

VOYAGES OF DISCOVERY

Exploring the Sunda Shelf with Universiti Malaysia Terengganu
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Keeper Of Ocean Treasures

A centre at UMT is now one of the leading marine repositories in the country

A Role Model of Success

A young professor at UMT has established himself as a successful academic

Feeling at Home

An American student joins in the effort to conserve turtles while engaging himself in the local culture

The Much Awaited Guests

The sea turtles have chosen the beaches in Terengganu as their nesting spots each year

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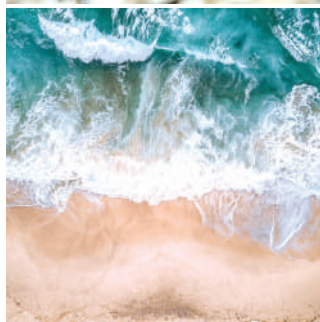
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VOYAGES OF DISCOVERY

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From The Vice Chancellor

Dear readers,

With great pride and enthusiasm, I introduce to you the latest edition of “Voyage of Discovery,” a publication that stands as a testament to the unwavering commitment and exceptional achievements of Universiti Malaysia Terengganu (UMT). Through this newsletter, we embark on a journey to showcase our institution’s remarkable strengths and achievements, this time with a special focus on the Institute of Oceanography and Environment (INOS).

INOS holds a distinguished place in the realm of research and innovation. In April 2001, it was officially recognised as a Centre of Excellence by the Government of Malaysia, endorsed by the International Oceanographic Commission (IOC) of UNESCO. Since then, INOS has been at the forefront of multidisciplinary marine science and oceanography research, providing advanced training to postgraduate students.

The year 2012 marked another significant milestone for INOS as it was designated as a Higher Education Institution Centre of Excellence (HICoE) in marine science by the Ministry of Higher Education Malaysia (KPTM). This accolade reaffirmed INOS’s status as the seventh HICoE in Malaysia and the sole Centre of Excellence in oceanography and marine science. INOS has consistently focused its primary research programmes on marine ecosystems and biodiversity.

INOS’s dedication to marine research has been acknowledged nationally and internationally. Recognising INOS as an oceanography and marine science leader, the Ministry of Higher Education Malaysia has entrusted it with comprehensive marine ecosystem research and conservation grants. Moreover, INOS has been named the National Ocean Biogeographic Information System (OBIS) Node, which is

pivotal in collecting oceanographic data for Malaysia. The institute has also been ranked among the top five in Southeast Asia for producing high-impact publications in marine research, as evidenced by Scopus in the South China Sea.

Internationally, INOS has forged strategic partnerships with the European Union through the TROPIMUNDO Erasmus Mundus programme, offering a master’s degree in Tropical Biodiversity and Ecosystems to students worldwide. Additionally, INOS has established collaborations with esteemed institutions such as the First Institute of Oceanography (FIO) in China, the University of Southampton (UOS), and the University of Western Australia (UWA).

Among its many accolades on the global stage, INOS proudly holds the distinction of being the world’s first Certified Associated Data Unit (ADU) in the International Oceanographic Data and Information Exchange (IODE) under UNESCO. Furthermore, it serves as the first Regional Training Centre (RTC) for the Asia-Pacific region within the Ocean Teacher Global Academy (OTGA).

As we delve into the pages of “Voyage of Discovery,” I invite you to explore the remarkable journey of INOS and Universiti Malaysia Terengganu in advancing the frontiers of oceanography and marine science. This publication serves as a testament to our dedication and an invitation to join us on our continued voyage of discovery, where knowledge knows no bounds and the ocean’s secrets are unveiled.

I extend my heartfelt gratitude to all the contributors, researchers, and staff who have made this newsletter possible, and I hope it inspires us all to dream, explore, and make discoveries.

Thank you for joining us on this extraordinary voyage.

PROFESSOR DATO’ DR. MAZLAN ABD GHAFFAR, FASc

Vice Chancellor, Universiti Malaysia Terengganu



Keeper Of Ocean Treasures

A centre at UMT is now one of the leading marine repositories in the country

By Assoc Prof. Dr Izwandy Idris, Head, South China Sea Repository and Reference Centre, Institute of Oceanography and Environment

The centre was set up in 2004. After two years, the number of registered specimens at the centre was a mere 38. But today the figure has grown to close to 60,000, with an estimated value of MYR 9 million.

Since its inception 18 years ago, the South China Sea Repository and Reference Centre (RRC) has successfully established itself as one of the leading marine repositories in Malaysia.

