



The 17th INTERNATIONAL KUROSHIO SCIENCE SYMPOSIUM

“Marine Resources Nurtured by the Biological and Environmental Diversity of
the Kuroshio Region: Collaborative Research for Innovation in Elucidation,
Utilization, and Management”

November 4_{MON}-6_{WED}, 2024

Venue: Asakura Campus, Kochi University

ABSTRACT BOOK

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Venue and Location

Kochi University - Asakura Campus (Location No. 1 on the map below indicates Asakura Campus as the symposium venue.)

From Kochi Ryoma Airport:

About 45 minutes by car

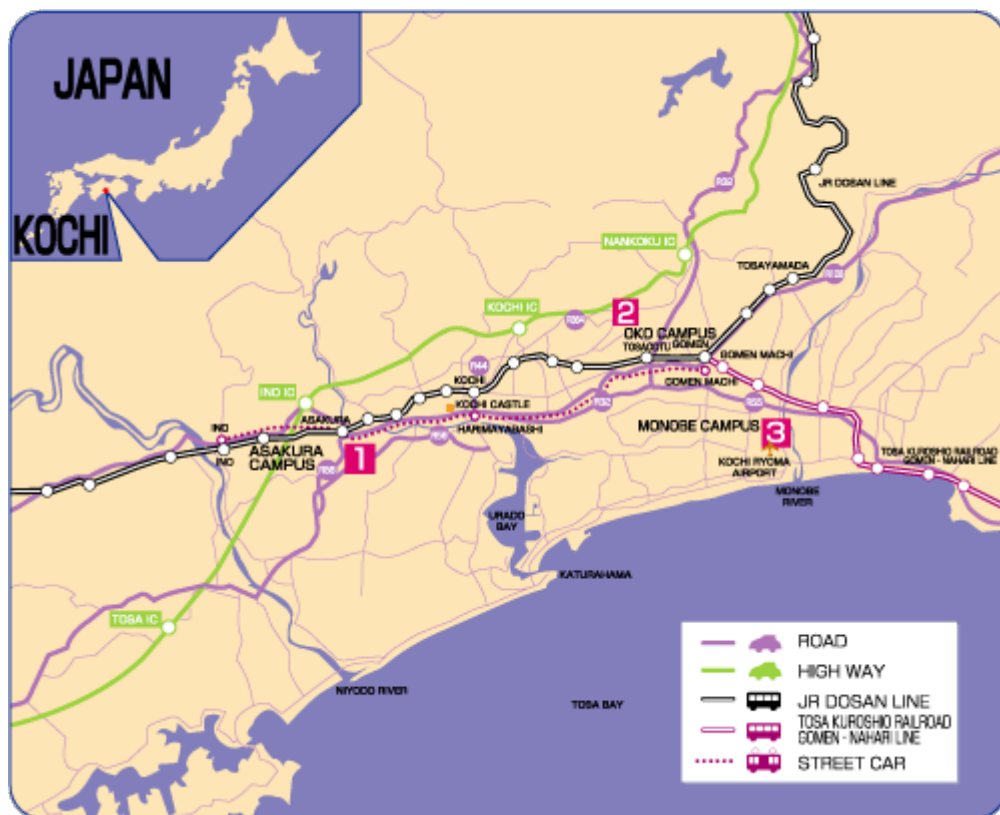
About 40 minutes to Kochi Station by airport bus, and then transfer to other transportation below

From Kochi Station:

About 20 minutes by car, or 25 minutes by bus

About 30 minutes by streetcar, get off at Asakura (Kochi Daigaku Mae)

About 15 minutes to Asakura Station on JR Dosan Line, and 3 minutes on foot from the station

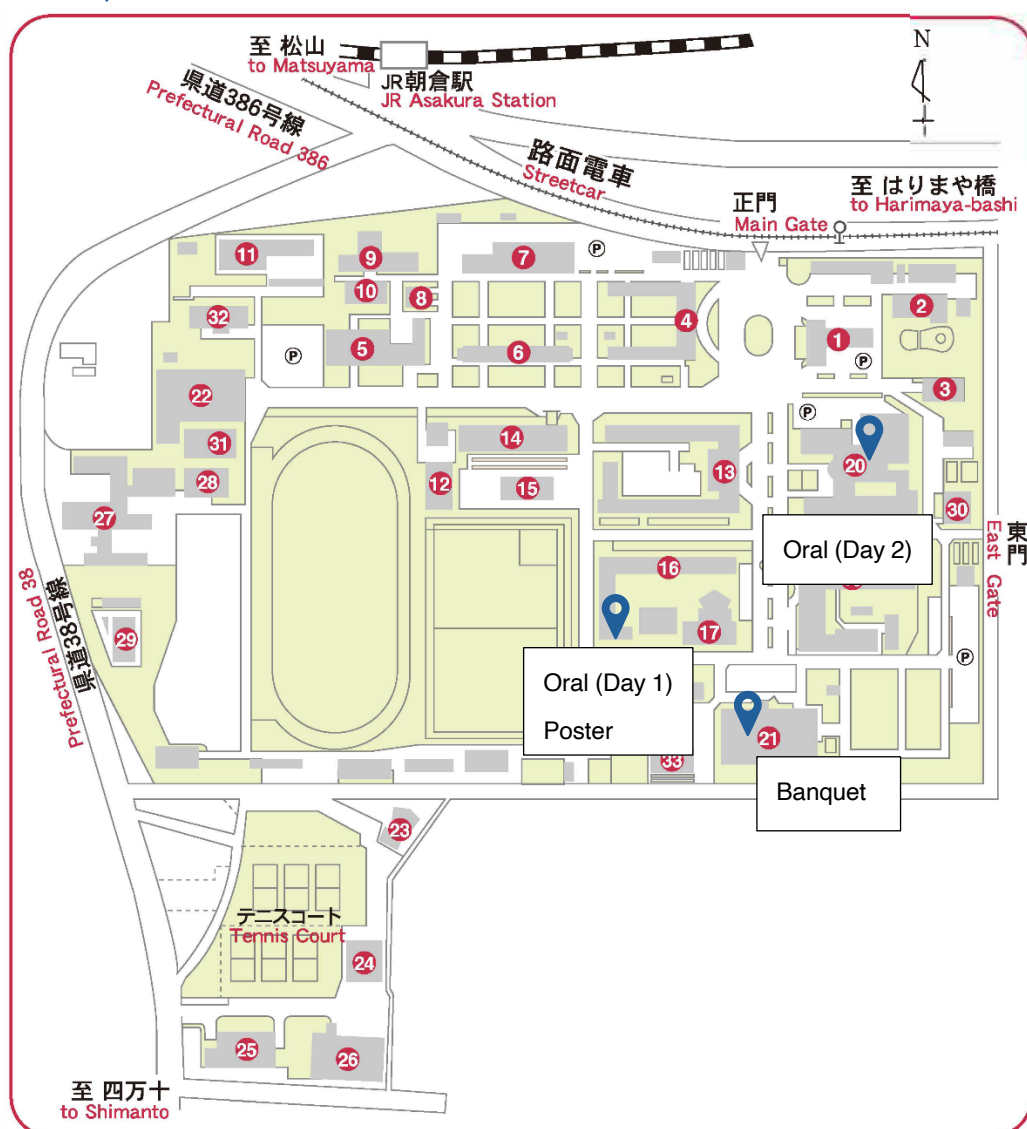


Map of Asakura Campus:

The venue for the oral presentations is Classroom 153 in the General Education Building 1, marked as No. 16 on the map below for Day 1, and Media no Mori (which means Media Forest), marked as No. 20 on the map for Day 2.

The venue for the poster presentations is Classroom 152 in the General Education Building 1, marked as No. 16 on the map.

The flags (📍) on the map below indicate the venues.



Schedule

Day 1: November 4 (Mon)

Networking Event with Alumni and Students for the Kochi University 75th Anniversary Ceremony (Venue: Classroom 153)

- 9:00 Opening Ceremony
- 9:05 Keynote Lecture 1
“Promoting the Aquaculture Industry with Sustainable Deep Ocean Water Resources”
Huang, P.-Y. (TAMSUO Aquatic Products, Taiwan)
- 9:30 Reports from Alumni
- 10:30 Break
- 10:40 Reports from Alumni
- 11:30 Lunch
- 12:30 End of Networking Event

17th International Kuroshio Science Symposium Day 1 (Venue: Classroom 153)

- 13:00 Opening Ceremony
Ukeda, H. (President, Kochi University, Japan)
- 13:15 Keynote Lecture 2
“Currents of Early Globalization: Kuroshio and the Manila-Acapulco Galleon Trade (1565-1815)”
Gerona, D. M. (Partido State University, Philippines)
- 13:50 Break
- 14:00 O1-01 “Can Indigeneity and Indigenous Fishing Practice Strengthen Resiliency of Fishing Communities against Climate Change and Promote Blue Transformation that can Support a Sustainable Blue Economy? Evidence from Tuna Hand Line Fishery of Lagonoy Gulf, Philippines”
Bradecina, R. G. (Partido State University, Philippines)
- 14:15 O2-02 “Microfinance, Social Networks, and Marine Protected Area Compliance in Fishing Communities”
dela Vega, J. M. A. (Partido State University, Philippines)

- 14:30 O1-03 “Promoting Effective MPA Management by Local Communities for Coastal Resource Conservation: Approach from Fostering Social Capital”
Shinbo, T. (Kochi University, Japan)
- 14:45 Break
- 15:00 O1-04 “Gliding Over Waves: Exploring the Mysterious Journey of Bony Flyingfish (*Hirundichthys oxycephalus*) in the Northwestern Pacific”
Chang, S.-K. (National Sun Yat-Sen University, Taiwan)
- 15:15 O1-05 “The Age and Reproduction of *Sardinella lemuru* in East Central”
Parreño K. A. (University of the Philippines Visayas, Philippines)
- 15:30 O1-06 “Path of the Kuroshio”
Yoritaka, H. (Kochi University, Japan)
- 15:45 O1-07 “Latitudinal Diversity Gradients of Marine Benthos Along Japan’s Coasts”
Jaspe, B. T. (Kochi University, Japan)
- 16:00 O1-08 “Lithium and Strontium Isotopic Observation of Hot Spring Waters in the Noto Peninsula before and after the 2024 M7.6 Earthquake: Implications for the Origin of Geofluids Involved in Earthquakes”
Zandvakili, Z. (Kochi University, Japan)
- 16:15 Poster session in Classroom 152
- 18:00 End of Day 1 Events

Poster Session (Venue: Classroom 152)

- P-01 “Ethnobotany and Antioxidant of Secondary Metabolite from Understorey Plant of Sinsagok Forest in Sanggau Regency West Kalimantan Indonesia”
Diba, F. (Bogor Agricultural University, Indonesia)
- P-02 “Marine Conservation Actions on Islands: The Impact of Designing Sustainable Tourism Activities on the Core Competencies of College Students in Taiwan”
Tseng, S.-W. (National Taiwan Ocean University, Taiwan)
- P-03 “Nesting Site Preferences of Sand Dwelling Gobies Revealed by Tailored Artificial Reefs”
Godfrey, H. H. (Kyoto University, Japan)
- P-04 “Development of a Method to Quantify the Impact of Bio-irrigation through *Upogebia* Burrows on the Marine Environment”
Takeno, K. (Kyoto University, Japan)
- P-05 “Functional Analysis of Increased GRP78 Expression due to Cellular Aging”
Escareal, Z. A. K. B. (Kochi University, Japan)

- P-06 “*Ulva meridionalis*-derived Polysaccharides Activate the β -catenin Pathway in Intestinal Epithelial Cells”
Maejima, Y. (Kochi University, Japan)
- P-07 “Regulation of Bioactive Compound Production in Co-cultures of Marine Bacteria”
Hirano, A. (Kochi University, Japan)
- P-08 “Effect of Phosphite-utilizing Bacteria on the Growth of Other Bacteria”
Homareda, A. (Kochi University, Japan)
- P-09 “Abdominal and Pleopod Variation of the Bopyrid Isopod *Ione cornuta*, a Parasite of the Ghost Shrimp *Neotrypaea japonica*, in Western Japan”
Kume, H. (Kochi University, Japan)
- P-10 “How Well Do Protected Areas Conserve Biodiversity across Taxa amidst Climate Change”
dela Vega, J. M. A. (Kochi University, Japan)
- P-11 “Genomic Divergence of *Acropora hyacinthus* from Kochi versus *Acropora* Species in Okinawa”
Manalili, S. E. N. (Kochi University, Japan)
- P-12 “Tellinid Bivalves of Shallow Depths in Uranouchi Inlet, Tosa Bay, Japan (Bivalvia: Tellinidae)”
Ito, S. (Kochi University, Japan)
- P-13 “The Status of the Loggerhead Turtle Nesting and Coastal Environment on Kochi Beach”
Yamaguchi, N. (Kochi University, Japan)
- P-14 “Larval Development of the Deep-Sea Sponge-Associated Shrimp, *Spongicola venustus* (Decapoda: Spongicolidae), Documented for the First Time in 150 Years”
Nakayama, K. (Kochi University, Japan)
- P-15 “Dose-Response and Molecular Regulatory Patterns of *Gracilariopsis heteroclada* to Fluoroquinolones”
Lin, K. (Guangdong Ocean University, China)
- P-16 “*Azolla* Culture at Varying Amounts of (*Best organic material in Study 1*)”
Molina, C. C. (Ilocos Sur Polytechnic State College, Philippines)

Day 2: November 5 (Tue)

17th International Kuroshio Science Symposium Day 2 (Venue: Media no Mori)

9:30 Keynote Lecture 4

“Science, People and Governance: Operating the Philippines’ Northern Pacific Seaboard Fisheries Management Area”

Ballad, E. L. (Bureau of Fisheries and Aquatic Resources, Philippines)

9:55 O2-01 “Status and Prospects of the Fishery Resources of Divilacan, Isabela”

Ame, E.C. (Bureau of Fisheries and Aquatic Resources, Philippines)

10:10 O2-02 “Ticao-Burias Pass Protected Seascape (TBPPS): Socio-Economic Baseline Study”

Nieves, P. M. (University of Santo Tomas–Legazp, Philippines)

10:25 O2-03 “Developing a Coastal Resource and Environment Mapping Protocol using Drone Survey-QGIS-Photogrammetry Applications”

Espadero, A. D. A. (Mindanao State University at Naawan, Philippines)

10:40 Break

11:00 O2-04 “Who Concerns the Channels? The Impact of Offshore Wind Farm Channel Planning on Stakeholders in Taiwan”

