

INOS



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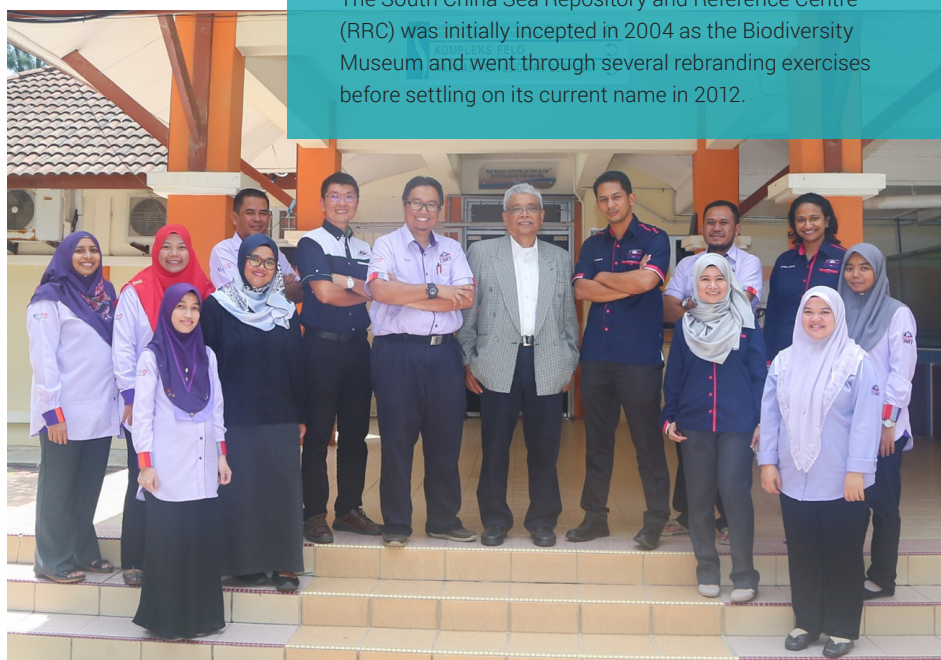
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The South China Sea Repository and Reference Centre (RRC) was initially inceptioned in 2004 as the Biodiversity Museum and went through several rebranding exercises before settling on its current name in 2012.

Preserving the Natural History of Malaysia's Marine Ecosystems

By Izwandy Idris

Malaysia is truly a maritime nation with its marine space twice larger than the land area. The nation's 4,675 km coastline borders the Strait of Malacca, the South China Sea, and the Sulu-Celebes Sea at the centre of Southeast Asia. Our reliance on the sea varies from trade, defence, food, economic exploitation, and other indirect functions. The Strait of Malacca is the world's second busiest shipping lane; the South China Sea is the main hydrocarbon reservoir and the islands in the Sulu-Celebes Sea hold the best dive sites in the world. At the same time, Malaysians are among the world's largest fish consumers, consuming an average of 56.5 kilograms per person annually. Hence, the ecosystem services of the seas are critical to Malaysia's survival and functionality as a maritime nation.

To ensure the ecosystem services provided by the seas continues, adequate information about our seas is imperative. These include data on physical, chemical, and biological components as well as underwater biodiversity. Information about our seas is needed for maritime and resource management, environmental monitoring, maritime security and safety, etc.

Our understanding of Malaysian marine biodiversity could be better. A proper record is required to determine our

known and to predict the unknown diversity. Changes in the marine ecosystem due to climate change, pollution and bioprospecting inadvertently impact species composition. Moreover, advancements in the taxonomic area (identifying and characterising organisms) may result in certain species bearing a different name than before. As a result, biodiversity data must be supported by deposited specimens for verification and updating. This is one reason why natural history museums or repositories such as the South China Sea Repository and Reference Centre (RRC) exist – as the depositories of marine biodiversity for the nation.

RRC was initially inceptioned in 2004 as the Biodiversity Museum and went through several rebranding exercises before settling on its current name in 2012. The primary goal of the RRC is to properly maintain, record, and prepare marine specimens for diverse uses such as research, reference, and knowledge transfer. The main users of specimens deposited at RRC are researchers (mostly, but unlimited to, taxonomists and ecologists) and educators. Furthermore, RRC aims to build networks with other museums and educational institutions within and beyond Malaysia to both improve specimen management and increase specimen engagement by users.