RRC's establishment back then was largely influenced by the notion of Malaysia being a maritime nation.

The fact is that Malaysia's marine area is more extensive than land (334,671 square kilometer vs. 329,847 km²), with a total of 4,675 km of coastline facing the Strait of Malacca, South China Sea, and Sulu Sea. The Strait of Malacca is the second busiest shipping lane in the world, and Malaysians are among the biggest consumers of fish in the world, with an average of 56.5 kg per person per year.

Without a doubt, Malaysia depends on the sea for trading, defence, food source, economic exploitation, and other indirect services. This dependency renders the ecosystem service provided by the seas essential for the survival and functionality of Malaysia as a nation.

Thus, for these reasons, information regarding our marine territory is highly needed. Required information ranges from details about physical, chemical, and biological components, including biodiversity. As our knowledge of the country's marine biodiversity is still incomplete, a proper record is also needed to determine our known and possibly unknown diversity.

In addition, changes in the marine ecosystem due to climate change, pollution, resource extraction, and utilisation affect species composition. Progress in the taxonomic field (naming and describing organisms) may also cause certain species to carry a different name than before. Hence, biodiversity data must be accompanied by the physical specimens for verification and update.

Objective of RRC

RRC was set up to manage these physical specimens. Its main objectives are to properly manage, record, and prepare marine specimens for various usages, including research, reference, and knowledge transfer.

RRC is one of the units of the Institute of Oceanography and Environment (INOS). When RRC was first formed, it was known as Biodiversity Museum. It then underwent several rebranding exercises until 2012, when the current name was adopted.

Of the total specimens currently deposited at RRC, 70 are categorised as type specimens, either holotype or paratype, which are directly used to describe new species in science. Holotype is a specimen on which a species' description is mainly based. Paratype on the other hand is an additional specimen that is added to a species' description at the original time of the description.

The specimens at RRC have come from the research conducted by UMT researchers and also those from other local institutions, such as Universiti Putra Malaysia and Universiti Sains Malaysia, and from international organisations, including Kagoshima University in Japan and the Australian Museum.

Specimens deposited at RRC are the physical evidence of the existence of these organisms in Malaysian waters and specific areas within our territory. This information can later be used as a baseline for area conservation, species-specific conservation, alien and invasive species control, commercial applications, and justification for sovereign rights or areas of national interest.

Many of the deposited specimens originated from unique places or locations that have strategic importance to the nation. For example, hard corals were collected from Malaysian-claimed atolls at Spratly islands, and gastropods were collected from various shipping ports.





Committed and experienced RRC team ensuring the quality of deposited specimens for research and teaching is at the highest level

Valuable Specimens

Undoubtedly, specimens deposited at RRC have high scientific values; therefore, RRC regularly receives visits from local and international taxonomic experts, who come to collect valuable data that is later translated into scientific publications.

Deposited specimens at RRC are managed based on the Museum Management Handbook by the National Park Service, USA. Moreover, RRC has upgraded its database by acquiring a licence from Re:discovery Software Inc. USA to use its collections management software (Proficio). These systems (collection management and database) have put RRC on the same operational level as other natural history museums/repositories worldwide.

As a result, RRC has received several recognitions from various agencies. The Ministry of Natural Resources (national marine repository centre) and the Malaysian Biodiversity Information System (MyBIS) have recognized RRC as a marine diversity data provider. In addition, the Australian Government has

identified and certified RRC as one of two agencies in Malaysia for specimen exchange and transfer with the Australian Counterpart. In 2017, RRC was appointed by the Ocean Biodiversity Information System (OBIS) as the Malaysian Node.

RRC staff, albeit small in numbers, are well-experienced and passionate about their tasks. For these reasons, they have also been invited by several agencies to assist and set up biodiversity-themed exhibitions, such as the NRE Interactive Gallery at Bukit Nenas, Kuala Lumpur, the transparent fish exhibition at Aquaria KLCC, the eco museum at Forest City Johor, and Natural History Exhibition at the State Museum of Terengganu.

As part of its knowledge transfer programme, RRC has also conducted several technical workshops on taxonomy and specimen management for researchers and technical staff, subsequently promoting the importance of natural history repositories among the public.