Tseng, S.-W. (National Taiwan Ocean University, Taiwan)

11:15 O2-05 “Institutional Fragmentation in Fisheries Management: Co-Management and the Circumstances of Countries in the Kuroshio Current Region”

Wu, B-S., Yang, M-H. (National Taiwan Ocean University, Taiwan)

11:30 O2-06 “Legal Frameworks for Offshore Wind Energy Development in Taiwan and Japan: Marine Spatial Planning and Future EEZ Governance”

Tsai, W-T., Yang, M-H. (National Taiwan Ocean University, Taiwan)

11:45 O2-07 “A Comparative Analysis of Risk Management Practices in Marine Activities between Taiwan and Japan: With a Focus on Diving Insurance Policies”

Lin, Y-Y., Yang, M-H. (National Taiwan Ocean University, Taiwan)

12:00 Break

12:15 O2-08 “Analysis of Extractive, Phytochemistry and GCMS of Gaharu (*Aquilaria malacensis* Lamk) from Landak Regency West Kalimantan Indonesia”

Diba, F. (Tanjungpura University, Indonesia)

12:30 O2-09 “The Characteristics of Gelam (*Melaleuca leucadendra*) Essential Oils From Sambas Regency and Singkawang City of West Kalimantan, Indonesia”

Yusro, F. (Tanjungpura University, Indonesia)

- 12:45 O2-10 “The Chemical Compound Profiles of and Anti-Fungal Activity of Essential Oils of Bay Leaves (*Syzygium polyanthum*) from Two Areas in West Kalimantan, Indonesia”
Mariani, Y. (Tanjungpura University, Indonesia)
- 13:00 Commemorative Photo
- 13:10 Lunch
- 14:30 Keynote Lecture 5
“Looking inside the Marine Research Center for Verde Island Passage after Five Years”
Saco, J. A. (Batangas State University, Philippines)
- 14:55 O2-11 “Marine Macrophyte Assessment in Claver, Surigao del Norte, Philippines”
Calala, L.R. (Mindanao State University at Naawan, Philippines)
- 15:10 O2-12 “Taxonomic Delimitation of the Monostromatic Green Algal Genera *Monostroma* Thuret 1854 and *Gayralia* Vinogradova 1969 (Ulotrichales, Chlorophyta)”
Cui, J. (Guangdong Ocean University, China)
- 15:25 O2-13 “Dose-response Pattern of Marine Macroalgae *Gracilaria bailinae* to Three Fluoroquinolones and the Cause-Outcome Relationship of Dose, Growth, Toxicity and Absorption”
Lin, K. (Guangdong Ocean University, China)
- 15:40 O2-14 “Expanding land-based cultivation of *Ulva* “SeaWheat” from Kochi, Japan”
Hiraoka, M. (Kochi University, Japan)
- 15:55 Break
- 16:15 Keynote Lecture 6
“Evaluate Northwest Pacific Fisheries Resources Using DNA Markers”
Lin, H.-C. (National Sun Yat-Sen University, Taiwan)
- 16:40 O2-15 “Population Genetics and Evolutionary History of the Indian Squid, *Uroteuthis duvaucelii* (d’Orbigny, 1935), in the Central Indo-Pacific”
Halasan, L. C. (National Sun Yat-Sen University, Taiwan)
- 16:55 O2-16 “Statolith Elemental Signatures of the Squid, *Uroteuthis duvaucelii*, in the Tropical Western Pacific”
Legaspi, J. (Kochi University, Japan)
- 17:10 O2-17 “Elemental Profiles and Cyclic Growth Patterns in Japanese Precious Corals: Insights from *Corallium japonicum* and *Pleurocorallium konojoï*”
Pepino, M.M.C. (Kochi University, Japan)
- 17:25 Break
- 17:35 O2-18 “Intensity of Wood Attacks Marine Borers at Sea on Meranti and Bengkirai Wood”
Yanti, H. (Tanjungpura University, Indonesia)

- 17:50 O2-19 “Macrofaunal Assemblage and Habitat Conditions of River Systems in Claver, Surigao del Norte, Philippines”
Padilla, R.F.Q (Mindanao State University at Naawan, Philippines)
- 18:05 O2-20 “Impact of Trematode Parasitism on the Distribution Patterns of *Batillaria multiformis* in Intertidal Zones”
Bradecina, S. R. B. (Kochi University, Japan)
- 18:20 Closing Ceremony
Itani, G. (Symposium Chair, Kochi University, Japan)
- 18:30 Move to the Cafeteria
- 18:45 Banquet
- 20:45 End of Day 2 Events

Day 3: November 6 (Wed)

Excursion - Ryuga-do Limestone Cave Tour (Half Day)

Ryuga-do Cave is one of the three largest limestone caves in Japan. This cave is unique in that ruins from approximately 2,000 years ago were discovered. The total length of this cave is 4,000 m, but an approximately 1,000 m long route has been developed. We will take visitors on a tour of the cave, explaining the cave organisms and the stalactite dating results, which are currently underway at Kochi University.

Keynote Lectures

Keynote Lecture 1

Promoting the Aquaculture Industry with Sustainable Deep Ocean Water Resources

HUANG, Ping-Yi ^{1,2*}

¹ Tamsuo Aquatic Products Co. Ltd., Yilan, Taiwan

² Center for Ocean and Underwater Technology Research of Tamkang University, New Taipei City, Taiwan

* koh@tamsuo.com

According to the report on fisheries published by the United Nations Food and Agriculture Organization, aquaculture production has been increasing since the 1970s. In 2022, for the first time, the global aquaculture production of aquatic animals surpassed that of wild capture. With the production of wild capture having plateaued since the 1980s and no further increase expected, the growing demand for aquatic products due to population growth and improved living standards can only be met through aquaculture. The importance of aquaculture in ensuring a stable supply of aquatic products will continue to increase in the future. However, aquaculture cannot be developed indefinitely, and currently, aquaculture farmers worldwide face various challenges. The aqua-farmers in Taiwan are also struggling to address issues such as changes in the aquaculture environment, rising feed costs, the spread of fish diseases, and marketing challenges. After obtaining a Ph.D. from the Graduate School of Kuroshio Science at Kochi University, the author had the opportunity to engage in research on deep ocean water and work on promoting the use of deep ocean water resources in Taiwan. The development of deep ocean water resource utilization and the promotion challenges of aquaculture in Taiwan will be introduced.

Keywords: deep ocean water, aquaculture, Taiwan

**Currents of Early Globalization: Kuroshio and the Manila-Acapulco
Galleon Trade (1565-1815) Water Resources**

DANILO MADRID GERONA

Partido State University, Goa, Camarines Sur, Philippines

Known to the Japanese centuries before the first Spanish navigators crossed the Pacific Ocean en route to the Philippines, the Kuroshio Current played a crucial role in subsequent galleon voyages, laying the groundwork for the early phase of global travel and commerce. Although most Spanish sailors remained unaware of it until the 19th century, navigational reports from the 16th century onward made passing references to oceanic and meteorological phenomena likely related to, or constitutive of, the Kuroshio. This lecture draws from various archives in Spain to examine these reported peculiarities, specifically: the contrasting wind systems known as the vendaval and brisa, which sailors primarily attributed to the galleons' trans-Pacific navigational propulsion; the distinctive turbulent currents, whirlpools, and violent storms observed along the eastern coastlines of the Philippines, identified by Kuroshio science as the bifurcation point; and the "natural" northward current that favorably pushed galleons toward the coasts of Taiwan, China, and Japan, providing Spain with initial incentives for imperial expansionism in northern Asia. Additionally, it underscores Japan's strategic importance as the last and only refuge for galleons in distress while navigating the Pacific.

On a global scale, the Kuroshio Current deserves significant credit for the early phase of globalization in the 16th century. The remarkable advancements made by Kuroshio scientists in studying global currents and related meteorological phenomena positioned the Philippines as an excellent site for future scientific discoveries and for historians to investigate the long-term impacts of the Kuroshio Current on Philippine and Asian history. The Kuroshio offers historians immense opportunities for innovative academic collaboration through a scientific paradigm that connects seemingly sporadic and unrelated natural phenomena to a deeper understanding of human events within their comprehensive and long-term historical contexts.

Estimating the Spawning and Nursery Locations of the Bali Sardinella in Bali Strait through Ichthyoplankton Studies and Trajectory Modeling

**Simanjuntak, C. P. H.^{1*}, Lumban-Gaol, J.², Cheung W. W. L.³, Reygondeau G.³,
Teh L.³, Ervinia A¹., Nabil², Nazal M. F.¹, Agustiadi T.⁴**

¹ Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University, Indonesia

² Department of Marine Science and Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University, Indonesia

³ Institute for the Oceans and Fisheries, The University of British Columbia, Canada

⁴ Research Center for Oceanography-National Research and Innovation Agency (BRIN), Indonesia

* charles_phs@apps.ipb.ac.id

The Bali Sardinella (*Sardinella lemuru*) is an economically important species in the Bali Strait and has been categorized as vulnerable. The Bali Sardinella Fishery Management Plan (BS-FMP) was established by the Minister of Marine Affairs and Fisheries of the Republic of Indonesia through KP Decree No. 198 of 2023 to manage this species. However, the spawning and nursery locations for this species mentioned in the BS-FMP are still based on conjecture. Therefore, this study aims to identify the spawning and nursery locations of Bali Sardinella using ichthyoplankton studies and trajectory modeling. Ichthyoplankton cruises with a bongo net were conducted at 18 sampling stations in April 2023, September 2023, and July 2024. At each sampling site, hydro-oceanographic conditions were observed, and plankton communities were collected. Abundant eggs and larvae of Bali Sardinella were caught in September, while some juvenile fish were collected by lift-net in April, July, and September. Backtracking modeling confirms that Bali Sardinella spawns in the Bali Strait, and forward-tracking modeling shows that the nursery ground for this species is situated in the western part of the Bali Strait. In addition, the upwelling phenomenon occurred in July and September, enhancing the abundance of phytoplankton and zooplankton, which are the main diet of fish larvae and juveniles of Bali Sardinella.

Keywords: Backtracking larval transport, Clupeid larvae, Hydrodynamic variability, *Sardinella lemuru*, Upwelling

Science, People and Governance: Operating the Philippines' Northern Pacific Seaboard Fisheries Management Area

Emma L. Ballad ^{1*} and Angel B. Encarnacion¹

¹ DA-Bureau of Fisheries and Aquatic Resources Region 2, Tuguegarao City, 3500 Cagayan, Philippines

* Presenter: elballad@gmail.com

The Northern Pacific Seaboard Fisheries Management Area (FMA), also known as FMA 1, is one of the twelve FMAs established in the country for the conservation and management of fisheries in Philippine waters by virtue of Fisheries Administrative Order (FAO) 263 series of 2019. The FAO summarizes the principles carried by the management strategy such as: adoption of ecosystem-based fisheries management; establishment of a management body; promotion of science-based approach; and delineation on the role of Local Government Units in the fisheries management.

The presentation outlines the ecological significance of FMA 1 which includes the areas along the Kuroshio Current, detailing its rich biodiversity as well as the challenges posed by anthropogenic and natural factors. It provides information on how science-based management policies are developed through a collaborative approach that includes technical experts and representatives from sectoral fishing communities in decision-making processes, ensuring the incorporation of traditional knowledge and practices. The governance framework serves as critical component for balancing conservation efforts with the social considerations such as livelihood and income. It puts emphasis on the importance of integrating scientific information, community involvement, and effective governance in the sustainable management of fisheries within FMA 1. By fostering partnerships among various stakeholders, the initiative aims to create a more sustainable and equitable fisheries management system.

Keywords: Community Involvement, Fisheries Management Area, Fisheries Governance, Northern Pacific Seaboard, Science-based management

**Looking inside the Marine Research Center for Verde Island Passage
after Five Years****

Saco, Jayvee Ablaña* and Azcuna, Miguel Enrique Ma. A.

Verde Island Passage Center for Oceanographic Research and Aquatic Life Sciences, Batangas State University – The National Engineering University, Rizal Ave., Batangas City, Batangas 4200 Philippines
Master of Science in Marine Biology Program, College of Arts and Sciences, Batangas State University – The National Engineering University, Rizal Ave., Batangas City, Batangas 4200 Philippines

* jayvee.saco@g.batstate-u.edu.ph

The Verde Island Passage or VIP encompasses the five provinces of Batangas, Marinduque, Oriental Mindoro, Occidental Mindoro, and Romblon. Owing to its central location in the Coral Triangle and its high marine biodiversity, it was labeled as the world's center of the center of marine shore fish biodiversity. The VIP is identified as one of the highest priority areas in the Coral Triangle for conservation and management. It has recently gained attention after being declared a Hope Spot by the Mission Blue Organization. However, the VIP is under threat due to increasing industrialization, increasing human-related activities, and even climate change which poses serious and detrimental effects to this marine corridor and its vast biodiversity. Within five years of the establishment of the marine research center for the VIP – the Verde Island Passage Center for Oceanographic Research and Aquatic Life Sciences, Batangas State University – The National Engineering University, the marine biodiversity assessment in selected sites showed that the VIP is still in good condition based on good coral cover and high biodiversity among most of the sites, some of which are not Marine Protected Areas (MPAs) and can be endorsed for MPA status based on coral cover and biodiversity. Although in good condition, the marine environment is still vulnerable as highlighted by decreases in seagrass cover in some sites and the proliferation of some green tide blooming species. This green-tide blooming species such as *Ulva* spp. has the potential to be used for biosurveillance. These species were shown to tolerate a wide range of temperatures, light intensities, and nutrients prompting their proliferation year-round. These biomonitoring data are stored in a database for use in forecasting and documentation, while, the collected specimens are preserved, photo-documented, stored, and uploaded to our online marine repository hub. To address food security and livelihood in coastal areas, economically important marine organisms were identified for culture technology development [i.e., seaweeds (*Kappaphycus*, *Halymenia*,

Asparagopsis, *Gelidiella*, *Saragssum*), sea cucumbers, oyster] and management strategies for the fishing industry i.e., Siganids. In addition, training in the culture of economically important freshwater organisms (i.e., tilapia) was done locally, producing four (4) tons of fresh tilapia to augment the fish supply in the province. There are still many gaps in understanding today's threats to the marine environment, and collaborations with other universities and institutions are essential to successfully conduct studies that focus on these threats.