RRC has established itself as one of Malaysia's premier marine repositories since its inception 18 years ago. The number of registered specimens lots has increased from 38 in 2006 to more than 50,000 in 2022, with an estimated value of MYR7.5 million. 70 of these are classified as 'type' (holotype and paratype) specimens, directly used to describe new species in science.

Countless deposited specimens came from unique or important locations, such as hard corals from Malaysian-claimed atolls in the Spratly Islands. These specimens were collected by UMT researchers and from other local and international institutions such as Universiti Putra Malaysia and Kagoshima University in Japan.



These deposited specimens provide physical proof of their presence in Malaysian waters. This can serve as the catalyst for both habitat and species-specific conservation, for commercial uses to combat alien and invasive species and to justify sovereign rights or areas of national interest. This attracts regular visits to from local and overseas researchers, translated into scholarly papers and books.

RRC has been recognised as a marine diversity data provider by numerous authorities, including the Ministry of Natural Resources (National Marine Repository Centre) and the Malaysian Biodiversity Information System (MyBIS). The Ocean Biodiversity Information System (OBIS) designated RRC as the Malaysian Node in 2017. Furthermore, the Australian Government has designated and certified RRC as one of two Malaysian agencies authorised to exchange specimens with the Australian counterparts.

INOS Signed LOI with Planmalaysia: Bringing Ecosystem-Based Planning to the Forefront

By **Wan Izatul Asma Wan Talaat**

On 27 March 2023, INOS, UMT and the Town and Country Planning Department (PLANMalaysia) has finally cemented our years-long collaboration in science-policy interface through the signing of a letter of intent (LOI). The LOI was signed in conjunction with the official visit of the Director General of PLANMalaysia, Dr Alias Rameli to INOS. Dr Alias has also been presented with his appointment letter as a distinguished visiting research fellow to UMT.

The LOI was signed in view of the past, present and future collaborative works between PLANMalaysia and UMT, which has been recognized through UMT's appointment as a Strategic Partner to PLANMalaysia under the recently-launched National Coastal Zone Physical Plan-2 (NCZPP-2).

As the main agency in development planning at the federal, state and local levels, PLANMalaysia holds a huge responsibility in ensuring that land-use planning of terrestrial and marine space is carried out sustainably. To do that, ecosystem-based planning is necessary to balance between socio-economic objectives and environmental conservation. Hence, as a leading institution in coastal and marine research, UMT is more than capable to facilitate informed decision making for sustainable land-use planning.

One such example is through Marine Spatial Planning (MSP), which is an ecosystem-based approach and a public policy process for a society to better determine how the ocean and the coasts are sustainably used and protected - for now and for the future generations. MSP has been set as a thrust action under NCZPP-2 and INOS, UMT will be the lead research institution in MSP implementation through its ongoing joint-project with Fujian Institute for Sustainable Ocean, Xiamen University, China (FISO-XMU).



The LOI was signed in conjunction with the official visit of the Director General of PLANMalaysia, Dr Alias Rameli to INOS.

Tahniah

DI ATAS PENUBUHAN SYARIKAT START-UP

Syarikat
OCEAN HYDRO SDN. BHD.
(202201047846 (1493543-P))

bagi pengkomersialan produk
MALAYSIA MARINE FORECAST SYSTEM (MFAST)



Congratulations !
Ocean Hydro Sdn. Bhd.

Dipengerusi Syarikat
Mohd Fadzil bin Mohd Akhir
Institut Oseanografi dan Sekitaran

New start-up Ocean Hydro - aims to make marine industry safer

We are thrilled to applaud the incorporation of Ocean Hydro Sdn. Bhd. (OHSB) as an INOS-based startup company. Committed to develop innovative solutions for the marine industry with its flagship product, the Marine Forecast System (MFAST), OHSB is set to revolutionise how we predict ocean conditions and weather patterns.

Shark Research Unveils Ocean's Power to Combat Climate

By **Shawkat Hossain**

Shark research in the Bahamas has resulted in one of the world's most significant marine discoveries. While evaluating data from camera-equipped tiger sharks across the country, scientists discovered that the sharks spent significant time in seagrass environments. The collaboration of humans and sharks has aided in the remote sensing of the most extensive seagrass ecosystem ever documented.