Awarded SOA Microgrants

RRC staff and associates have been awarded microgrants from the Sustainability Ocean Alliance (SOA) since 2020, starting with a microgrant for the new approach in biodiversity teaching using epoxy (Epoconomy). The centre then was awarded a microgrant for the sharing of information via database (Lab to Web) in 2021. These microgrants have allowed the RRC team to show their capability and subsequently attracted UNIQLO to co-sponsor RRC Open Day 2022, consisting of both online and physical interactions with target audiences. This year, RRC has received another grant from SOA to enhance the digital repository interface under a project called Malaysian Aqua Archive (MAQIVE). This project will allow greater access to RRC collections remotely to further encourage research and knowledge transfer.

Nevertheless, it is not all smooth sailing for RRC. Like other natural history museums/repositories, the centre faces daily struggles with issues such as operational expenditure, human resource, capacity development, perception, and mindset.

RRC's involvement and interactions with other entities, such as MyMuse (Committee of Museums and Galleries-Malaysian Public Universities), provide useful feedback on matters related to natural history collections in Malaysia.

Having many taxonomists working as academics at UMT is also an advantage for RRC. They provide support in scientific inputs and grant applications, and offer technical advice on specimen management.

Recently, a new renovation project has been approved by the UMT's leadership to upgrade the facility and infrastructure at RRC. The renovation aims to ensure the specimens at RRC are in excellent condition, efficiently support the research ecosystem at UMT, and enhance collaborative research with other institutions. In addition, the upgraded facility will allow RRC to accept non-marine specimens (terrestrial and freshwater) as part of the collections.

RRC has come a long way from the time it was first set up, and judging from its present performance, it can be argued that RRC has established itself as one of the leading repositories in the country.

It is quite an achievement for a centre that had a mere 38 specimens within the first two years of its existence. ♦



RRC regularly conducts knowledge transfer activities, such as a natural history seminar delivered by a visiting researcher



RRC regularly receives visits from international researchers who come to examine the deposited specimens. One researcher is Prof Julia Sigwart from the Sackenberg Natural History Museum, Germany.

The Ocean's Our Limit

An institute has worked its way up to
become a national centre of excellence

*By Prof. Ts. Dr. Mohd Fadzil Mohd Akhir, Director,
Institute of Oceanography and Environment (INOS)*

The institute first began as a small marine science station, set up in 1979, when UMT was still a branch of Universiti Putra Malaysia.

Since then, the institute has worked its way up to become what it is today.

The Institute of Oceanography and Environment (INOS) is now a premiere centre of excellence in Malaysia, focusing on oceanic and marine-related research and post-graduate training.

Commencing operations in 2001, INOS was the first research institute at UMT. It is also among the oldest and most established research institutes in Malaysia.

The major objective of INOS's establishment is to achieve a better understanding of the major scientific questions about the marine environment and its interaction with the earth systems. And it aims to do so through scientific research, oceanographic observations, data modelling, and satellite studies.

INOS has been conducting multi-disciplinary research mostly related to the oceanographic field. These studies have been carried out in areas within the Malaysian waters, but the main focus is within the South China Sea region, where the research is targeted at understanding the baseline information of the area.

In April 2001, INOS was accorded the official status as a centre of excellence by the Malaysian government, at the recommendation of the Intergovernmental Oceanographic Commission of UNESCO (IOC).



HICoE report submission by INOS Director Prof. Fadzil to UMT Vice Chancellor Prof. Mazlan



Site visit by the Higher Education Centre of Excellence (HICoE) to UMT



INOS Supercomputing Facilities, used to test mathematical models for complex physical phenomena or designs, such as climate and weather

Accorded HICoE Status

In 2012, INOS was accorded the prestigious Higher Institution Centre of Excellence (HICoE) status, due to its long-term commitment in the field of marine science nationally and regionally.

HICoE is an accreditation the Ministry of Higher Education (MOHE) introduced in 2007 in conjunction with the launch of the National Higher Education Strategic Plan (NHESP). The accreditation is awarded to high-achieving centres of excellence to encourage them to work towards becoming global leaders in their research niche areas. A centre recognized as HICoE is officially considered among the best in the nation.

INOS completed the 10-year HICoE programme in 2021, and now the institute has become a key oceanography and marine science knowledge institution that supports the national needs. INOS is also increasingly turning into a global institute.

As a HICoE, INOS has become a leader in marine sciences. Broad area of oceanography still its core focus, INOS realigned its research under the HICoE programme with the aim to bolster three main focus areas within the South China Sea.

These three areas are marine environmental processes, marine ecology, and ocean governance, an emerging field that provides the science-policy nexus to achieve the United Nations Sustainable Development Goals. Trans-disciplinary and integrated approaches are being used to fortify the core area of oceanography that has always been INOS's forte.