Keywords: biodiversity, biosurveillance, marine resources, monitoring, food security

**Saco, Jayvee Abaña and Azcuna, Miguel Enrique Ma. 2023. Looking inside the Marine Research Center for Verde Island Passage after Five Years. SciEnggJ. 16 (2) 385-386. <https://scienggj.org/2023/SciEnggJ%202023-PopSci-54.pdf>

Keynote Lecture 6

Evaluate Northwest Pacific Fisheries Resources Using DNA Markers

Lin, H.-C. ^{1*}, Guo, Y.-H. ¹, Hong, R.-Y. ¹, and Halasan, L. C. ¹

¹ Department of Marine Biotechnology and Resources, National Sun Yat-sen University, Kaohsiung, Taiwan

* hsiuchinlin@mail.nsysu.edu.tw

Two marginal seas of the Northwest Pacific, the East China Sea (ECS) and South China Sea (SCS), represent one of the world's most densely populated regions. These seas have long endured substantial fishing pressures by surrounding nations. Climate change and marine pollution have heightened concerns, contributing to the ecological fragility and continual depletion of marine resources over the past few decades. Taiwan, positioned at the confluence of ECS and SCS, provides a pivotal conduit for fisheries resources and, therefore, is critical for evaluation. DNA markers have been widely applied to evaluate fisheries resources by estimating the genetic diversity, population structure, effective population size, historical population dynamics, migration patterns, etc. For the past few years, our team has used DNA markers to study several fisheries species, including cutlassfishes (*Trichiurus* spp.), squid (*Uroteuthis edulis*), and yellowstripe scad (*Selaroides leptolepis*). We observed a general pattern of a more restricted distribution range and difficulties in species identification based on morphology, which resulted in elusive fishery data.

Keywords: fishery, microsatellite, mitochondrial DNA

Oral Presentations

O1-01

Can indigeneity and indigenous fishing practice strengthen resiliency of fishing communities against climate change and promote blue transformation that can support a sustainable blue economy? Evidence from tuna hand line fishery of Lagonoy Gulf, Philippines

Bradecina, R. G. ^{1*}

¹ Partido State University

* Presenter: rgbradecina@yahoo.com

Current developments provide opportunities for application of indigeneity and cultural dimensions in fisheries and coastal resource management and in climate change actions. Fishing communities and local government units in Lagonoy Gulf have been recipients of initiatives supporting functional community rights-based management through managed access with reserves (MA+R) and community-based marine fishery reserves and sanctuaries aka marine protected areas adopting western science and management knowledge. Coastal ecosystems are socioecological systems. Social capital as property of sociocultural environment takes the form of relational resources composed of social networks, norms, trust and shared resources. These aid in characterization of social system and analysis of traditional forms of resource governance. Including them in coastal and fisheries resource conservation may increase buy-in, reduce conflicts, etc. Multi-stakeholder partnership on tuna fisheries in the area are establishing long-term market access, and responsible fisheries management which can provide selectively caught tuna to market actors abroad to strengthen fishers' livelihood. This initiative for Eco labeling requires fishers' adherence towards promoting sustainable fishery and safe tuna products. Eco labeling over-emphasize impacts from fisheries rather than provide balanced perspectives of impacts from the entire product chain. With the mapping of blue economic development, there are calls for building attractive financing portfolios that look at potential of establishing blue financing schemes that encourage blue investments to strengthen the country's ocean economy. This paper links the potential of social capital and measurable predictors to support community-based marine conservation and sustainable resource governance. It also provides localized information affirming the relevance of indigenous knowledge system and fishing practices in pursuing safe and sustainable fishery products. Finally, this paper provides quantification and economic valuation of carbon foot print from indigenous tuna fishing practices supporting initiatives to establish blue financing schemes such as payment for

marine environmental services.

Keywords: social capital, community-based marine conservation, indigenous knowledge system, blue financing

Microfinance, Social Networks, and Marine Protected Area Compliance in Fishing Communities

dela Vega, J. M. A.^{1*}, Bradecina, R. G.¹, Shinbo, T.², and Morooka, Y.³

¹ Partido State University

² Kochi University

³ Professor Emeritus, Kochi University

* Presenter: dacillo.joela@parsu.edu.ph

This study examines the relationship between microfinance, social networks, and compliance with Marine Protected Area (MPA) regulations in fishing communities in Sagñay, Camarines Sur, Philippines. The research aims to understand how access to microfinance and the strength of social networks influence the behavior and decision-making processes of local fishers regarding observance to MPA rules. This study combines qualitative interviews with quantitative surveys to capture the distinctions of social capital, financial accessibility, and their effects on coastal resource management. Findings suggest that fishers with better access to microfinance resources are more likely to engage in sustainable fishing practices, as these financial tools alleviate economic pressures that often lead to overfishing. Additionally, strong social networks within the community enhance collective action, leading to higher compliance rates with MPA regulations. This study emphasizes the importance of integrating financial support mechanisms with community-based management strategies to enhance the effectiveness of MPAs in promoting coastal resource conservation. The results have significant implications for policymakers aiming to foster both economic resilience and environmental sustainability in coastal communities.

Keywords: marine protected area, social networks, financial support, community-based management

Promoting Effective MPA Management by Local Communities for Coastal Resource Conservation: Approach from Fostering Social Capital

Teruyuki Shinbo^{1*}, Joela M. A. dela Vega-Dacilo², Emma L. Ballard³, Raul G. Bradecina²

¹ Kochi University, Japan

² Partido State university, the Philippines

³ DA-Bureau of Fisheries and Aquatic Resources Regional Office 2 (DA-BFAR RO2), the Philippines

Important coastal ecosystems in tropical and subtropical regions, such as coral reefs, seagrass beds, and mangrove forests, have deteriorated in recent years. Their conservation is an urgent issue. For this purpose, marine protected areas (MPAs) have been established in the Philippines. Community-based management (CBM), which is carried out to make MPAs function effectively, requires the participation of local residents, especially fisherfolk, in that management. If sufficient participation from residents is not ensured, necessary management will not be carried out. And MPAs will become "paper MPA" and effective conservation will not be realized.

The first factor that may encourage local residents to participate in MPA management is economic factors such as the provision of honoraria and other economic benefits.

However, there are also cases where a conflict occurs in local communities when economic benefits such as honoraria are brought into the community from outside.

Among these, we had found that social capital, a non-economic factor, influences residents' participation in MPA management.

Social capital is a resource that contributes to increasing people's productivity and utility, embedded in social relationships, such as norms of trust and reciprocity, and social networks (connections between people). As the name "capital" suggests, social capital is thought to increase or decrease through some kind of investment, promotion, or encouragement. Specifically, we found the examples where trust is fostered among members through joint activities within a community. By promoting such joint activities through policy intervention, such as by granting communities a livelihood project, it may be possible to increase participation in MPA management. It is also expected that the internal structure of the community and the habits of everyday life contribute to the enhancement of social capital within the community.

As a next step, we plan to conduct research project regarding how a community's ethnic composition (e.g., size of AETA group) and various customs affect the formation of social capital. I. e., we will conduct field survey like interview with

local residents, questionnaire surveys, and public goods game experiments in 2-3 areas. Through such research, we would like to consider what kind of policy interventions will increase social capital and encourage participation in coastal resource management activities such as MPA management.

Keywords: Marine Protected Areas (MPAs), Community-Based Management (CBM), Social Capital, Coastal Resource Conservation, AETA

Gliding Over Waves: Exploring the Mysterious Journey of Bony Flyingfish (*Hirundichthys oxycephalus*) in the Northwestern Pacific

Chang, S.-K.^{*1 2} and Lin, C.-H.¹

¹ Graduate Institute of Marine Affairs, National Sun Yat-sen University, Kaohsiung, Taiwan,

² Sustainable Ocean Governance Center, National Sun Yat-sen University, Kaohsiung, Taiwan

* Presenter: skchang@faculty.nsysu.edu.tw

Bony flyingfish (*Hirundichthys oxycephalus*) exhibits a widespread distribution across the northwestern Pacific Ocean and represents one of the six predominant flyingfish species in Taiwan's eastern waters. This species holds significant ecological and economic importance, serving as a crucial component in the flyingfish roe fishery of northeastern Taiwan and being utilized as bait in longline and trolling fisheries. To elucidate the spatiotemporal migration patterns of the fish, a comprehensive study was conducted over a five-year period from 2008 to 2012. The research encompassed an extensive geographical range; biological samples and fishery catch data were collected from six locations: Goto (GT) and Yakushima (YK) in Japan; Keelung (KL), Hualien (HL), and Ludaο (LD) in Taiwan; and Batanes (BT) in the Philippines, during different time periods, using port sampling, at-sea surveys, and international collaborative efforts. The possible migration behaviors of the fish were estimated based on spatiotemporal gradient changes in fish density, fish size, and gonadosomatic index (GSI), in conjunction with otolith ring analyses. The sampling program did not observe bony flyingfish in Batanes, and the results of this investigation suggest the presence of three spawning grounds within Japanese and Taiwanese waters: A primary spawning ground located in the northeastern waters of Taiwan (Keelung); a winter spawning area situated in the southeastern waters of Taiwan (Ludaο); and a presumed winter spawning area south of Jeju in the East China Sea. While these findings provide valuable insights into the migratory behavior of the fish, it is imperative to acknowledge that these inferences require further corroboration through comprehensive oceanographic studies, particularly focusing on current patterns and their potential influence on larval dispersal and adult migration routes. Such additional research would serve to validate and potentially refine the current understanding of the fish's spatiotemporal dynamics in the northwestern Pacific region.

Keywords: migration route, GSI, fish density, spawning ground.

The Age and Reproduction of *Sardinella lemuru* in east central Philippines

Parreño K. A. ^{1*}, Campos, W. L.¹, Regalado, A. B.¹, Nuñez, K. P.¹

¹ OceanBio Laboratory, Division of Biological Sciences, CAS, University of the Philippines Visayas, Miagao, Iloilo, Philippines

* Presenter: ktpamonag@up.edu.ph

Sardinella lemuru dominates the small pelagic fisheries in the Philippines. The Bali sardine are protracted spawners with spawning peak starting October until January and reported minor peaks in other fishing grounds. Understanding the age, growth and hatch date seasonality of spawning adults during the peak season (Oct - Jan) provides critical insights on the dynamics and productivity of the Bali sardine. Age and growth were estimated from the daily deposition and width of increments in otolith microstructures examined under the scanning electron microscopy. While hatch dates were obtained from the capture date and age in days interpolated from the SEM Age and length (in SL) relationship. Results showed that a substantial percentage of the major peak spawners comprise of individuals hatched outside the main spawning season and belongs to two age groups: a younger and an older batch aged 5-6 months and 7-11 months, respectively. Early life growth of both age groups was then compared. The oceanographic conditions influencing the reproduction of *Sardinella lemuru* in east central Philippines is discussed.

Keywords: *Sardinella lemuru*, age, growth, reproduction, east central Philippines

Path of the Kuroshio

Yoritaka, H.^{1*}, and Nakamura, R.¹

¹ Kochi University

* Presenter: yoritaka@kochi-u.ac.jp

There are four types of paths of the Kuroshio south of Japan (Fig. 1). And there are two types of Kuroshio large meanders: the large meander west (LMW), whose trough (the southernmost point) is located west of the Izu–Ogasawara Ridge, and the large meander east (LME), whose trough is located on the ridge. Fitting the solution of the path equation to the Kuroshio path, characteristic velocities and meander wavelengths of the LME were not significantly different from those of the LMW. The difference in longitude between the LME and LMW troughs is due to the difference in separation longitude, not the difference in meander wavelength associated with the difference in characteristic velocity. (Yoritaka et al., 2023)

There is a sea-level difference of approximately 20 cm between the west coast of Kyushu and the east coast of Honshu. During the non-large meander (NLMN and NLMS), the Kuroshio is attached to the southern tip of the Kii Peninsula and is responsible for approximately 9 cm of this difference in coastal sea-level, while during the large meander west (LMW), the Kuroshio leaves the Kii Peninsula and a Kuroshio branch is instead attached to the southern tip of Izu Peninsula and is responsible for approximately 7 cm of this difference in coastal sea-level.

Keywords: Kuroshio, large meander, path equation, coastal sea-level

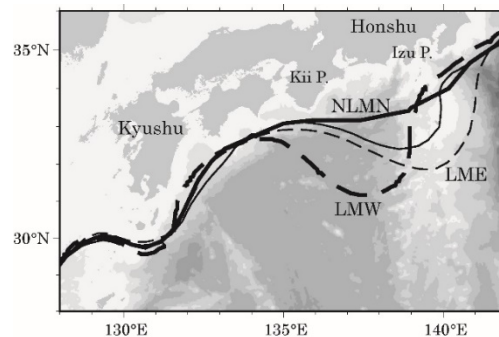


Fig. 1 Four types of paths of the Kuroshio. Non-large meander north (thick solid line), non-large meander south (thin solid line), large meander west (thick dashed line), and large meander east (thin dashed line).

Latitudinal Diversity Gradients of Marine Benthos Along Japan's Coasts

Jaspe, B.T., ^{1*}, Kanaya, G., ² and Miura, O.³

¹ Graduate School of Kuroshio Science, Faculty of Agriculture and Marine Science, Kochi University, 200 Monobe, Nankoku, Kochi, 783-8502, Japan

² National Institute for Environmental Studies, 16-2 Onagawa, Tsukuba, Ibaraki, 305-8506, Japan

³ Faculty of Agriculture and Marine Science, Kochi University, 200 Monobe, Nankoku, Kochi, 783-8502, Japan

* Presenter: beverlyjaspe19@gmail.com

Recent studies on the latitudinal diversity gradient (LDG) have garnered considerable attention. However, they remain limited by a relatively small number of sampling sites and are predominantly focused on terrestrial ecosystems. This study examined the latitudinal gradients in species richness of marine benthos across 171 stations along the coast of Japan between 24°N and 45°N. To determine the multi-scale variability of benthos, hierarchically nested sampling design was employed. Published datasets of benthic communities were obtained. The presence or absence of marine organisms in 1, 244 census plots from Hokkaido to Okinawa was examined. A total of 1, 271 taxa was identified. Mollusca was the dominant taxonomic group with 36% of total composition, followed by Malacostraca (28%), Annelida (20%), and other groups (16%), respectively. Decreasing trends were observed to all major taxonomic groups as we plotted it against latitude. The results also showed decline in species richness with increasing latitude in alpha, beta, and gamma diversity indices, suggesting clear evidence of LDG. Gamma diversity was highly variable (3-290 species) with a station in Hokkaido had the lowest species found, characterized by a clay-peat sediment type, whereas a station in Kyushu had the highest number of species found, with a sand-mud sediment type. In terms of alpha diversity, 4 plots located in Hokkaido recorded no species, whereas the plot located in Kyushu recorded 61 species. Mean alpha diversity and gamma diversity were significantly correlated with each other. We also found that the similarity between benthic communities decreases with increasing geographic distance. This pattern is consistent with the idea that communities that are farther apart geographically are more dissimilar, possibly due to varying environmental conditions such as temperature and sediment type, habitat fragmentation, or limited species dispersal across distances.