These grass-like meadows combat climate change by capturing vast amounts of carbon via photosynthesis and safely storing it in their deep root systems beneath the seafloor. The massive discovery of these beds, covering 92,000 km² (35,521 square miles), makes it one of our planet's most important global climatic assets.

Austin J. Gallagher (founder of the non-profit ocean research group Beneath the Waves) and Carlos M. Duarte lead this project. "This discovery reminds us that ocean exploration and study are crucial for a healthy future. The ocean's untapped potential is boundless. Furthermore, this discovery highlights science's importance in developing resilient communities. And we understood that with a finding of this importance, we needed to bring in the best storytellers in the world," said Dr Austin J. Gallagher.

INOS has been involved in this project, and as we begin to

investigate how important the ocean is in mitigating the effects of global warming, we invite you to learn more about the benefits of seagrass by reading the recently published research entitled 'Tiger sharks support the characterisation of the world's largest seagrass ecosystem' in Nature Communications (Link provided below).

The ocean and our world are interrelated plant and animal species that work together to maintain environmental equilibrium. Tiger sharks and seagrass are two critical species that will aid in our understanding and response to climate change.

Link: <https://www.nature.com/articles/s41467-022-33926-1>



The scientists deployed bio-logger tags equipped with cameras on tiger sharks. Review of this footage showed significant time spent in seagrass habitat, and sparked the initial curiosity around the seagrass meadows of The Bahamas. Photo credit: Diego Camejo for Beneath the Waves (2019).

Universities are hotbeds of talent, research, and innovation. By encouraging and supporting start-up companies, universities can instil entrepreneurship culture and contribute to economic growth. Indeed, the idea of a start-up within the university is exciting and practical.

OHSB is a prime example of this. The company has leveraged the resources and expertise of the university to develop a product that will significantly impact the marine industry. MFAST is a sophisticated system that uses advanced data analytics and machine learning algorithms to provide accurate and timely marine forecasts.

OHSB is now working on expanding data solutions for a wider marine industry that will involve climate change and ocean productivity data. With climate change affecting our planet and ocean health is under countless threats, there has never been a more critical time for solutions to mitigate the impacts of such.

The implications of such a product are far-reaching. It will not only facilitate marine operators and decision-makers to plan their operations but will also contribute to the safety and sustainability of our oceans.

As we celebrate the establishment of OHSB and the commercialisation of MFAST, we look forward to the company's continued growth and success. We are also proud that OHSB is being managed and run by our alumni, who have experienced the research environment at INOS. They would bring in quality and most importantly, support UMT aspirations and values. We wish them all the best in their endeavours and look forward to seeing them make



Served as an opportunity to enhance scientific studies on this endangered species, the lab's presence at The Taaras showcases physiological research on sea turtles while functioning as a tourism attraction.

Breaking Barriers in University-Industry Partnerships for Innovation

By **Mohd Uzair Rusli**

University-industry collaboration entails joint work in developing and sharing of knowledge, technology, and expertise between corporations and academic institutions. This partnership allows access to industry partners to advanced research equipment and knowledge while providing universities with real-world projects and industry exposure. Forming an industrial lab within a university refers to establishing a research facility that addresses industry partners' demands.

Many universities worldwide have created industry-university partnerships and labs, which are important in encouraging innovation and driving economic growth. The concept of industry labs within universities dated to the late 19th and early 20th centuries when colleges began emphasising practical research and technology transfer. The idea gained traction in the post-World War II era. Governments worldwide increased their investments in scientific and technology research, and universities and corporations recognised the benefits of collaborating more closely.

"Our biologist plays the role of a science communicator when visitors receive visits from various backgrounds".





There are numerous successful examples of university-industry collaborations and the formation of industry labs within institutions. One fine example is the early-1990s collaboration between the Massachusetts Institute of Technology (MIT) and General Electric (GE). This collaboration combined the skills and resources of MIT's faculty and students with GE's technological capabilities and industry experience, resulting in the development of new technologies, goods, and services and significant economic growth in the region. A striking instance was the development of GE's "Brilliant" range of industrial control systems, which are currently utilised in various industries, including power generation, aviation, and transportation. The collaboration also allowed MIT students to obtain hands-on experience and assisted GE in recruiting top talent from the university.