INOS has partnered with many national institutions, government agencies, industry players, as well as NGOs, working together to develop a better understanding towards our seas.

It is through our research that new features and understanding have been discovered, including upwelling, thermal fronts, and current circulation in the South China Sea. Our coral scientists have introduced new methods in coral health assessment and understanding the impact of climate variability on the South China Sea.



Anti trawl Acoustic Doppler Current Profiler (ADCP) maintenance near the Tiong and Dulang Oil Platforms on board of RV Discovery



INOS receiving the Accredited IODE National Oceanographic Data Centre (ADU) certificate from Dr. Peter Pissierssens, Head of the IOC Project Office for IODE

Ranked Top Five

This has led to a significant increase in journal publications over the past five years. INOS has been ranked as the top five South East Asia institutions that have published marine-related research carried out in the South China Sea. The success is due to the hard work of all INOS's staff and the strong support from UMT's top management. Contributions from INOS will surely continue to benefit the nation.

Over the years, INOS has increased its international partnerships in various areas. The institute has partnered with the International Oceanographic Data and Information Exchange (IODE) UNESCO, which has led INOS to be recognized as the first institution in the region to become an IODE Associate Data Unit.

INOS has also been established as one of the only four full-fledged OceanTeacher Global Academy (OTGA) under IODE UNESCO, and it is responsible for conducting training for the Asia-Pacific region.

Through its collaboration with foreign universities, INOS has become a full member of the EU Tropimundo, offering a master's programme for international students at UMT campus.

INOS's collaborations with the First Institute of Oceanography in China and University of Western Australia on technology transfer have enabled the institute to build its ocean modelling capability.

Due to the successes of its international partnerships and collaborations, INOS's research, knowledge and technology transfer, as well as funding for research and training have been significantly impacted. This has consequently increased our index in every aspect of scientific merits and most importantly increased trust among stakeholders in our research outputs that have benefited the nation.

Emphasis on Ocean Governance

Through its research innovations that have evolved for over 20 years, INOS has been able to bring more impact to the stakeholders. INOS has started to emphasize the role of ocean governance in marine environmental research through its HICoE programme, which is about translating scientific findings into actionable plans, whether in the forms of laws, policies, management plans or spatial planning. The Ocean Governance Research Programme, one of the core teams in INOS HICoE programme, has been working with the other groups in the programme to bridge the science and policy by facilitating in evidence-based decision-making.

INOS will play a bigger role for the next 10 years, in line with the spirit of the United Nation Decade of Ocean Science for Sustainable Development 2021-2030. We will continue to march forward by providing innovative solutions and making our oceans better, through international partnerships with multiple stakeholders and engagement with the IOC-UNESCO.

As the sole HICoE in marine science, INOS shoulders a huge responsibility in ensuring the success of the national agenda of protecting our marine environment. INOS will always focus on high-impact research that will benefit the country. To produce outputs of national importance, INOS will strengthen research and engagement in the various aspects in oceanography, marine biodiversity including the endangered species, and marine environmental governance.

Already a premier centre of excellence in Malaysia, INOS's further commitment in generating impactful research that will solve emerging issues facing the marine in this country will ultimately position the institute as a regional leader in marine research, particularly in the South China Sea.

