statistical significance of differences in socio-demographic factors across the identified clusters. The exploratory factor analysis (EFA) identified two categories of inhibiting factors: (1) Marketing mix-based inhibitors and (2) User-based inhibitors. These factors were further analyzed to identify their impact on consumer behavior. Two distinct consumer segments emerged from the cluster analysis: “Modern Shoppers” and “Conventional Shoppers.” Modern Shoppers demonstrated a higher propensity for online food purchases, influenced by convenience and digital literacy. Conversely, Conventional Shoppers preferred traditional shopping methods, influenced by trust issues and lack of familiarity with technology.

Keywords: Consumer behavior, Digital marketing, E-commerce, Market segmentation



Customers' perception and knowledge of fish oil supplements: A case study of a pharmacy in Tangalle, Southern Sri Lanka

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Abstract

Health-related impacts of fish oil consumption have been documented. However, there is limited research relevant to this topic in the context of Sri Lanka. This study attempted to address this research gap by exploring the customers' perceptions, knowledge, usage patterns, and influencing factors for consuming fish oil supplements in the market. Primary data were collected by surveying customers from January to February 2024 using a pre-tested questionnaire. Every fifth customer who came to the prescription acceptance counter of a private pharmacy in Tangalle, Sri Lanka was selected for the survey. Only 300 customers completed the survey out of the invited 450 customers. Data were analyzed using both descriptive and inferential statistics. The latter included binary logistic regression and chi-square test. In the sample, 73% of respondents had heard about fish oil supplements but only 30% had used the product. The findings indicate that fish oil is commonly used for dietary support (27%), particularly during pregnancy, for dermatological conditions (20%), as a substitute for not consuming non-veg foods (13%), and for controlling post-menstrual syndrome symptoms (8%). Most respondents (44%) used this supplement based on medical practitioners' recommendations. The most common reasons for not using this product were lack of perceived need for it (57%) and unfamiliarity with the product (23%). The chi-square test results demonstrated a significant association between age ($p < 0.05$, $\chi^2 = 67.69$, $DF = 2$), income level ($p < 0.05$, $\chi^2 = 18.46$, $DF = 3$), and the use of fish oil supplements. Younger individuals and higher-income groups are more likely to use fish oil supplements. According to the findings of the binary logistic regression model, customers who believe that fish oil supplements are not expensive, improve skin conditions, and acknowledge the detailed description of the labels on fish oil supplement products are more likely to use the product ($p < 0.05$). The study concluded that medical advice plays a crucial role in fish oil supplement consumption, particularly among younger individuals and higher-income groups. It is recommended to penetrate the fish oil supplement market using the identified key motive factors by offering informative product labeling and affordable pricing for the fish oil supplements.

Keywords: fish oil consumption, medical practitioners, informative labeling, affordable pricing



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