Keywords: latitudinal diversity gradient, marine benthos, alpha diversity, beta diversity, gamma diversity

Lithium and strontium isotopic observation of hot spring waters in the Noto Peninsula before and after the 2024 M7.6 Earthquake: Implications for the origin of geofluids involved in earthquakes

Zandvakili, Z.^{1*}, Kagoshima, T.², Morishita, T.³ Hiramatsu, Y.³ and Nishio, Y.¹

¹ Marin Core Research Institute, Kochi University

² Toyama University

³ Kanazawa University

* Presenter: b22d6c01@s.kochi-u.ac.jp

The Noto Peninsula earthquake, with a magnitude of M7.6, occurred on New Year's Day 2024 in the northern part of the Noto Peninsula, near the earthquake swarm zone. An intense crustal seismic swarm had begun in late November 2020 at the tip of the Noto Peninsula (Umeda et al., 2024; Amezawa et al., 2023; Nishimura, 2024). The occurrence of the Noto Peninsula earthquake swarms (which include four clusters: northern, northeastern, western, and southern—the latter being the first to begin; Amezawa et al., 2023) has been linked to the upwelling of non-volcanic fluids. This is supported by the presence of a continuous low-resistivity zone, extending from the depth of the southern cluster to the northern cluster, as estimated from onshore broadband electromagnetic field data (Yoshimura et al., 2024).

To further investigate the origin of these fluids beneath the Noto Peninsula, we measured Li and Sr isotopes in hot spring samples from the area between 2022 and 2024, covering the critical period around the M7.6 earthquake. A geochemical time-series analysis of several springs revealed anomalies that appear to be related to seismic activity.

Keywords: Geofluids, Earthquake, Noto peninsula, Isotopes

Status and Prospects of the Fishery Resources of Divilacan, Isabela

Ame, E.C.*¹, Silva, A.D¹, Undiana. R¹, Torres, RJ¹

¹Bureau of Fisheries and Aquatic Resources 02

*Presenter: evelyncame83@gmail.com

Fisheries development in a geographically isolated area like Divilacan has been meager due to the transport problem of goods and services from the mainland and the inadequacy of support from the government. The surrounding pristine environment, the vast natural resources, the presence of Sierra Madre Mountain ranges, and its nearness to the Philippine Sea made it a good place for economic activities. Two coves are located within Divilacan, the Bicobian and Dimasalansan Cove, both showing great potential for fisheries development and protection. However, these areas remain backward and poverty-stricken. Through participatory resource appraisal (PRA), the strengths and opportunities of Divilacan were determined to better address the issue of resource management and utilization. Results show that the presence of Sierra Madre Mountain ranges serves as a transport barrier for people, goods, and services but has a positive impact on the diversity of its marine resources. Most of the land areas are covered with thick forests. Its fertile lands are utilized for agriculture mainly for rice, vegetables, and other fruit-bearing trees. Majority of the population is involved in farming and fishing. Fishing activities are done within the cove and within municipal waters where various fishes are being caught using different gears such as cast nets, gill nets, and hand lines. Indigenous people were identified as one of the key resource users who use traditional fishing gear such as spear guns for fishing. The dense seagrass meadows were observed to have contributed to the increasing fish population in the coves. Five seagrass species such as *Cymodocea rotundata* (Cr), *Enhalus acoroides* (Ea), *Halodule pinifolia* (Hp), *Syringodium isoetifolium* (Si), and *Thalassia hemprichii* are present in the area. Fish species caught include siganids, mullet, crevalle, mudcrab, octopus, and some edible reef fishes. Divilacan's pristine vast marine resources may offer a comparative advantage in terms of improving the living conditions of the populace in the area however strict regulatory measures should be undertaken to sustain the benefits it can provide to the people.

Keywords: Bicobian cove, Dimasalansan cove, Philippine sea, Indigenous people

Ticao-Burias Pass Protected Seascape (TBPPS): Socio-Economic Baseline Study

**Plutomeo M. Nieves¹, Manuel E. Narvadez Jr.², Richelle B. Bañadera³,
Demetrius C. Reyes³**

¹Director, Office of Research, UST-Legazpi, Rawis, Legazpi City

²World Wide Fund for Nature – Sustainable Tuna Project 2, Quezon City

³Research Assistant, WWF-TBPPS Project

Corresponding author: plutz1122@yahoo.com

This paper is a benchmark study focuses on the socio-economic and fisheries of the municipalities bordering Ticao-Burias Pass Protected Seascape. A total of 1,080 respondents across study sites participated and was implemented using survey interview, focus group discussion and key informant interview.

Demographic composition consists of fishing households with 75.28% dependency ratio, mean households size of 4.4, residing within the 40-meter easement zone. The total population is 940,097 with mean density of 516/km², predominantly Catholics with Bicolano ethnicity identifiable by the language spoken. “Agta-Tabangnon” and “Agta Cimarron” are the ethnic tribes noted. Literacy is not an issue except in adult education. The general health condition varies across localities with 83.15% owned sanitary toilets; 34.50% relied on commercially available mineral water.

Majority (61.75%) of the HHs consider themselves better off than poor despite earning PhP3,000 to PhP5,000m-1 which is below the PhP12,082m-1 poverty threshold for a family of five to meet their minimum basic food and non-food needs. Sadly, 38.52% do not have secondary sources of income and 63.79% are without other occupational skills attributed to low level of education attained, limited skills, limited access to land and capital making them less competitive to augment their meager income. In this regard, employment opportunity, credit & financing, and safe drinking water are the identified community needs.

The fisheries sector consists of 34,758 registered fishers, 3,627 registered boats with 5,653 gear types classified under six groups exploiting the multi-species fisheries. Estimated annual production is 157,892.68 MT, of which 3,110.29MT during lean season and 154,782.39MT for peak season. Catch composition is generally pelagic and demersal species belonging to 30 families. *Sardinella gibbosa* and *Sardinella lemuru* are the most important species caught.

The issues and concerns ventilated by stakeholders are interconnected from apprehension of displacement due easement provision to waste management down to the illegal, unregulated and unreported fishing including the oversupply/overfishing of sardines along with marketing and post-harvest problems infrastructure are the pressing issues and challenges in TBPPS.

Keywords: Ticao-Burias Pass Protected Seascape, benchmark, multi-species fisheries, easement, and better-off.

Developing a Coastal Resource and Environment Mapping Protocol using Drone Survey-QGIS-Photogrammetry Applications

Anabelle Dece A. Espadero^{*1}, Daniza Mae C. Oco², Garry C. Marapao³, Sandra M. Moscoso¹, Ed Vince Ruiz¹, and Renoir A. Abrea³

¹ College of Marine and Allied Sciences, Mindanao State University at Naawan, Naawan, 9023 Philippines

² College of Business Administration and Accountancy, Mindanao State University at Naawan, Naawan, 9023 Philippines

³ College of Agriculture, Forestry, and Environmental Science, Mindanao State University at Naawan, Naawan, 9023 Philippines

* Presenter: anabelledece.espadero@msunaawan.edu.ph

Tropical coastal ecosystems, including mangroves, seagrass, and coral reefs, are transitional environments that exist in a delicate balance between open water and upland landscapes. Effective management of these ecosystems requires the ability to monitor their physical features and processes with high spatial and temporal resolutions, ideally represented in maps. Although some areas in the Philippines have achieved this level of monitoring, current methods often rely on time-consuming in situ techniques, which may not capture the larger scale required for coastal mapping. To address this limitation, a new cost-effective approach to coastal mapping has been developed using drones. This approach serves as a valuable resource assessment and monitoring tool for both research institutions and community partners in Naawan and Balingoan, Misamis Oriental.

Drones are deployed at an altitude of 50 meters, capturing high-resolution images at a range of 0.5 cm² to 1 cm² per pixel. These digital images are then stitched together using Agisoft Metashape software to create orthophoto images, allowing for the derivation of habitat extent. The accuracy of the generated thematic maps is validated using in-situ data, specifically ground control points. Compared to satellite data, this drone-based approach offers higher-resolution images, enabling a more detailed assessment of habitat features such as seagrass, mangroves, and coral reef cover. Additionally, it allows for larger-scale coverage than traditional in-situ methods. The implementation of drone mapping for coastal research provides technical guidance and serves as an evidence-based tool for the management and conservation of natural resources in coastal areas.

Keywords: Tropical coastal ecosystem, coastal drone mapping, DJI Mavic 3, photogrammetry

Who Concerns the Channels? The Impact of Offshore Wind Farm Channel Planning on Stakeholders in Taiwan

Sheng-Wen Tseng ^{1*}, and Yu-Ping Wang ²

¹ Liberal Education Division, General Education Center, National Taiwan Ocean University, Keelung, Taiwan

² Department of Transportation and Communication Management Science, National Cheng Kung University, Tainan, Taiwan

* Presenter: swtseng.tw@gmail.com; swtsengtw@email.ntou.edu.tw

Wind power has become an important strategic industry that will help Taiwan achieve a low-carbon society, conserve energy and reach carbon reduction goals. When developing offshore wind farms, important factors such as wind turbine layout, ship navigation, marine ecology, and the interests of the fishing community must be given careful consideration. However, in the past studies, the impact and interactive effects of these developments on all the stakeholders, such as the developers, shipping companies, fishermen, fishing associations, and others, have not been properly investigated. The research question is: What economic and ecological impact will the development of an offshore wind farm have on all the stakeholders? This research focuses on the Changhua offshore wind farm, and conducts research through qualitative interviews, field investigations, and the collection of secondary data from the stakeholders. This study concludes that the stakeholders most effected by both the ecological and economic impact were the fishermen and the fishing community as a whole. The government needs to further consider how to protect the rights and interests of fishermen and the fishermen's associations. This study makes two theoretical contributions: (1) it fills the research gap in existing studies that did not examine all stakeholders, and (2) clarifies the types and interactive effect on stakeholders in wind farm channel planning.

Keywords: Ocean, Ecology, Offshore wind power, Ships passing, Environment

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Institutional Fragmentation in Fisheries Management: Co-Management and the Circumstances of Countries in the Kuroshio Current Region

Bo-Shian, WU^{1*}, Ming-Hao, YANG^{2*}

¹ Student of Graduate Program in Ocean Policy, National Taiwan Ocean University

² Assistant Professor of Graduate Program in Ocean Policy, National Taiwan Ocean University

*Presenter: gibson4797@gmail.com

The concept of “institutional fragmentation” originated in international law and was later adapted by international relations scholars to analyze global governance frameworks. Institutional fragmentation has been widely discussed in recent years, particularly in the field of environmental governance. This fragmentation often involves complex systems of institutions and governance mechanisms in specific areas of world politics, sometimes referred to as regime complexes, clusters, or networks. In this article, we focus on fisheries management as one of these issue areas. The phenomenon of institutional fragmentation is also prevalent in fisheries management, yet there is limited scholarly research on this subject.

This research aims to illustrate the phenomenon of institutional fragmentation in fisheries and explore how cooperation between Taiwan and Japan can address these issues. We begin by defining institutional fragmentation and then discuss the degrees of fragmentation from an overall perspective of fishery management. By conceptualizing governance architectures in different issue areas, we can conduct a comparative analysis of varying degrees and types of fragmentation. Additionally, the co-management system, a recent trend in fisheries management, is considered a new institutional approach. While literature suggests that co-management could be a future strategy for managing fisheries, it also presents some concerns. Despite being potentially unwieldy, time-consuming, and costly, co-management may offer tangible benefits in practice. We examine whether this system contributes to the fragmentation of fisheries management and its impact on governance mechanisms. Since co-management involves stakeholders in governance and policy-making, it is regarded as a decentralized system. Lastly, we focus on future prospects for how cooperation between Taiwan and Japan could address the challenges of institutional fragmentation.

Keywords: Institutional fragmentation; fisheries management; co-management; Kuroshio Current Region

Legal Frameworks for Offshore Wind Energy Development in Taiwan and Japan: Marine Spatial Planning and Future EEZ Governance

Wan-Ting TSAI* and Ming-Hao YANG*

College of Ocean Law and Policy, National Taiwan Ocean University, Keelung, Taiwan

* 11204002@email.ntou.edu.tw

Japan and Taiwan, in the context of sustainable development, are actively promoting energy transition, with offshore wind power becoming a crucial component of their energy policies. However, the complexity of maritime resource management and legal frameworks poses significant challenges to offshore wind development in both countries. The relevant laws and policies play a critical role in shaping industry growth. Marine spatial planning is vital in offshore wind development. It helps coordinate various marine activities such as fishing and shipping while reducing conflicts among stakeholders. Comparing the main regulations and intentions of both countries, Japan passed the "Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities" in 2018, considering marine spatial planning issues and establishing government-led councils to coordinate sea area usage. Taiwan, however, implemented a three-stage policy in 2012, focusing on development procedures without addressing coordination mechanisms between offshore wind and other marine industries. This leaves conflicts between sea area users to be resolved by developers, necessitating the promotion of stakeholder participation and cross-sector coordination through marine spatial planning mechanisms.

Despite differences in development processes and regulations, both Japan and Taiwan have recently shown interest in developing offshore wind power within their Exclusive Economic Zones (EEZs), highlighting the growing importance of EEZ governance. They are undergoing a transition from fixed-foundation offshore wind turbines to floating wind technologies, and from domestically-driven regulations to frameworks increasingly influenced by international norms. This evolution presents challenges in aligning with international legal norms and coordinating sea area usage with neighboring countries. wind power systems, analyzes the shortcomings of their sea area use mechanisms, explores future EEZ governance prospects, and discusses the establishment and application of marine spatial planning to promote sustainable marine development in both countries.