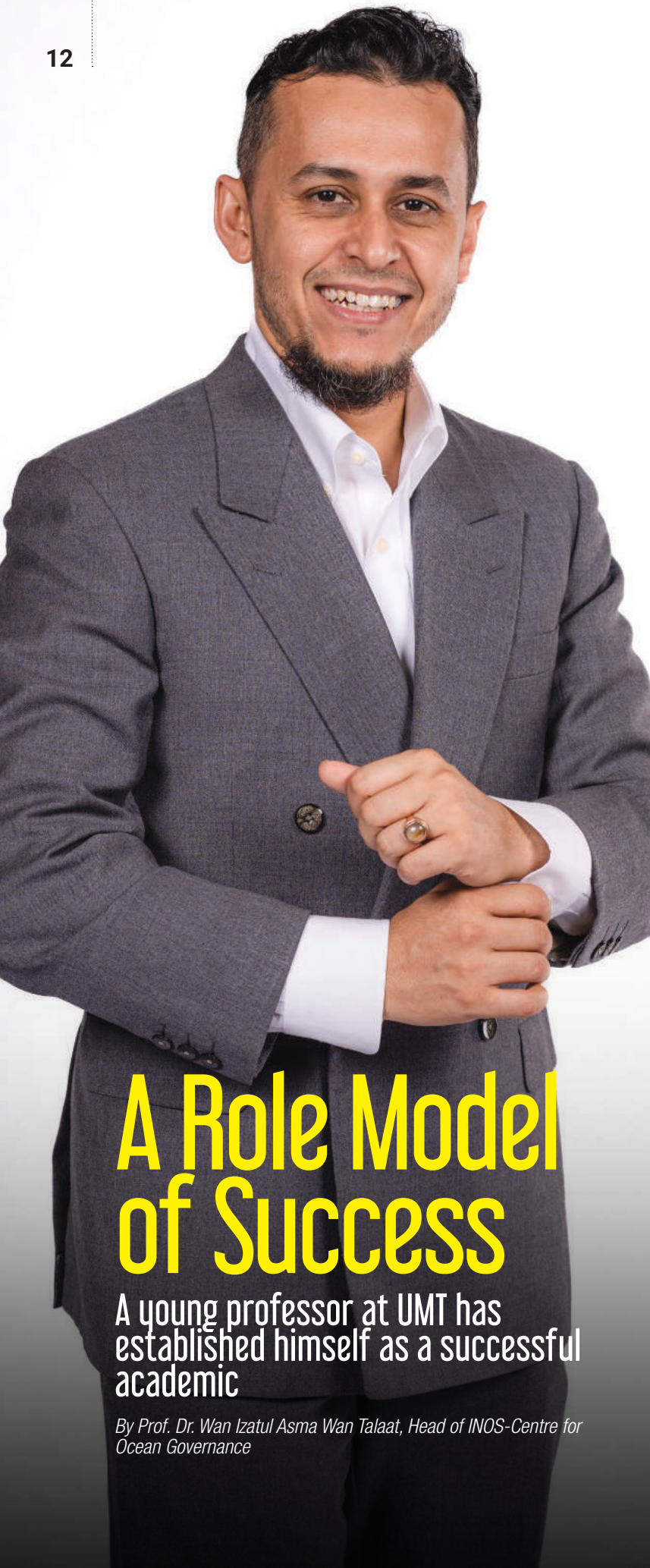
The institute that began as a small station 44 years ago has progressed remarkably. ♣



Letter of Intent (LOI) signing between INOS and Department of Town and Country Planning (PLANMalaysia)



Public lecture by Her Excellency Datin Paduka Nur Ashikin Mohd Taib, Director General of the Department of Maritime Affairs, Ministry of Foreign Affairs



A Role Model of Success

A young professor at UMT has established himself as a successful academic

By Prof. Dr. Wan Izatul Asma Wan Talaat, Head of INOS-Centre for Ocean Governance

“I have always had a passion for the environment.”

- Professor Fadzil

He was first trained as a civil engineer at Heriot-Watt University in the UK. But after graduation he never went into building and infrastructure construction, a career more commonly associated with those having civil engineering degrees.

Instead, he developed a keen interest in oceanography, which is the scientific study of the oceans. He maintains oceanography still falls within the scope of civil engineering in that it encompasses the effects of the oceans on the coastal environment and communities.

His decision to venture into a different path has paid dividends.

Today, with a host of achievements under his belt, Prof. Fadzil is one of the more successful academics at UMT.

“I have always had a passion for the environment,” he said. “I had taken a few subjects related to coastal engineering at the undergraduate level.”

With a strong love for oceanography, Professor Fadzil subsequently enrolled at the University of Western Australia, and there he completed his PhD in that branch of science dealing with physical and biological aspects of the oceans.

His decision to join UMT as a lecturer after obtaining his PhD was influenced by what the university already had at the time—cutting-edge technological equipment and facilities in his field of study.

“Physical oceanography, my specialization, requires access to the latest analytical apparatus for accurate, detailed results,” he said.

One of the Leading Minds in Oceanography

Having been working in oceanography for the past 17 years, Professor Fadzil is now one of the leading minds in oceanography in Malaysia.

As a lecturer at UMT, he has conducted research in his area of interest, coastal physical oceanography, mainly focusing on field observations and numerical modelling.

He has actively been studying the southern South China Sea, particularly in terms of ocean currents, wind, and waves and its water masses, focusing on the impact of seasonal changes as well as climate change.

Although working in oceanography, Professor Fadzil has not let his engineering skills go to waste. He has applied them in physical oceanography, enabling him to determine the ocean systems' behaviour and their impacts on both Malaysia's coastal regions and the inhabiting communities.