In Malaysia back in 2018, the Sea Turtle Research Unit (SEATRU) of INOS, UMT and The Taaras Beach and Spa



Resort in Redang launched a slightly different industry-university lab concept named the Public Viewing Lab. The project took off through support from Berjaya Hotels and Resorts, the resort owner, on SEATRU, which has been undertaking conservation and research works on sea turtles on the island since 1993. Served as an opportunity to enhance scientific studies on this endangered species, the lab's presence at The Taaras showcases physiological research on sea turtles while functioning as a tourism attraction.

The lab produces faster research results and lowers the university's laboratory running expenditures. Two marine biologists have been assigned to the lab serving as science communicators on full sponsorship by the resort. With so many visitors, conservation activities now have a platform to directly engage a wider audience and enhance the sale of conservation-themed goods, leading towards self-sustenance in the long run. However, there are huge obstacles



to overcome, such as regulatory and legal issues, because there is no reference or benchmark for establishing the lab. Close collaboration with the Department of Fisheries Malaysia is crucial in tackling these difficulties.

Universities and industry partners may have distinct cultures, work methods and communication practices, which can create challenges to effective collaboration. A university research team may conduct tests conventionally with caution while the industry partner may work in a more agile and fast-paced manner. This disparity can lead to misunderstandings, especially when meeting deadlines. This issue may be felt most acutely by in-house biologists working in the laboratory. To overcome these cultural differences, both the university and the industrial partner should be open to learning from each other and establishing a common ground. Regular communication and updates on the research progress can assist in keeping both sides aligned towards a successful end.

Another cultural barrier is that industry partners frequently have shorter R&D spans, whilst universities have longer timeframes for research and discovery, and balancing between the two can be difficult. However, this can be overcome by keeping abreast to the latest scientific developments. I was intrigued by the recent speech by our Higher Education Minister, Datuk Seri Mohamed Khaled Nordin, 'Let us remember that our presence in university is to fulfil national and patriotic obligations, not to pursue individualistic happiness.' Therefore, university-industry partners

should keep in mind of the aims to collectively advance our nation's growth.

In conclusion, a bright future for university-industry collaboration with enormous potential exists. What can be accomplished with enhanced collaboration and understanding between academics and industrial partners is limitless. With both parties bringing distinct viewpoints and strengths to the table, innovation flourishes where diverse perspectives meet. Collaboration may spur innovation and help solve complicated challenges in novel and exciting ways. With open communication and mutual willingness to learn from each other, university-industry cooperation will lead to a brighter future for the nation.

Author at Public Viewing Lab working on blood biochemistry of sea turtles in our effort to assess the effect of tourism towards sea turtle health in Redang Island, Terengganu.

This article first appeared in the February 2023 issue of TheEdgemarkets.com

INOS and DoFM Quest for a Better Pulau Kapas Marine Park

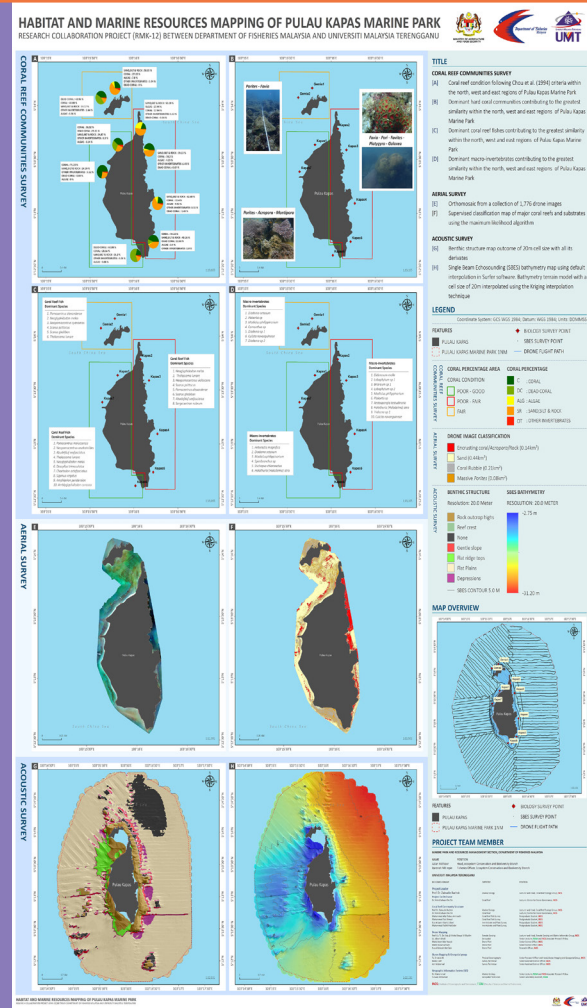
By Siti Tafzilmeriam Sheikh Abdul Kadir & Zainudin Bachok