Keywords: Offshore Wind Energy, Marine Spatial Planning, Exclusive Economic Zone, International Law

A Comparative Analysis of Risk Management Practices in Marine Activities between Taiwan and Japan: With a Focus on Diving Insurance Policies

Yu-Ying LIN^{*}, Ming-Hao YANG^{*}

College of Ocean Law and Policy, National Taiwan Ocean University, Keelung, Taiwan

^{*} 11304001@email.ntou.edu.tw

The participation of people in Taiwan and Japan in water recreation activities has increased year by year, and the accompanying risks have gradually become the focus of international attention. Taiwan has passed a law that compels diving operators to take out commercial liability insurance to protect against the risks of activities, but diving instructors who bring guests in their own name cannot be insured because they cannot obtain commercial registration. This could result in coaches being fined or ordered to suspend their business by the government, putting their right to work at risk due to their lack of insurance. Japan adopts self-insurance, although it retains the insurance option and flexibility of personal coaches but lacks risk protection. The two systems have their own advantages and disadvantages, although Taiwan's compulsory insurance can improve the safety and security, but it still needs to solve the problem of insurance for individual coaches; Japan, on the other hand, should strengthen the protection of insurance and risk management for diving companies while maintaining flexibility. Therefore, this study compares the risk management methods and current situation of diving activities in the two countries, hoping to compare the crux and advantages and disadvantages faced by the two countries, and propose risk management methods that can be used for mutual reference.

Keywords: Diving activity, Water recreation, Liability insurance, Risk management, Compulsory insurance

**Analysis of Extractive, Phytochemistry and GCMS of Gaharu
(*Aquilaria malacensis* Lamk) from Landak Regency
West Kalimantan Indonesia**

Farah Diba*, Munadian, and Yanieta Arbiastutie

Forestry Faculty Tanjungpura University Indonesia

* Presenter: E-mail: farahdiba@fahutan.untan.ac.id

Agarwood is a non-timber forest product that has very high economic value that generally forms on the main trunk of the tree and is very rarely found on branches and twigs. Until now there is no complete information about the basic properties of branches and twigs of this agarwood tree, so the utilization of this part cannot be optimized. This research aims to analyze the content of chemical branches and twigs compounds for optimal utilization. Phytochemical analysis show that branches and twigs of agarwood contain alkaloids, phenolics, flavonoid and terpenoids. GC-MS analysis of the ethanol extract showed that there were similarities in the compounds contained in the main stem with the compounds contained in the branches and twigs. The compounds identified by GC-MS analysis are n-Hexadanoic acid, Hexadecanoic acid-ethyl ester, Hexadecanoic acid-methyl ester, 6,7-dimethoxy-2-phenethyl-4-H-chromone, octadecadienoic acid, linoelaidic acid, and oleic acid. The results of the analysis of the chemical extractive substance content of agarwood branches and twigs that are soluble in cold water, hot water, ethanol benzene and 1% NaOH solution were 6.93% and 6.21%; 7.62% and 5.74%; 3.70% and 2.6%; 25.59% and 19.08% respectively. Meanwhile the content of holocellulose, alpha cellulose and lignin are 13.95% and 10.90%; 42.45% and 33.85%; 31.20% and 32.60%. Based on the research findings, it can be concluded that the use of agarwood may be equated with the use of the main stem of agarwood because the content pattern of its branches and stems in comparable.

Keywords: *agarwood, Aquilaria malaccensis, GC-MS, phytochemical, wood extractive*

The Characteristics of Gelam (*Melaleuca leucadendra*) Essential Oils From Sambas Regency and Singkawang City of West Kalimantan, Indonesia

Fathul Yusro^{1*}, Yeni Mariani¹, & Hikma Yanti¹

¹ Faculty of Forestry of Tanjungpura University, Pontianak, West Kalimantan, Indonesia

*fathulyusro@gmail.com

Gelam (*Melaleuca leucadendra*) is a Myrtaceae family plant with characteristics similar to eucalyptus. Gelam is a plant that is endemic to the peat swamp ecosystem. Traditionally, the local community used stems for construction materials, barks for ship repairs, and leaves for treatment for diarrhea, vomiting, and wounds. Gelam has leaves with an aroma similar to eucalyptus oil as produced by the Eucalyptus plant. This aroma indicates that this gelam plant contains essential oils. In West Kalimantan, gelam plants are spread in several areas, such as Sambas Regency and Singkawang City. This research aims to determine the characteristics of essential oils originating from Sambas Regency and Singkawang City. The essential oil from distilled gelam leaves was analyzed using GC-MS to determine the constituent compounds and observe their physical properties. The research showed that 52 compounds comprise the essential oil of gelam leaves from Sambas Regency, with the main compound being 2-carene (14.01%). Thirty-five compounds comprise the essential oil of gelam leaves from Singkawang, with the main compound being eucalyptol (44.84%).

Keywords: Essential oils, Gelam leaves, *Melaleuca leucadendra*, Sambas regency, Singkawang City

The Chemical Compound Profiles of and Anti-Fungal Activity of Essential Oils of Bay Leaves (*Syzygium polyanthum*) From Two Areas in West Kalimantan, Indonesia

Yeni Mariani^{1*}, Fathul Yusro¹, & Hikma Yanti¹

¹ Faculty of Forestry of Tanjungpura University, Pontianak, West Kalimantan, Indonesia

*yeni.mariani81@gmail.com

Essential oil is a non-timber forest product (N.T.F.P.) produced by plants due to its secondary metabolites. Plants from the Myrtaceae family have been known to produce essential oils, including bay leaves in the genus *Syzygium*. Bay leaves (*Syzygium polyanthum*) are easy to find, widely planted, and used as plants that produce spices and medicines. This study was conducted to determine the profile of chemical compounds that make up the essential oil produced by bay leaves grown in two areas in West Kalimantan and to analyze their anti-fungal activity. We produced the essential oil by taking part of the leaves from bay plants that grow in one location in Kubu Raya Regency and Sambas Regency. The leaves are distilled to obtain essential oil, which is then analyzed using GC-MS to obtain its constituent compounds. The anti-fungal activity was carried out on the wood rot fungal (*Schizophyllum commune* Fries) at five concentration levels (2, 4, 6, 8, and 10%). There are 18 main compounds found in the essential oil of bay leaves from Kubu Raya, while 81 are found in oil from Sambas. The main chemical compound of the essential oil of bay leaves originating from these two regions is caryophyllene, with the highest percentage shown from the Kubu Raya bay leaf (40.79%) and 37% from the Sambas bay leaf. Bay leaf essential oil shows anti-fungal activity and high growth inhibition and is potentially as wood preservative.

Keywords: Anti-fungal, bay leaf, essential oils, *Syzygium polyanthum*, *Schizophyllum commune*

Marine Macrophyte Assessment in Claver, Surigao del Norte, Philippines

Calala, L.R.^{1,2*}, Espadero, A.D.A.^{1,2}, Ruiz, E.V.C.², and Abrea, R.A.^{2,3}

¹College of Marine and Allied Sciences, Mindanao State University at Naawan,
Naawan, Misamis Oriental 9023 Philippines

²Coral Reef Management Hub, Mindanao State University at Naawan,
Naawan, Misamis Oriental 9023 Philippines

³College of Agriculture Forestry and Environmental Sciences, Mindanao State University at Naawan,
Naawan, Misamis Oriental 9023 Philippines

*lovella.calala@msunaawan.edu.ph

Marine macrophytes serve as valuable indicators of ecosystem condition and habitat health. The establishment of various industries across the coastal barangays in Claver provided income to coastal communities. However, these developments may pose significant threats to the marine environment through increased organic loading and eutrophication which can ultimately lead to habitat destruction. Seagrass and seaweed resources across eight monitoring sites were assessed using a modified transect line-quadrat method and results were compared to the data obtained from previous surveys conducted in the area from 2021 to 2023. The present study recorded eight seagrass species with *Halodule uninervis* and *Thalassia hemprichii* as the most common species. Seagrass percent cover was generally low, ranging from 9.41% - 19.86% in most sites, except in Alingkakajaw Island South (76.82%) and Lapinigan West (34.32%). The highest density (564 shoots m²) was observed in Alingkakajaw Island South for *H. uninervis*. These findings were comparable to the 2023 data where distribution of *Halodule* species was observed in areas with loose sediments that are often disturbed by strong wave action. A total of 22 seaweed species were recorded across sites while previous surveys reported a total of 15 to 25 species, of which, *Padina* and *Sargassum* are the dominant species. These results will be instrumental for the Local Government Unit of Claver in developing an effective, science-based resource management plan aimed at protecting and conserving coastal resources.

Keywords: bioindicator, biodiversity, seagrass, macroalgae, Claver

**Taxonomic Delimitation of the Monostromatic Green Algal Genera
Monostroma Thuret 1854 and *Gayralia* Vinogradova 1969
(Ulotrichales, Chlorophyta)**

**Jianjun Cui^{1*}, Chunli Chen¹, Huaqiang Tan², Yongjian Huang¹, Xinyi Chen¹,
Rong Xin¹, Jinlin Liu³, Bowen Huang¹ and Enyi Xie^{1*}**

¹ Fishery College, Guangdong Ocean University, Zhanjiang 524088, China

² Southern Marine Science and Engineering Guangdong Laboratory (Zhanjiang), Zhanjiang 524006, China

³ College of Marine Ecology and Environment, Shanghai Ocean University, Shanghai 201306, China

* cuijianjun29@163.com

The genera *Monostroma* and *Gayralia* belong to the order of monostromatic green algae; however, their taxonomic delimitation remains controversial at the genus level. This study attempts to address this issue through the combined analysis of the morphology and nuclear-encoded Internal Transcribed Spacer region sequences of monostromatic green algal samples collected in the South China Sea. Our phylogenetic data revealed that the monostromatic specimens were separated into the *M. nitidum* clade, *G. brasiliensis* clade, and a single *Monostroma* sp. clade, and that the inter-genera genetic distance between the *Monostroma* and *Gayralia* genera was lower than that observed within the *Monostroma* genus. All the specimens presented similar morphology in their single cell-layered thallus, with irregularly arranged cells, rounded cell corners, a parietal chloroplast, and predominantly one (>90%) pyrenoid. Their most obvious morphological difference was in thallus thickness and size. Moreover, the monostromatic specimens of the *M. nitidum* clade corresponded to the morphological description of the *M. nitidum*-type specimens. The genus *Monostroma* was erected earlier than the genus *Gayralia*. Therefore, we propose to assign the genus *Gayralia* to *Monostroma* based on the morphological and phylogenetic analysis and genetic distance data presented here.

Keywords: *Gayralia*; Internal Transcribed Spacer sequence; *Monostroma*; morphology; taxonomy

Dose-response Pattern of Marine Macroalgae *Gracilaria bailinae* to Three Fluoroquinolones and The Cause-Outcome Relationship of Dose, Growth, Toxicity and Absorption

Kun Lin^{1*}, Enyi Xie¹, Xuefeng Wang¹, Jianjun Cui¹, Yong Liu¹

¹ Fisheries College, Guangdong Ocean University, Zhanjiang, 524088, China

* Presenter: 18320354319@163.com

As micropollutants, residual fluoroquinolone antibiotics (FQs) have been shown to affect various aspects of aquatic plant growth, while aquatic plants have demonstrated potential in facilitating the removal of FQs from the environment. However, the response patterns and removal efficiency of macroalgae exposed to FQs, as well as the cause-and-effect relationships between these processes, remain unclear. To address this, the present study investigates the acute growth and toxicity responses of *Gracilaria bailinae* to three FQs—norfloxacin (NOR), enrofloxacin (ENR), and lomefloxacin (LOM)—across a range of doses (0, 2, 4, 8, 16, 32, and 128 $\mu\text{g/mL}$) and exposure periods (24, 48, 72, and 96 hours). Residual FQs concentrations in seawater were determined using HPLC-MS/MS after 72 hours of exposure. Structural equation modeling (SEM) was applied to explore the relationships between initial dose, algal responses, and FQs absorption. The results demonstrated that the growth response patterns of *G. bailinae* under each FQs exposure were hormesis, characterized by Bell-shaped or Hill-shaped dose-response curves. FQs exhibited limited toxicity to *G. bailinae*, with most toxicity curves indicating that 50% inhibition would not occur before 96 hours of exposure. After 72 hours, FQs removal rates ranged from $54.18 \pm 6.10\%$ to $97.93 \pm 0.17\%$, with NOR showing the highest removal rate and ENR the lowest. SEM analysis revealed that the growth response was the primary factor directly influencing FQs absorption (regression coefficient 7.044), while toxicity had an inverse effect (regression coefficient -1.683). The specific growth rate (μ) directly influenced both the terminal concentration and removal rate of FQs and indirectly impacted FQs absorption efficiency through the inhibition of toxicity. These findings suggest that trace levels of FQs in the environment can stimulate the growth of *G. bailinae*, which demonstrates strong tolerance to high FQs concentrations, highlighting its potential for use in marine wastewater treatment. The SEM results further indicate that the growth-promoting effects observed at low FQs concentrations may be attributed to altered competition between *G. bailinae* and microorganisms, driven by the bactericidal effects of FQs, rather than direct toxic stress.

Keywords: Dose-response pattern, Fluoroquinolone antibiotics, *Gracilaria bailinae*, Cause-outcome relationship, FQs absorption

Expanding land-based cultivation of *Ulva* “SeaWheat” from Kochi, Japan

Masanori Hiraoka^{1*} and Takushi Namba²

¹ Usa Marine Biological Institute, Kochi University, Inoshiri 194, Usa, Tosa, Kochi 781-1164, Japan

² Research and Education Faculty, Multidisciplinary Science Cluster, Interdisciplinary Science Unit, Kochi University, Kochi 783-8505, Japan

* mhiraoka@kochi-u.ac.jp

Green seaweed *Ulva* is currently called "SeaWheat" in the EU, and is considered an important biological resource for the bioeconomy, and its production is being promoted. In East Asia, especially in Japan, *Ulva prolifera* has been used as a traditional food ingredient, and has long been produced by natural collection or net farming in the sea. However, due to ocean warming, *Ulva* production from natural waters is decreasing dramatically. To compensate for the lack of supply, land-based tank cultivation is rapidly expanding. The land-based cultivation technology was developed in Kochi, and commercial production began in 2004. In Kochi, *Ulva* production from natural waters dropped to zero in 2020, but now *Ulva* produced through the land-based aquaculture has completely supplemented previous production. The Kochi aquaculture technology has spread throughout the country, and currently a total production of around 50 dry tons per year is achieved. This technology can also be applied to seaweeds other than *Ulva*, and preparations are underway to commercialize them.