"In Terengganu, these studies are important as the monsoon season has a big influence on the livelihood and economic well-being of the people who live along the coast of the state," he said.

One of the highlights of his study was his discovery of an upwelling system along the east coast of Peninsular Malaysia, turning him into a renowned expert in the dynamics of upwelling system. Upwelling is an oceanographic phenomenon whereby deep, cold water moves towards the ocean surface.

This water contains nutrients that are good for the growth of planktons, the basis of the ocean food chain, thus providing a positive boost to the marine ecosystem.

A young and dynamic academic, Professor Fadzil possesses a vast experience in researching and publishing in his field of expertise.

He has his own research team at UMT, known as the Coastal Oceanography Dynamic (COD) research group. Under his stewardship, the COD team has developed a very significant new knowledge and high-quality research publications on physical oceanography in the country, supplementing the previously inadequate oceanographic profile of the southern South China Sea.

This was possible when in 2014 UMT acquired a research vessel the RV Discovery, research vessel in Malaysia, that changed the course of oceanographic research in the country. Oceanography work was able to be moved further offshore, thus allowing Professor Fadzil's team to explore new territories in the offshore region. New equipment was also deployed, including the deep ocean buoys that were able to collect long time-series data with various parameters. With new valuable data input, the team managed to publish impactful research on the dynamics of the South China Sea in high-impact journals.



Discussing research progress with the Coastal Oceanography Dynamic (COD) team

INOS and other UMT delegates meeting with Minister of Natural Resources, Environment, and Climate Change (NRECC) Nik Nazmi Nik Ahmad. As a HICoE, INOS works closely with NRECC Ministry on oceanographic matters



Involved in National and International Collaborations

Professor Fadzil has been involved in many national and international collaborations.

His works in the South China Sea have impressed international collaborators, allowing him to be involved in multiple research projects under the Intergovernmental Oceanographic Commission of the Western Pacific (IOC-WESTPAC).

He has also been appointed as principal investigator for the Upwelling Research Group, comprising members from various regional nations. The group is working to establish constructive information on upwelling sites within the South China Sea.

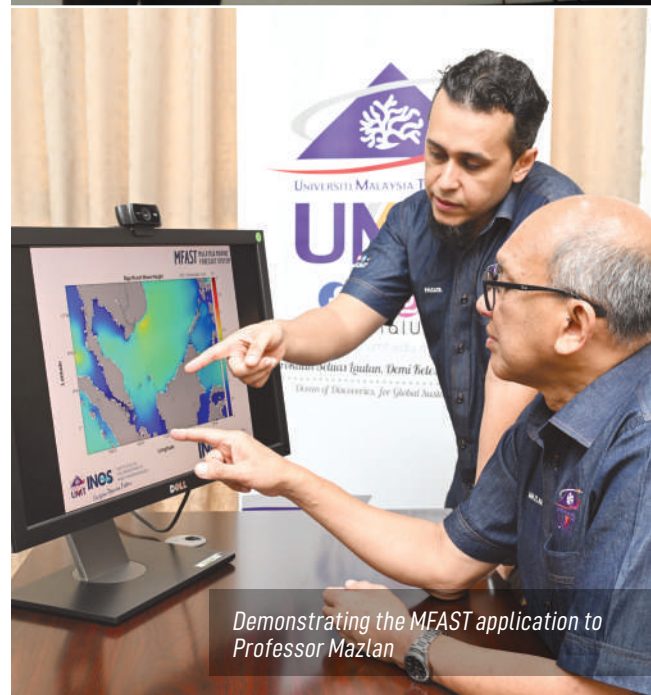
Besides leading multinational research projects, Professor Fadzil is also leading an ongoing ocean climate project under the Long-Term Research Grant Scheme (LRGS).

Professor Fadzil's partnership with the First Institute of Oceanography, China, brought him into a very interesting project—the Ocean Forecasting System. Years of work finally bore fruit when a forecasting system with a 5-day prediction of ocean currents, wave heights, and surface temperatures in the region was developed. This operational forecast system, named Malaysia Marine Forecast System (MFAST), is now freely available online for public and industrial use.

As one of the leading oceanography scientists with expertise in ocean observation systems and ocean modelling capacity, Professor Fadzil possesses a broader perspective of the oceanography landscape at both the local and international levels. This has allowed him to be involved in multiple engagements with government agencies and ministries including the Ministry of Science, Technology and Innovation of Malaysia (MOSTI) and the Ministry of Natural Resources, Environment and Climate Change (NRECC).