Pulau Kapas, a small island near Kuala Terengganu, is a serene sanctuary for nature lovers and adventure seekers in the east coast of Peninsular Malaysia. With its white sandy beaches and thick palm trees, it offers a laid-back environment and a "home away from home" vibe in a typical Malay village setting.

Snorkelling and diving are popular activities near the western shore's shallow coral reefs, where tourists can see a variety of fish species and sea turtles. The island also has several good diving locations, including a World War II Japanese shipwreck, which has turned into an underwater "forest" full of corals and fish.

The Institute of Oceanography and Environment (INOS) and the Department of Fisheries Malaysia (DoFM) are collaborating to revitalise the Pulau Kapas Marine Park. This collaborative project aims to preserve coral reefs' ecological and economic value. To that end, the INOS and DoFM have comprehensively researched the park's habitats and resources, culminating in a field survey in July 2022.

Prof. Dr Zainudin Bachok coordinated the study, which employed three approaches to collect data: SCUBA diving surveys, unmanned aerial vehicle (UAV) surveys of shallow reef areas, and sound mapping of the deeper bottom. A GIS technique was used to assess and arrange the data, which included information on the structure, shape, and distribution of corals and associated species.



The findings provide a comprehensive understanding of the reef's features and will facilitate ecosystem-based strategic management via Marine Spatial Planning. This quest aims to build a map of the park's habitats and resources that will aid in the management of Pulau Kapas Marine Park by enhancing communication,





Labelling tree species



Height and diameter measurements

Cracking Mangrove's Vitality Code with Modelling

By **Md Rodila Ibrahim**

Mangroves are forest ecosystems in tropical and subtropical regions along coastlines and estuaries. They

offer numerous ecosystem services, including acting as a natural barrier against storm surges and erosion, providing habitat for various marine species, storing carbon, and cycling nutrients. Mangroves are critical for maintaining the health and productivity of coastal ecosystems. The loss of mangrove habitats can significantly impact local fisheries. Protecting and restoring mangroves is essential for the long-term sustainability of coastal ecosystems.

The intertidal zone is a vital and intricate ecosystem essential to the health and sustainability of coastal environments. Understanding and protecting this ecosystem to maintain biodiversity and ecological functions is necessary.

IBM simulations called mesoFON were used to analyse the dynamics of the *R. apiculata* species in the Matang Mangrove Forest Reserve (MMFR). Data on tree height, diameter at breast height, and species identity were collected above ground at different ages in the study area. Soil samples were collected at different layers but in the same area to analyse nitrate and phosphorus levels. Before collecting the data from above and below ground, four plots with a size of 10m by 10m were randomly built. All data, from above and below ground, were used to calibrate the model before simulation.

This IBM simulation using the mesoFON model found that planting more than 20,000 saplings is highly suitable for reforestation. The number of saplings planted affects various factors such as tree height, stem size, density, biomass, and total seedling mortality. The average death rate of saplings due to competition also significantly impacts the total number of saplings.

Individual-based models (IBMs) have several limitations to be considered, such as computational resources, data requirements, parameterization, and interpreting results. Nonetheless, monitoring mangrove growth is crucial for understanding the health and resilience of coastal ecosystems. It can also inform policies and management practices to help protect these valuable ecosystems.