Keywords: Bioeconomy, Kochi, Land-based tank cultivation, SeaWheat, *Ulva*

Population Genetics and Evolutionary History of the Indian Squid, *Uroteuthis duvaucelii* (d'Orbigny, 1935), in the Central Indo-Pacific

Lorenzo C. Halasan^{1*} and Hsiu-Chin Lin¹

¹ Department of Marine Biotechnology and Resources, National Sun Yat-sen University, Kaohsiung 80424, Taiwan

* enzohalasan@mail.nsysu.edu.tw

The Central Indo-Pacific (CIP) has been recognized as a global hotspot for coastal cephalopod diversity, being second to none. This region encompasses the totality of Southeast Asia, bordering the southern waters of Japan and the upper South China Sea at its north, and to the top half of the Australian continent to its south. *Uroteuthis* (*Photololigo*) *duvaucelii* (Cephalopoda: Loliginidae) is one of the top commercial squid commodities in these waters, being prominently abundant in both the Pacific and Indian Ocean realms. Albeit such economic relevance, the biological knowledge regarding the genetic structure, population distribution limits, and past demographic signatures of the species is non-existent. This study examined a 530 bp portion of mtDNA CO1 sequences from N=442 *U. duvaucelii* individuals collected from major fishing markets throughout the CIP, alongside publicly available data entries. Haplotype clustering and maximum likelihood tree-based inferences revealed the existence of four genetic clades, with each one predominantly occupying different portions of the CIP. Namely, these clades are the (a) widespread Indo-Pacific; (b) coastal Indochina; (c) lower Western Pacific, and (d) the exclusive Indian Ocean clades. The most common haplotype was represented by n=112 individuals, diversely collected from six different collection areas. Within-clade %K2P distance were between 0.05 – 0.33%, whereas across-clade distances varied from 5.48 – 10.54% K2P. TimeTree analysis revealed that *U. duvaucelii* plausibly emerged around 7.52 MYA and the split between the Indian and Pacific Ocean clades occurred around 4.97 MYA. Historical demography inferred *via* Bayesian skyline reconstructions suggested that the species experienced a decline in population size from 3.0 – 1.5 MYA then followed by a rapid increase up to the present time. Such insights on the evolutionary history can bridge information gaps in our overall understanding of the evolutionary history of *U. duvaucelii*, and probably towards other CIP coastal decapod groups in general.

Keywords: Genetic structure, demographic history, evolution, mtDNA CO1, loliginidae

Statolith Elemental Signatures of the squid, *Uroteuthis duvaucelii*, in the Tropical Western Pacific

Jessica Legaspi¹ and Tomoyo Okumura²

¹Kuroshio Science Program, Graduate School of Integrated Arts and Sciences, Kochi University, Kochi 783-8502, Japan

²Marine Core Research Institute, Kochi University, Kochi 783-8502, Japan

The *Uroteuthis duvaucelii* is an abundant coastal squid of vast commercial importance across the Indo-Pacific region. In squids, statolith microchemistry helps delineate population structure, reconstruct life histories and movement patterns, and identify habitat characteristics. Thus, this study aims to characterise the statolith microchemistry of the populations of *U. duvaucelii* caught in Taiwan, Malaysia, and the Philippines. Several trace elements are detected at measurable concentrations using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). These include strontium (Sr), magnesium (Mg), manganese (Mn), iron (Fe), Barium (Ba) and sodium (Na). The trace elements/Ca ratio differences give us information about the habitat characteristics of different ontogenetic stages and population structure. The most abundant element is the Sr/Ca ratio. It is known to correlate with temperature and describe habitat characteristics, while Ba/Ca is an indicator of vertical movement. The Na/Ca and Mg/Ca ratios indicate specific physiological processes and environmental variations in marine ecosystems. Various environmental factors also influence the uptake of these elements. The Mn/Ca and Fe/Ca ratio is also known to be the key elements of different cohorts of squids. Thus, this study demonstrates that the microchemistry of statoliths can offer valuable insights into the life history, ontogenetic patterns and population structure of *U. duvaucelii* across the Western Pacific.

Keywords: Loliginids, trace elements, LA-ICPMS, habitat, population

Elemental Profiles and Cyclic Growth Patterns in Japanese Precious Corals: Insights from *Corallium japonicum* and *Pleurocorallium konojoi*

PEPINO, M.M.C.^{1*}, LEGASPI, J.M.¹, and OKUMURA, T.²

¹ Kochi Univ. • Kuroshio Sci. Program, ² Kochi Univ. • MaCRI

*b21d6c08h@kochi-u.ac.jp

Precious corals, such as *Corallium japonicum* and *Pleurocorallium konojoi*, serve as long-term archives of oceanic environmental changes, preserving elemental variations within their growth rings. Initial findings from this study suggest that *Corallium japonicum* exhibits a cyclic growth pattern, characterized by regularly spaced rings followed by compacted rings, while this cyclicity is less pronounced in *Pleurocorallium konojoi*. Understanding the geochemical composition and growth dynamics of these species is essential for reconstructing past ocean conditions and assessing the impact of environmental changes on deep-sea ecosystems. However, data on the historical geochemical signatures and growth patterns of these species, especially in the Ashizuri fishing field in Kochi Prefecture, Japan's largest precious coral fishing field, remains limited. This study investigates the geochemical properties and growth development of two species of precious coral collected from the Ashizuri fishing field during the 2017 and 2018 fishing seasons. A total of seven colonies were analyzed: six colonies of *Corallium japonicum* (comprising both living and dead samples) and one dead colony of *Pleurocorallium konojoi*, from which 10 samples were examined. The samples, with varying carbon-dated ages, were collected from different depths and locations, providing a spatially and temporally diverse dataset. Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS) was used to perform line scans from the center to the edge of coral cross-sections, capturing temporal elemental variations. This technique enabled the reconstruction of coral growth patterns and environmental conditions over time. This research advances the understanding of the growth and development of *Corallium japonicum* and *Pleurocorallium konojoi*, providing critical data for reconstructing historical oceanic conditions and coral responses to environmental changes.

Keywords: Precious coral, *Corallium japonicum*, *Pleurocorallium konojoi*, elemental profile, LA-ICPMS

Intensity of Wood Attacks Marine Borers at Sea on Meranti and Bengkirai Wood

**Hikma Yanti^{1*}, M Dirhamsyah¹, Ahmad Yani¹, Yeni Mariani¹, Fathul Yusro¹,
& Muhammad Riski**

¹ Faculty of Forestry, Tanjungpura University, Daya Nasional Street Pontianak 78124

*hikmayanti@fahutan.untan.ac.id

The use of transportation such as wooden ships, docks, piles and buildings at sea are mostly made of wood. The wood used is inseparable from attacks by wood borers at sea called marine borers. The purpose of this study was to determine the intensity of wood borer attacks at sea on meranti and bengkirai wood at the Mempawah River estuary, determine the effect of differences in depth on the intensity of wood borer attacks at sea, and identify the types of wood borers at sea that attack meranti and bengkirai wood at the Mempawah River estuary. This study was conducted for 3 months at the Mempawah River Estuary, Mempawah Regency. The test used Meranti and Bengkirai wood test samples measuring 2 cm x 5 cm x 30 cm. Data analysis used a Completely Randomized Design (CRD) with 5 replications so that there were 15 test samples of each type of wood. The results showed that the natural durability of wood (percentage of weight loss) of Meranti and Bengkirai wood was included in class I durability or very resistant to attacks by wood borers at sea. The weight loss of Meranti wood from the lowest to the highest in sequence is a depth of 5 cm (3.88%), a depth of 25 cm (7.37%) and a depth of 50 cm (12.23%). The weight loss of Bengkirai wood from the lowest to the highest in sequence is a depth of 5 cm (2.73%), a depth of 25 cm (3.54%) and a depth of 50 cm (9.09%). This difference in depth has a very significant effect on the weight loss value of the test sample. The types of marine wood borers found in the waters of the Mempawah River estuary are *Limnoria* sp., *Balanus* sp., *Nereis* sp. and *Teredo* sp.

Keywords: Attacks, bengkirai wood, intensity, marine wood borers, meranti wood

Macrofaunal Assemblage and Habitat Conditions of River Systems in Claver, Surigao del Norte, Philippines

Padilla, R.F.Q^{1*}, Larano, G.J.V¹, Vedra, S.A.¹, Vicente, R.J.², Espadero, A.D.A², and Abrea, R.A.¹

¹College of Agriculture, Forestry and Environmental Sciences

²College of Marine and Allied Sciences, Mindanao State University at Naawan, Naawan, Misamis Oriental, Philippines

*Presenter email: ramonfrancisco.padilla@msunaawan.edu.ph

Freshwater ecosystems in the Philippines face significant threats due to natural disasters intensified by climate change, these issues are compounded by human activities, including pollution, leading to habitat loss and a decline in biodiversity. Many fish and invertebrate species, especially those in resource-demanding river systems, are increasingly vulnerable. Research indicates that rivers in the Philippines, particularly in Mindanao, are biologically at risk. The study on macrofaunal and habitat conditions in the river systems of Claver, Surigao del Norte revealed high vegetation cover along riverbanks, and less cover on estuarine sites. Turbidity of water is also common provided by silts transported in the streams and deposited on build up zones, although, sites situated upstream exhibit clearer waters.

Assessment of macrofauna revealed two Phyla, six classes, 14 orders, and 33 families with 568 individuals recorded across sites. Phylum Arthropoda constitutes the majority of macroinvertebrates, with 567 individuals (99.82%), in contrast to Phylum Mollusca, which has only 0.18%. Recent survey on fish recorded three species belonging to 3 families, namely, Carp/Minnow *Cyprinidae sp.* which was recorded in Sensio Creek Upstream, Glass fish *Ambassis interrupta* recorded in Hayanggabon estuary, and Longnose Pipefish *Micropis aculeatus*, both recorded also in Hayanggabon and Taganito estuary.

Taganito River recorded the highest flow rate at 113.34 cubic meters per second, an increase from previous years, the surface water temperatures varied between 28.3°C and 33.4°C, salinity ranged from 0.00ppt to 2.67ppt, and pH levels were between 7.61 and 8.42. Nutrient concentrations showed nitrate levels from 0.05 to 0.61, very low nitrite levels (0.00005 to 0.00705), and phosphate levels from 0.05 to 0.13. All measurements remain within the DENR Standards for Effluent Class “SC” Waters. Various stakeholders, including government and non-government organizations, are collaborating on conservation efforts to address environmental challenges.

Keywords: Freshwater, Macrofauna, Biodiveristy, Vulnerability, Conservation

Impact of Trematode Parasitism on the Distribution Patterns of *Batillaria multiformis* in Intertidal Zones

Sandy Rey B. Bradecina^{1*)} and Osamu Miura²⁾

1) Graduate School of Kuroshio Science, Kochi University, 200 Monobe, Nankoku, Kochi, 783-8502 Japan

2) Faculty of Agriculture and Marine Science, Kochi University, 200 Monobe, Nankoku, Kochi, 783-8502 Japan

* Presenter: E-mail: reybradecina@gmail.com

Behavioral changes of the snail hosts induced by trematode infections can lead to spatial disparities in the snail population along the intertidal elevational gradient. In this research, we explored how trematode infections affect the behavior and distribution of the snail hosts *Batillaria multiformis* on the rocky tidal flat of Kan-onji, Japan. Seventy sampling locations were randomly chosen using quadrats throughout the intertidal gradient. A total of 1,322 *B. multiformis* snails were collected and examined for parasitism. A greater number of infected snails, including those afflicted by *Cercariae batillariae* and *Cercaria hosoumininae*, were found in the lower elevational gradient. A mark and recapture field experiment was carried out to evaluate the movements of the snails along the intertidal gradient. Approximately one hundred samples were retrieved after four months from the release. A majority of the infected snails migrated to the lower shore, while most of uninfected snails moved towards the higher shore. These results bolster our hypothesis that *C. batillariae* and *C. hosoumininae* modify the behavior of *Batillaria multiformis*, likely in pursuit of more suitable habitats for parasite transmission.

Keywords: *Batillaria multiformis*, Behavioral modification, Distribution, Trematode

Posters

P-01

Ethnobotany and Antioxidant of Secondary Metabolite from Understorey Plant of Sinsagok Forest in Sanggau Regency West Kalimantan Indonesia

Farah Diba*, and Yanieta Arbiastutie

Forestry Faculty Tanjungpura University Indonesia

* Presenter: E-mail: farahdiba@fahutan.untan.ac.id

The majority of people living near the Tembawang Sinsagok forest are of the Binenguh Dayak ethnic group who still use understorey plants as a source of medicine. The aim of the research was to carry out an inventory of the understorey plants used by the community as medicine and to carry out extraction using the maceration method on the under storey plants used as medicine. Next, phytochemical and antioxidant testing was carried out. The research location is in the Tembawang Sinsagok forest, Sanggau Regency, West Kalimantan Province, Indonesia. The results of the research obtained 14 under storey plants which are used as medicine by the community, namely sambung nyawa (*Gymnanthemum amydalium Sch Bip EX Walp*), cengkodok (*Melastoma malabatricum L*), patah kemudi (*Pseudelephantopus spicatus*), Jukat coku, Jojak ticua'k, sopar doyo'k, pumongkak, pungkolas tapa, rumput mutiara (*Oldenlandia lancifolia*), jujua riga (*Veronica sp*), pungkolas tas, kariopiat (*Macaranga sp*), salam (*Syzigium polyanthum*). People use understorey plants as medicine for stomach aches, headaches, fever, toothache, lowering high blood pressure and treating wounds. The results of the phytochemical analysis showed that the sambung nyawa, pungkolas tapa, and pungkolas tas plants contain alkaloids, flavonoids, phenolics, terpenoids, steroids and saponins. All understorey samples contained alkaloid and phenolic compounds. The under storey plants that have the highest antioxidant effect are acarbose at 99.219%, Jokat coku at 67.915%, and pungkolas tas at 67.360%. The understorey plants from the Tembawang Sinsagok forest which is used by the Binenguh Dayak community as medicine has secondary metabolite compounds which have the potential to be developed as anticancer drugs.