Delivering talk in the First IOC-WESTPAC Workshop on upwelling region in the South China Sea



Demonstrating the MFAST application to Professor Mazlan



INOS "Engage & Innovate: For Ocean and Us" 2023 programme at Setiu Wetlands



With the 3rd Tropical Ocean and Marine Sciences International Symposium (TOMSY) 2022 organising committee

A Prolific Leader

As INOS director, Professor Fadzil can be considered a prolific leader.

He has introduced a data management approach at INOS and it is now part of the institute's culture. This approach stresses on researchers' involvement throughout the whole process in operational management, from data collection to data repository.

On another note, for the past few years Professor Fadzil has made all the staff at INOS involved in innovative products, such as system development, database and repository, module development and new research methods.

To accelerate INOS into a more successful future, he has stressed on internal cooperation between the talents across all levels so that the institute's Objectives and Key Results (OKRs) can be successfully met.

Professor Fadzil's leadership is about finding the balance between performing high-impact research and producing innovative solutions for national interests. This is key to INOS's vision, which sees the institute charting the passage and shaping the future of oceanographic research in the country, in line with the vision of the UN Decade of Ocean Science for Sustainable Development.

Despite his young age, Prof. Fadzil has established himself as one of the more successful academics at UMT, as proven by his several big achievements.

His decision to go in a different direction after obtaining his civil engineering degree appeared to be the right one.

Surely, Professor Fadzil has never regretted staying away from buildings and structures.✦



Winning Their Hearts

UMT has become a university of choice for TROPIMUNDO students

*By Assoc. Prof. Dr. Behara Satyanarayana,
Local Coordinator of TROPIMUNDO*

When it comes to a popular international programme funded by the European Commission and offered by 17 universities throughout the world, UMT is the proud holder of one record.

UMT was the first institution in Asia to welcome this unique programme. After acquiring a full-partner status in 2014, UMT has received 135 students from 46 countries. With this number, UMT has topped the list among participating universities exclusively for the Semester 2 curriculum.

For the past nine years, UMT has become the university of choice for international students enrolling in the Erasmus Mundus Joint Master Degree Programme of Tropical Biodiversity and Ecosystems, or TROPIMUNDO (<https://www.tropimundo.eu/>).

Erasmus Mundus programmes aim to enhance the quality of higher education through dialogues and understanding between people and cultures from both developed and developing nations.

TROPIMUNDO, one of its programmes, not only brings together world's higher education institutions with longstanding expertise in tropical rainforests, woodlands, and coastal ecosystems, but also provides knowledge on tropical ecosystems' biodiversity and environment to postgraduate students.

TROPIMUNDO is a unique mobility programme that receives overwhelming responses from students all over the world. The MSc degree is designed for four semesters and is worth 120 European Credit Transfer and Accumulation System (ECTS) credits. Implemented by the European Higher Education, ECTS is a tool that allows students to study in a different country and have their academic qualification and study periods abroad recognized.

TROPIMUNDO is currently offered by nine institutions in European countries, namely Belgium, France, and Italy, and by eight institutions in non-European countries, which include Cameroon, Malaysia, Sri Lanka, and Kenya.

Though new students may choose any of the seven non-European institutions for their Semester 2 enrolment, UMT's good reputation, spread through word-of-mouth from former students, has been winning the hearts of most of them and made these students come to Malaysia every year.

At UMT, the Institute of Oceanography and Environment (INOS) has coordinated TROPIMUNDO since 2015.



Professor Mazlan and Professor Fadzil distributing the Certificate of Attendance to TROPIMUNDO students after their successful completion of Semester-2 study at the UMT

Courses Offered

To meet the core objective of this EC-funded programme, UMT offers six courses, which are Mangrove Field School (15 ECTS), Remote Sensing & GIS (3 ECTS), Tropical Oceanography (3 ECTS), Estuarine & Mangrove Ecology (3 ECTS), Conservation of Marine Endangered Species (3 ECTS), and Lake & Terrestrial Ecology (3 ECTS).

UMT received the first cohort of 16 students from 12 countries in 2015. This was followed by the second cohort of 16 students from 11 countries in 2016, third cohort of 20 students from 12 countries in 2017, fourth cohort of 17 students from 12 countries in 2018, fifth cohort of 16 students from 11 countries in 2019, sixth cohort of 18 students from 11 countries in 2020, seventh cohort of 3 students from 2 countries in 2021, and eighth cohort of 9 students from 5 countries in 2022. The ninth cohort of 20 students from 14 countries are currently here completed the programme.