Labelling tree species

Mangrove modelling is a valuable tool for comprehending the complex interactions between mangrove ecosystems and their environment. These models can simulate mangroves' response to changes in environmental factors and predict the effects of climate change and human activities on these ecosystems. There are three main types of mangrove models: process-based, empirical, and agent-based or individual-based models (IBMs). Process-based models simulate physical, chemical, and biological processes, empirical models use statistical relationships, and IBMs

simulate individual organisms and their interactions.

Mangrove modelling is a valuable tool that can inform management and conservation decisions for mangrove ecosystems. It can help identify areas suitable for mangrove restoration, predict the effects of sea level rise, and evaluate management strategies to control invasive species or mitigate human activities.

Matang Mangrove Forest Reserve in Malaysia covers 40,000 hectares. It is managed through a 30-year crop rotation system, including clear-felling, natural regeneration, and enrichment planting. The reserve is home to diverse flora and fauna, including rare and endangered species. The forest provides important ecosystem services and is an exemplary sustainable conservation and management area.

Research Inspiration

A Young Researcher's Journey

By Siti Tafzilmeriam Sheikh Abdul Kadir

"Be Patient, and This Will Lead to Success in Your Life."

"The research itself is a journey - a journey filled with obstacles and challenge. As a father of three young energetic boys, the greatest obstacle in my research is 'TIME'. Time management is important for me to get a better quality of life, especially when my children always demand for our time together. Besides, research can be challenging when the findings are beyond our expectation. This will pose significant challenge in comprehending the finding of the study."

A doctorate in coral reef ecology, Mohd Safuan Bin Che Din aspires to become more versatile by exploring new fields and enhancing his skills as a young lecturer at INOS. He was recently involved in several projects, predominantly in the collaborative projects with the Department of Fisheries Malaysia (DOFM) namely marine habitat mapping in Pulau Kapas Marine Park, Marine Park Sustainability Management Plan in Labuan Marine Park, as well as a study on the Malaysian policies and laws on marine biodiversity and ecosystem.



A doctorate in coral reef ecology, Mohd Safuan Bin Che Din aspires to become more versatile by exploring new fields and enhancing his skills as a young lecturer at INOS.



He has also been actively involved in consultancy works.

As a young researcher placed under the Centre for Ocean Governance, INOS (INOS-COG), he is also involved in the Malaysian Marine Spatial Planning (MMSP) project, which is an ecosystem-based approach that focuses on allocating ocean space for multiple users to reduce conflict between humans and the environment. This pilot MMSP project is a joint-project with Xiamen University of China and is focusing on Kuala Terengganu-Kuala Nerus districts.

He has also been actively involved in consultancy works. The most recent project was to survey marine flora and fauna mainly marine megafauna and coral reef communities at Luconia Shoal National Park, an offshore coral reef approximately 180 km from Miri, Sarawak.

According to Safuan, "My family has always been supportive of me and seeing my sons – Muhammad Al Haziq, Muhammad Al Hafiy and Muhammad Al Hakim- grow happily always inspired me to become more successful and to be a better person."

Safuan always holds two mottos in life. Firstly, "Be Patient". He believes that by being patient, it will lead to success in life. He quoted the words of Prophet Muhammad Rasulullah p.b.u.h. "whoever remains patient, Allah will bestow patience upon him, and no one is ever given anything better and more generous than patience." Her second motto is based on a quote from the most prominent scientist of all time, Sir Albert Einstien - "If we knew what we were doing, it would not be called research, would it?". He believes that research is an action to find something we do not know, and our curiosity will lead to research.



The working visit mostly filled with site surveys to coastal areas in the pilot study and river boat cruise along the Terengganu to validate the points marked in the draft MSP maps drawn prior to the visit.

The discussion subsequently concluded with several agreed upcoming activities for the pilot project as well as future projects to complement and facilitate the MSP plan under the UN Ocean Decade.



This Kuala Terengganu-Kuala Nerus MSP will pave the path for MSP in Malaysia and serve as a catalyst for ecosystem-based approach in managing our coastal and marine resources.