Keywords: antioxidants, medicinal plant, Tembawang Sinsagok forest, understorey plants

Marine Conservation Actions on Islands: The Impact of Designing Sustainable Tourism Activities on the Core Competencies of College Students in Taiwan

Sheng-Wen Tseng ^{1*}, and Peng-Hui Hou ²

¹ Liberal Education Division, General Education Center, National Taiwan Ocean University, Keelung, Taiwan

² Bachelor Degree Program in Oceanic Cultural Creative Design Industries, National Taiwan Ocean University, Keelung, Taiwan

* **Poster Presentation:** swtseng.tw@gmail.com; swtsengtw@email.ntou.edu.tw

Tourism activities in Matsu Islands are greatly affected by seasonal and climactic factors and there is a shortage of marketing and planning talent. Nevertheless, the economic and demographic problems during Matsu's transition also present an opportunity for universities to enter the community and provide solutions. In order to achieve the goals of SDGs-8 and SDGs-14, the Matsu Islands (Nangan Township) were chosen as the research sample for this study, and faculty and students worked together with community partners to design and promote Matsu as a sustainable tourism destination. This study encourages cooperation and mutual support among student members in the group to design sightseeing activities with the theme of marine conservation within the "Creative Marketing Planning Practice" course (Liberal Arts Curriculum) at a Taiwanese university. An "Industry-Academia-Community Actor-Network" was built to assist college students to develop four marine-conservation-oriented tour itineraries/activities. This study finds that collaborative learning and island-based experiential learning helped to enhance the critical, communication, creative and problem-solving competencies of interdisciplinary team members. The course incorporated the concept of sustainable use of the oceans and an experiential learning trip in Matsu. By enhancing the sense of local identity, it helps promote university students' learning objectives in memory, comprehension, and creativity. Additionally, it encourages them to propose sustainable tourism solutions from dynamic perspectives.

Keywords: social design, sustainable tourism, volumetric turn, Matsu, cooperative learning

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Nesting site preferences of sand dwelling gobies revealed by tailored artificial reefs.

Godfrey, H. H.^{1*}, Ito, T.¹, Ravishankar, J.³, and Masuda, R.¹

¹ Maizuru Fisheries Research Station, Field Science Education and Research Center, Kyoto University

² Sesoko Station, Tropical Biosphere Research Center, University of Ryukyus

³ Human-Robot Interaction Lab, Graduate School of Informatics, Kyoto University

* Presenter: hunter.godfrey.46x@st.kyoto-u.ac.jp

Artificial reefs (ARs) have been deployed throughout the world since prehistoric era for providing habitat of marine resources as well as a tool for fisheries management. Here we used ARs for observing species-specific behavior and inter-specific interaction targeting a specific species of goby. *Istigobius campbelli* is known as a tropical goby but has recently been increasing in temperate Japanese coastal waters. The survey was conducted in shallow sandy area in Otomi, Fukui, Japan in 2023. Three types of ARs of increasing complexity (flat tile, single level cinder block, and double level cinderblock) were deployed, five replicates for each, to provide habitat for *I. campbelli* and other fish species. Surveys were conducted with SCUBA diving, and we recorded all species of fish associated with each AR. Behavior of *I. campbelli*, particularly nesting and mating activity, was also recorded. We tested to see if *I. campbelli* and other fish species preferred a specific type of artificial reef. As a result, *I. campbelli* did not show a preference between the ARs as a nesting site, but did associate more with more complex reefs along with other fish species. This implies that nesting sites are limited by bottom area rather than vertical complexity in *I. campbelli*. Using these artificial reefs also facilitated observations of intra- and interspecific interactions in *I. campbelli*. Intraspecific interactions included mating rituals, agonistic territorial behavior, and other ambiguous behaviors between conspecifics that would require further investigation. There were also interspecific interactions to note, including nesting invasion by *Dictyosoma brugerii* and nesting *Chromis notata notata* on artificial reefs with *I. campbelli*. This study also furthered understandings of tailored artificial reefs and their use as a scientific experiment tool. In the future, environmental DNA metabarcoding will also be applied for water samples collected to compare the observed ecology vs that which is detected by eDNA.

Keywords: Artificial reefs, Goby, Interspecific interaction, Mating behavior, in situ

Development of a method to quantify the impact of bio-irrigation through *Upogebia* burrows on the marine environment.

Takeno, K. ^{1*}, Henmi, Y.¹, and Sugimoto, R.²

¹ Maizuru Fisheries Research Station, Kyoto University

² Laboratory for Aquatic Ecosystem, Fukui Prefectural University

* Presenter: takeno.keisuke.55e@st.kyoto-u.ac.jp

Mud shrimps construct and inhabit Y-shaped burrows in tidal flats where they cause sediment reworking and water-irrigation through their burrows. This water irrigation has a large impact on tidal flats, because it facilitates the material cycle between seawater and inner soil as a form of bioturbation. However, there is currently no established method to quantitatively measure this water exchange in field studies. There are two reasons why it is difficult to measure water changes in the field. First, water flows bidirectionally through the same burrow openings, making it difficult to use conventional measuring devices that do not accommodate the two-way flow. Second, external factors such as sudden changes in water temperature in the field can further complicate accurate measurements. Therefore, the purpose of this study is to develop a method for measuring water exchange through burrows by solving these problems and apply it to field research. We devised a measurement technique using an SFM1 device (produced by ICT), which was originally designed to measure sap flow velocity. For measuring flow velocity with the SFM1, three electrodes (a heat source and two temperature sensors) are inserted into the fluid and the heat ratio method is used to measure flow velocity from the time of heat transfer that varies with each flow rate. As a result of equipment calibration, we discovered that this heat ratio method is suitable for measuring bidirectional water flow and is unaffected by differences in water temperature (15, 20, 25, 30°C). Furthermore, it was confirmed that this method can measure flow rates ranging from 2 ml/min to 70 ml/min bidirectionally. We then created a waterproof casing for the device and adopted it for field use conducted at Moune Bay, Miyagi Prefecture, on January 16th, 2024. In the field, we successfully measured water-exchange through their burrows. The measurement results revealed both “Active Irrigation” caused by biological activity inside burrows, and “Passive Irrigation” caused by external influences such as tides, waves and wind. Moving forward, we will investigate the reproducibility of the results in order to validate the efficacy of SFM1.

Keywords: active irrigation, bio-irrigation, heat pulse method, mud shrimp, passive irrigation

Functional analysis of increased GRP78 expression due to cellular aging

Escareal, Z. A. K. B.^{1*} and Namba, T.¹

¹ Faculty of Agriculture and Marine Science, Kochi University.

* Presenter: b23m6h54m@kochi-u.ac.jp

Cellular aging is characterized by the gradual decline of physiological functions, leading to increased vulnerability to age-related diseases. A key cellular process affected by aging is protein homeostasis, which is largely maintained by the endoplasmic reticulum (ER). With age, the efficiency of the ER in protein folding, production, and its stress response mechanisms—collectively known as the unfolded protein response (UPR)—diminishes. This decline contributes to the accumulation of misfolded proteins and cellular dysfunction. Our study investigates the relationship between ER function and cellular aging, focusing on the ER chaperone protein, GRP78, which is induced by the accumulation of unfolded proteins in the ER during ER stress.

Using human skin fibroblast cells (NB1RGB) as a proliferative and replicative aging model, we compared the expression of GRP78 protein between young and aging cells. Our results showed that GRP78 expression was slightly increased in senescent cells, suggesting that weak ER stress occurs in senescent cells. We also compared with young and aging cells under various ER stress conditions. Findings reveal that when exposed to ER stressors, aging cells showed weaker induction of GRP78 expression than young cells. Time-course assays using ER stressor treatment displayed no activation of both the PERK and IRE1 pathways, which are related to upregulation of GRP78 expression in aging cells. In contrast, young cells displayed PERK activation under the same conditions. Notably, cell viability assays using ER stressor treatment showed that aging cells significantly suppressed ER stress induced cell death compared to young cells. Overall, these results suggest a complex relationship between ER stress response and cellular aging, wherein aging cells may have adapted to chronic low-level ER stress but show an impaired response to acute ER stress. This study contributes to the understanding of how the UPR and ER stress mechanisms change during cellular aging. Such information can be used for future research on anti-aging strategies targeting ER stress pathways.

Keywords: Aging, endoplasmic reticulum stress, unfolded protein response, GRP78

***Ulva meridionalis*-derived polysaccharides activate the β -catenin pathway in intestinal epithelial cells.**

Yuka Maejima^{1*} and Takushi Namba^{1,2}

¹ Faculty of Agriculture and Marine Science, Kochi University.

² Graduate School of Kuroshio Science, Kochi University.

* b24m6h39@s.kochi-u.ac.jp

Intestinal epithelial cells play a critical role in absorbing nutrients such as sugars, amino acids, fatty acids, vitamins and minerals from food digestion. They also act as a physical barrier to pathogens and harmful substances, secrete digestive enzymes, and modulate immune responses. Maintaining the homeostasis of these cells is therefore essential for overall health. A key factor in this homeostasis is the balance between cell proliferation, differentiation and apoptosis, in which the β -catenin signaling pathway plays a central regulatory role. Activation of the Wnt-GSK3 β pathway leads to the accumulation of β -catenin in the cytoplasm, its translocation to the nucleus, and the promotion of specific gene transcription. This process ensures proper control of intestinal epithelial cell proliferation and differentiation. Conversely, decreased activity of the β -catenin pathway due to aging can disrupt cellular homeostasis.

In this study, we synthesized Ulvan-Na to improve the functionality of Ulvan, a polysaccharide derived from *Ulva meridionalis* and investigated its effects on the β -catenin pathway in intestinal epithelial cells. Using Caco-2 cells, a common model for intestinal epithelial cell lines, we found that treatment with Ulvan-Na increased β -catenin expression levels compared to Ulvan. Immunohistochemical analysis suggested increased nuclear localization of β -catenin following Ulvan-Na treatment. Although excessive activation of β -catenin can promote cell proliferation, Ulvan-Na did not affect the proliferation of Caco-2 cells, indicating that it does not activate the β -catenin pathway to a degree that influences cell growth. Additionally, since the expression levels of phosphorylated GSK3 β , which promotes β -catenin degradation, remained unchanged with Ulvan-Na treatment, it is possible that β -catenin pathway activation occurs independently of the Wnt-GSK3 β pathway.

These results suggest that Ulvan-Na is a novel compound with enhanced functionality over Ulvan, capable of activating the β -catenin pathway. Therefore, Ulvan-Na may have the potential to restore diminished intestinal epithelial cell homeostasis in conditions where β -catenin pathway activity is reduced, such as aging.

Keywords : Ulvan-Na, Intestinal epithelial cells, physical barrier, β -catenin, aging

Regulation of bioactive compound production in co-cultures of marine bacteria

Aya Hirano*, Dana Ulanova

Graduated school of Integrated Arts and Sciences, Kochi University

* b24m6h38@s.kochi-u.ac.jp

In the natural environment, microorganisms interact via bioactive substances, also called natural products (NPs), to exchange nutrition or compete. Some of these NPs have antimicrobial, anticancer, anti-inflammatory and other bioactivities and are used as medicinal drugs. Microorganisms can interact in the laboratory in co-cultures of two or more strains cultivate on the same medium. Co-cultures can cause activation or suppression of NP production. Activation often occurs by induction of NP expression of genes that are not expressed in monocultures. On the other hand, there are only few reports on suppression mechanisms. However, the elucidation of the mechanisms by which the production of NPs is inhibited may contribute to the understanding of the control mechanisms of production and facilitate the discovery of new compounds. In addition, it may lead to a comprehensive understanding of microbial interactions. Therefore, the aim of this study was to investigate the mechanisms of inhibition of the production of antimicrobial substances in the co-culture of marine bacteria.

Method: Marine microorganisms isolated from sponges were used for co-culture on solid medium. Antimicrobial activity test used Gram-positive bacterial test strain. The pairs with a smaller zone of microbial growth inhibition in the co-culture than in the monoculture were defined as those in which suppression occurred. The co-culture and monoculture extracts were analyzed by LC-MS.

Results: In total, 45 pairs were co-cultured. Of those, 11% had no change in colony growth and suppression occurred. LC-MS profiles of two selected bacterial strains were compared. Differences were observed between co-culture and monoculture extracts. In the future, I will identify compounds affected by co-culture and analyze changes in gene expression between co-culture and monocultures.

Keywords: Microbiology, Microbial interactions, Natural Compounds, Co-culture, Antibiotics

Effect of phosphite-utilizing bacteria on the growth of other bacteria

Jun Homareda* and Dana Ulanova

Kochi University

* Presenter: b23m6h45@s.kochi-u.ac.jp

In natural environment, microorganisms interact with other organisms. Microorganisms produce chemical compounds which are also called natural products (NPs) in these interactions. NPs often have useful properties including antimicrobial and are used for development of agrochemicals and medicinal drugs. Nowadays, there are many NP-derived products. But since there is a drug-resistant pathogen problem, new microbial NPs are highly demanded. In addition, microbial interactions affect their growth and metabolism. Therefore, the study of microbial interactions has also an ecologically significance.

Nutrients are involved in the microbial interactions. Phosphorus (P), in a phosphate form, is known to affect in microbial interactions and NP production. On the other hand, the knowledge about phosphite (PO_3), another source of P in nature, is limited. This study aims to clarify the role of PO_3 on bacterial interactions by co-culturing of PO_3 -utilizing bacteria with another bacterial strains.

Six bacterial strains, which show a high growth on media supplemented with PO_3 , were isolated from the coastal zone, Kochi Prefecture. In future, the co-culture of PO_3 -utilizing bacterium and no-utilizing bacterium will be performed, and PO_3 effect will be evaluated. In addition, NPs production will be tested by antibacterial assay. Based on these results, we plan to clarify the role of PO_3 on bacterial interactions.

Keywords: Bacteria, Interaction, Phosphate, Phosphite, Natural products

Abdominal and pleopod variation of the bopyrid isopod *Ione cornuta*, a parasite of the ghost shrimp *Neotrypaea japonica*, in western Japan.