Working Visit for Malaysian Marine Spatial Planning (MMSP)

By **Wan Izatul Asma Wan Talaat**

Marine Spatial Planning (MSP) is basically an ecosystem-based approach and a public policy process for a society to better determine how the ocean and the coasts are sustainably used and protected - for now and for the future generations. The MMSP is a joint-project between Fujian Institute for Sustainable Ocean, Xiamen University, China (FISO-XMU) and Institute of Oceanography and Environment, Universiti Malaysia Terengganu, Malaysia (INOS-UMT) funded by China Oceanic Development Foundation (CODF). The pilot project was selected to focused on two districts of Kuala Terengganu and Kuala Nerus, which will be the first MSP for Malaysia under the recently-launched National Coastal Zone Physical Plan-2 that has put MSP as a thrust action. The preliminary groundworks on MSP along the 225km-Terengganu's coastal stretch was first initiated by UMT and WWF-Malaysia way back in 2016 leading to this 2-year pilot MMSP project, which commenced on 1 December 2021.

On 11-15 March 2023, INOS-UMT hosted a long overdue working visit due to the pandemic by FISO, XMU and another partner, Ocean Environment Science and Technology Ltd (OEST), as well as Sanya Coral Reef Ecology Institute. The delegation was led by Professor Xiongzhi Xue, the Dean of FISO-XMU, while OEST was represented by Mr Chunhong Fang, the Deputy General Manager. The Sanya Coral Reef Ecology Institute was represented by its Director, Dr Chuanliang Wu.

The working visit mostly filled with site surveys to coastal areas in the pilot study and river boat cruise along the Terengganu to validate the points marked in the draft MSP maps drawn prior to the visit.

The first physical stakeholders' focus group discussion for the project, the UMT-XMU Joint Workshop on Kuala Terengganu-Kuala Nerus MSP, was also convened at UMT campus by Professor Wan Izatul Asma Wan Talaat, the Head of Centre for Ocean Governance, who leads the project in Malaysia. Apart from the researchers from both sides, most participants present were from Kuala Terengganu City Council, the local authority for both the districts in the MSP project. Other major stakeholders involved were from Terengganu State Economic Planning Unit, Terengganu State Town and Country Planning Department (PLANMalaysia@Terengganu), and Terengganu Water Resources Board. The workshop was then followed with the Seminar on MSP to provide highlights on the MSP Project as well as to promote the marine science works in all the three partners institutions, INOS-UMT, FISO-XMU and OEST.

A closing discussion was held at the end of the 4 days working visit to surmise the findings of the site surveys and the stakeholders' workshop. The discussion subsequently concluded with several agreed upcoming activities for the pilot project as well as future projects to complement and facilitate the MSP plan under the UN Ocean Decade. This Kuala Terengganu-Kuala Nerus MSP will pave the path for MSP in Malaysia and serve as a catalyst for ecosystem-based approach in managing our coastal and marine resources.



Deadly Jellyfish Spotted on Local Beach - RRC Team Takes Action

By Izwandy Idris & Ahmad Fakhurrazi Mokhtar

The South China Sea Research Repository team of INOS, UMT (RRC) has taken the proactive initiative of informing the local public about the dangers of Portuguese Man'O War (PMOW) jellyfish. These jellyfish, known locally as *Ubur-Ubur Api*, were discovered abandoned in Pantai Pandak, Cendering. RRC has taken a proactive step in educating the local population about the dangers of Portuguese Man'O War (PMOW) jellyfish. These jellyfish are known as *Ubur-Ubur Api* locally and were discovered abandoned at Pantai Pandak, Cendering.

Recognizing the possible damage that PMOW jellyfish pose to human health, the RRC team took the initiative to raise awareness among the local people. They have been successful in informing people about the potential risks of these jellyfish during several campaign.



It should be noted that the sting of a PMOW jellyfish can result in extreme pain, redness, and swelling to human. It can also trigger anaphylactic shock, which can be fatal in some situations. As a result, it is critical to avoid all contact with PMOW jellyfish.

We advise everyone to immediately report any sightings of PMOW jellyfish to the appropriate authorities. By doing so, we can ensure that the required precautions are taken to protect the people and marine life.



The RRC team's efforts to raise awareness about PMOW jellyfish are an outstanding example of how collaboration between scientist and local public can be beneficial in raising environmental awareness as well as conserving marine ecosystems. We admire their efforts and hope that more people will join them in helping to protect our environment.