Kume, H.^{1*}, Maekawa, A.², Ohshima, T.², Tamaki, A.³, Warditno, Y.³, Itani, G.^{1,2}

¹ Graduate school of Kuroshio Science, Kochi University, Japan

² Faculty of Education, Kochi University, Japan

³ Nagasaki University, Japan

* Presenter. E-mail: hkume1967@gmail.com

The genus *Ione* of the isopod family Bopyridae is known to parasitize the gill chambers of callinassid shrimp, which live almost exclusively in burrows in tidal flats or subtidal sediments. Genus *Ione* has a distinctive abdominal morphology, such as the highly digitated lateral plates, and seven species are recognized based on the shape of the coxal plates on the pereon. Female can be divided into four types based on the presence or absence of pleopods on each pleonal segment and the pleopod (uniramous or biramous). *Ione cornuta*, like *I. ovata* and *I. thoracica*, are known to have the first to fifth pleopods all biramous types. Close examination of *I. cornuta* specimens from Uranouchi Inlet, an inner estuary of Tosa Bay, revealed a uniramous fifth pleopod, the same type as *I. thompsoni* and *I. tubelata*. To describe the variation in the shape of the pleopod of *I. cornuta*, we studied the shape of the pleopods of 340 females of *I. cornuta*one parasitic on three tidal flats in the Ariake Sea and the Seto Inland Sea, in addition to Uranouchi Inlet. As a result, only one typical type of *I. cornuta* was obtained, and 140 individuals were obtained for the type in which the fifth pleopod was uniramous. In addition, 145 individuals were of unknown type, in which the fourth and fifth pleopods were uniramous. Furthermore, 51 individuals had a uniramous fifth pleopod, with one of the fourth pleopods being uniramous and the other biramous. Three other individuals were found to have different shapes in the left and right pleopods. The incidence of these types is not related to body size; therefore, it is thought that they are not caused by developmental changes. in this study, 13 (3.9%) females and 10 (3.8%) males had different numbers of abdominal segments. To date, no cases of body segment loss have been reported in Bopyridae. The results of this study are important because the presence or absence of pleopods and the shape of pleopod (uniramous or biramous) are taxonomic traits of many other genera of the Bopyridae.

Keywords: Bopyridae, polymorphism, pleon segments, rate of abnormal

How well do protected areas conserve biodiversity across taxa amidst climate change

dela Vega, J. M. A.^{1*}, and Higa, M.²

¹ Graduate School of Integrated Arts and Sciences, Kochi University

² Faculty of Science and Technology, Kochi University

* Presenter: jioiedelavega@gmail.com

Protected areas (PAs) are crucial for preserving biodiversity, but their ability to remain effective under climate change remains uncertain. Previous research suggests that PAs may be unevenly distributed, potentially limiting their effectiveness in protecting key species. This study assesses the ability of Japan's PAs to serve as refugia for various native species in the face of climate change. The study obtained spatial data of PAs and species occurrence data for native plants, birds, mammals, amphibians, freshwater fish, and reptiles from Think Nature's database. The study utilized 12 general circulation models (GCMs) and four shared socioeconomic pathways (SSPs) from the World Climate Research Program (WCRP). MaxEnt was used to develop species distribution models (SDMs) of said species, wherein future habitat projections were generated under two migration scenarios: full migration, assuming unrestricted movement of species, and no migration, where species are assumed to remain restricted to their current habitats. PAs harbor only 10-30% of plant species populations, offering limited habitat coverage, but species within them are more maintained than those outside. Results showed significant variability in species richness across GCMs. Central and Northern Japan were identified as critical refugia for plants, birds, mammals, and amphibians, while lowland regions were critical for freshwater fish and reptiles. The no migration scenario projected greater species loss than the full migration scenario. However, under the extreme climate scenario (SSP5-8.5) and no migration scenario, most plant species are expected to retain their potential habitats within PAs, indicating a low risk of extinction. Similarly, birds, mammals, and amphibians showed similar patterns of retained species within PAs, while freshwater fish and reptiles displayed a different pattern. Overall, species reductions within PAs varied across different taxa depending on climate scenarios and migration assumptions.

Keywords: protected areas, effectiveness, species distribution modeling (SDM), migration scenarios

Genomic divergence of *Acropora hyacinthus* from Kochi versus *Acropora* species in Okinawa

Sam Edward N. Manalili^{1*}, Takuma Mezaki², Takahiro Taguchi³, Satoshi Kubota⁴

¹Kuroshio Science Program, Kochi University, Nankoku, Kochi, Japan.

²Kuroshio Biological Research Foundation, Otsuki, Kochi, Japan

³Department of Nutrition, Faculty of Health Science, Kochi Gakuen University, Kochi, Japan

⁴Kuroshio Science Unit, Kochi University, Nankoku, Kochi, Japan

* Presenter: sam.manalili2021@gmail.com

Acropora is the most diverse and abundant genus of scleractinian corals, essential to coral reef ecosystems through genomic adaptations that enhance resilience to warm and variable environments (Shinzato et al., 2021). The *Acropora hyacinthus* species complex, widely distributed across the Asia-Pacific region, inhabits both tropical and high latitude shallow reefal and non-reefal areas. Distribution patterns along the Kuroshio Current reveal distinct genetic lineages between mainland Japan and the Ryukyu Islands populations, consistent with separation by the Tokara Gap (Suzuki et al., 2016). In *Acropora* species in Okinawa, Shinzato et al. (2021) identified genomic adaptations, such as gene duplications in stress response genes, that may drive speciation within the genus. However, the genomic divergence between *A. hyacinthus* colonies in Kochi and Okinawa remains unclear, particularly regarding genomic and predicted protein-level differences. Therefore, this study performs a whole genome analysis on *A. hyacinthus* from Kochi and Okinawa to assess their genomic divergence and potential speciation.

An fragment of a *A. hyacinthus* colony was obtained from Nishidomari Bay, Kochi. Genomic DNA was extracted, and a DNA library was prepared using the SMRTbell Express Template Prep Kit 2.0 (PacBio) and sequenced using Revio (PacBio) to produce HiFi reads. The Kochi *A. hyacinthus* genome was assembled using *HiFiasm*, and contig count, N50 values, genome length, and GC content were assessed. *BUSCO* (Manni et al. 2021) analysis was conducted to evaluate completeness and reliability in either genome or protein mode. Genes were predicted using *maker* (Campbell et al. 2014), and protein counts were compared between Kochi and Okinawa colonies, with validation through cross-species alignment across six *Acropora* species. Genomic divergence analysis using *MUMmer* (Marçais et al. 2018) was performed through genome alignment with six *Acropora* species and protein-level phylogenetic clustering. The Kochi genome assembly exhibited fewer contigs and higher N50 values compared

to other *Acropora* species, while maintaining genome length and GC content consistent with established *Acropora* genomes. Genome BUSCO analysis confirmed high genome completeness at 94%, comparable to other *Acropora* assemblies, validating the reliability of the Kochi genome assembly. Protein prediction identified a higher number of predicted proteins in the Kochi population relative to Okinawa, supported by a 90% protein BUSCO completeness score and robust cross-species alignment across six *Acropora* species. A genome alignment of approximately 50% genome alignment between Kochi and Okinawa *A. hyacinthus*, is a divergence rate higher than typically expected for conspecific colonies and comparable to divergence seen among other *Acropora* species. Protein-level phylogenetic clustering distinctly separated the Kochi and Okinawa colonies, suggesting significant genomic divergence that may indicate early stages of speciation. These results imply that geographic isolation and barriers such as the Kuroshio Current and Tokara Gap have limited gene flow between populations, driving evolutionary divergence within the *A. hyacinthus* complex. In conclusion, the significant genomic divergence and distinct phylogenetic clustering between Kochi and Okinawa populations indicate the impact of geographical barriers on coral population genetics.

Keywords: genome, geographic isolation, coral, protein orthology

Tellinid bivalves of shallow depths in Uranouchi Inlet, Tosa Bay, Japan (Bivalvia: Tellinidae)

Soma Ito^{*}

Science Program, Graduate School of Integrated Arts and Sciences, Kochi University

^{*} Presenter: sitokairui@gmail.com

The tellinid bivalve fauna of six survey sites at depths of 0–2 m in Uranouchi Inlet, Tosa Bay, off the coast of Tosa City, Kochi Prefecture, Japan were surveyed from September 2019 to September 2024. Tellinid bivalves were sampled using scoop nets and shovel. In this study, 36 species were found in muddy bottom and sandy mud sediments. Tellinid bivalves were identified at the genus or species level where possible. Eleven taxa could only be identified to genus level, while five taxa could only be identified to family level. This result implies that taxonomic studies on this family are insufficient. Although the six sites were only approximately 2 km apart at most, each site had a slightly different environment and tellinid bivalve fauna. Five of the six survey sites had seagrass areas, with both species diversity and abundance higher in seagrass area than in the non-seagrass area. Some tellinid bivalves occur on both the seagrass and non-seagrass areas.

Keywords: Tellinidae, taxonomy, fauna, seagrass, Uranouchi Bay

The status of the loggerhead turtle nesting and coastal environment on Kochi Beach

Noah Yamaguchi ^{1*} and Tomomi Saito ¹

¹ Usa Marine Biological Institute, Kochi University

* Presenter: noaymgch53@gmail.com

In order to research the relationship between loggerhead turtle nesting ecology and coastal environment of Kochi Beach, Kochi Pref., Japan, drone survey, sand particle analysis and darkness measurements were conducted. We divided the beach into eight study sections by each characteristic and tried to specify the environmental factors that affect nesting ecology. In drone survey, using aerial photograph, the backshore area was calculated by image analysis software. For sand particle analysis, samples were collected from the innermost part of the backshore to a depth of 50 cm from the ground surface, and the median particle size was calculated. For darkness measurements, using Sky Quality Meter, the darkness at high tide line from 0 to 360 degrees horizontally and 0 to 30 degrees vertically was measured. The results showed that the nesting female emerged evenly in all sections. On the other hand, nest densities and nesting successes at sections near the Niyodo River mouth were higher than those far from it. The backshore areas were decreasing and sand particle sizes were larger with the increasing distances from the Niyodo River mouth. Darkness are higher near the Niyodo River mouth. The multivariate analysis suggested that darkness and sand particle affect their emergence and nesting.

Keywords: Sea turtle, *Caretta caretta*, ecology, drone, sky quality meter,

**Larval development of the deep-sea sponge-associated shrimp,
Spongicola venustus (Decapoda: Spongicolidae), documented for the
first time in 150 years**

Mikihiro Nakagawa^{1*}, Tomomi Saito^{2*}

¹ Department of Natural Science, Graduate School of Integrated Arts and Sciences, Kochi University

² Usa Marine Biological Institute, Kochi University

* Presenter: b23m6g18@s.kochi-u.ac.jp

The deep-sea sponge-associated shrimp *Spongicola venustus* is known to symbiotically inhabit, usually as a male-female pair in the gastric cavity of hexactinellid sponges such as the genus *Euplectella*. Reports on the larva of *S. venustus* date back to the H.M.S. Challenger expedition around 150 years ago, where a line drawing of a newly hatched prezoaea obtained from an ovigerous female maintained onboard was documented. In this study, larvae hatched from ovigerous females collected in Tosa Bay were reared and confirmed that the larval development undergoes at least eight pelagic larval stages. Newly hatched prezoaea emerges enveloped in a thin cuticular membrane, with the rostrum and natatory setae folded, and able to swim headfirst using its antennal scales. The morphology and swimming behavior of the prezoaea are presumed to facilitate the smooth escape of larva from the parental egg chamber and sponge mesh. The larva of *S. venustus* can be distinguished from those of the previously known species of the shallow-water genus *Microprosthema* by having the long rostral spine on the carapace and the protrusions on the posterior ventral margins of the first to fifth pleonal somites.

Keywords: Crustacea, Stenopodidea, prezoaea, larva, symbiosis, Tosa Bay

Dose-Response and Molecular Regulatory Patterns of *Gracilariopsis heteroclada* to Fluoroquinolones

Kun Lin^{1*}, Yong Liu¹, Jianjun Cui¹, Enyi Xie¹, Xuefeng Wang¹

¹ Fisheries College, Guangdong Ocean University, Zhanjiang, 524088, China

* Poster Presenter: 18320354319@163.com

Fluoroquinolone (FQ) antibiotics, as micropollutants, have significant impacts on aquatic plant growth. In this study, we first investigated the dose-response and molecular regulatory patterns of *Gracilariopsis heteroclada* under FQ exposure. Growth followed a hormetic dose-response pattern, with low concentrations promoting growth and higher concentrations inhibiting it. The specific growth rate and FQ removal exhibited a reciprocal cause-effect relationship, indicating that growth is a key driver of FQ absorption efficiency. To further explore the underlying biological pathways, we used enrofloxacin (ENR) as an example. Exposure experiments were conducted at 0 (control, AN), C_{top} (maximum growth effect, AT), and EC_{50} (half-maximal effective concentration, AE) doses of ENR. Through transcriptomic and metabolomic analyses, several key pathways were identified under ENR stress. Glycerophospholipid metabolism played a critical role in maintaining membrane structure and signaling under stress. At AT concentration, metabolic activity peaks, activating secondary pathways like isoquinoline alkaloid biosynthesis, enhancing efficiency and stress tolerance. As concentrations increase from AT to AE, metabolic activity declines, with inhibition of glycerophospholipid and sugar metabolism, suggesting feedback regulation to maintain membrane stability. At AE concentration, key processes such as amino acid biosynthesis and glycerol metabolism are suppressed, indicating metabolic imbalance. While stress response peaks at AT with increased TOP II activity supporting DNA replication and repair, photosynthesis is weakest at AT, slightly improving at AE despite oxidative damage and reduced metabolic efficiency. These findings highlight the complex molecular responses of *G. heteroclada* to FQ exposure, providing important insights into its potential role in mitigating antibiotic pollution in marine ecosystems.

Keywords: Enrofloxacin metabolism, *Gracilaria bailinae*, Stress response pattern, Transcriptomics, Metabolomics

***Azolla* Culture at Varying Amounts of (Best organic material in Study 1)**

Solomon A. Anagaran¹ & Christian C. Molina^{2*}

¹ & ² Faculty, Ilocos Sur Polytechnic State College - Provincial Institute of Fisheries, Narvacan Campus

Sulvec, Narvacan, Ilocos Sur 2704 Philippines

*Corresponding Author

Email: cmolinaprc1020@gmail.com

Contact number: 09102690304

Azolla, a floating aquatic fern known for its ability to fix atmospheric nitrogen through its symbiotic relationship with other organism (e.g. *Anabaena azollae*), is widely used as a biofertilizer and livestock feed. This study evaluated the effects of different organic fertilization rates on the biomass production of *Azolla* (*Azolla* sp.) and examined the influence of water temperature on its growth. The experiment was conducted using a Completely Randomized Design (CRD) with four treatments (0.05 kg, 0.1 kg, 0.2 kg, and 0.3 kg of organic fertilizer per 2 m²) replicated three times. The organic fertilizer used was a mixture of chicken droppings, cow dung, and vermicompost. The results showed that the Treatment 0 (0.05 kg/ 2m²) produced the highest biomass yield, with no statistically significant differences between treatments ($p > 0.05$). This suggests that *Azolla* sp. can maintain its productivity even with minimal fertilization. Additionally, a strong positive correlation ($r = 0.954$, $p < 0.05$) was observed between water temperature and biomass yield, with higher temperatures resulting in increased production.

Keywords: *Azolla* sp., organic fertilizer, biomass yields, fertilization rate