The successful run of the TROPIMUNDO programme at UMT, with a consistent number of international students coming every year, clearly shows the university's potential as a world-class institution having high academic standards.

Although TROPIMUNDO students come to UMT with a mission of exploring the tropical biodiversity and ecosystems, they are also given the opportunities to engage in activities with the local communities, thanks to the way the course curriculum is designed. They share their knowledge when they join awareness campaigns on viral infections transmitted by mosquitoes, plant mangroves in association with the Forestry Department, visit schools to educate children on the importance of natural resources, among others.

Students also conduct interviews with local stakeholders to form suggestions for improved management options for mangrove habitats, marine endangered species, tourist-centric islands, etc.



UMT top management and INOS support staff with the 9th cohort of TROPIMUNDO students in 2023



*Giovanna Wolswijk standing next to a high-grown red mangrove (*Rhizophora apiculata*) tree at Matang Mangrove Forest Reserve in State Perak, Peninsular Malaysia*

Immersed in the Local Culture

Besides learning and doing field activities, students have the opportunity to take part in local cultural events as well. By having the students mingle with the local communities, UMT achieves one of the fundamental values of TROPIMUNDO, which is to have intensive contact with different cultures and languages.

TROPIMUNDO students have had good things to say about their time at UMT. According to them, UMT extended a warm welcome, provided ample opportunities to learn new knowledge, and helped them take part in various extracurricular activities, some of which were beyond their anticipation. Believing UMT is a good destination for TROPIMUNDO students, they suggest that others will not want to miss the chance of studying at the university.

One of these students is Giovanna Wolswijk from Italy, who came as the fourth cohort in 2018.

“My TROPIMUNDO semester at UMT gave me a life-changing experience,” she said.

Giovanna later registered at UMT for her PhD study as she thought the university was an ideal place to conduct research on mangrove habitats. Now she is working on the carbon stock of Matang Mangrove Forest Reserve with different aged vegetative stands. She hopes to land a suitable career at UMT once she has graduated from her PhD study.



A thrilling experience for TROPIMUNDO students after learning about the community-based mangrove management and ecotourism initiatives at the Matang Mangrove Forest Reserve



Mr. Winfred Marshal, PhD candidate at INOS, joining and helping TROPIMUNDO students on their field excursion

“It is always a wonderful experience to associate with the programme as a UMT buddy”

- Nur Hannah Abd. Rahim

UMT Buddies

UMT normally partners TROPIMUNDO students with UMT buddies, most likely postgraduate students who share the same supervisors as them. This helps the international students acclimatize to a new environment, with the buddies showing the students around and helping them complete things, such as registering for courses. The supervisors often ask the buddies to help with the short-term thesis works TROPIMUNDO students have to prepare.

Oftentimes, TROPIMUNDO students and their buddies become very close, and some of them still remain connected with their helpful local friends even after leaving Malaysia. In some cases, they have helped each other with career planning and development.

Nur Hannah Abd. Rahim is one of the local students who has been involved with the TROPIMUNDO programme a few times.

“It is always a wonderful experience to associate with the programme as a UMT buddy,” said the PhD student.

She has helped a couple of TROPIMUNDO students with their research in Malaysia, providing language translation for socio-ecology topics. In the process, she said she also gained new knowledge regarding her research methodology, data analyses, and interpretation skills. She in fact learned how to use R, a free statistical software, from her TROPIMUNDO friends.

“Some of us constantly update each other on the progress of our studies,” she said. “I believe this kind of programme creates a more supportive environment that is crucial for postgraduate students.”

UMT’s diverse courses and lecturer’s commitment have made the campus the best choice for TROPIMUNDO students. This trend looks to continue well into the future, ensuring that UMT remains in the good books globally. ♣



Hannah with TROPIMUNDO students from Columbia and Morocco



Keeping Our End of the Deal

UMT's expertise is put to work in a strategic partnership

By Ts. Dr. Azizi Ali, Senior Research Officer, INOS

Several years back, INOS paid a simple visit to this one company, a household name in the oil and gas industry. That visit turned into something significant for both parties. It kick-started a partnership between them that has lasted till today.

For the past five years, INOS has been collaborating with the company, HidroKinetik Technologies Sdn. Bhd., providing its expertise in several marine-related projects all over the country.

INOS and HidroKinetik Technologies share many similarities in terms of the nature of their work. This has allowed the forming of the partnership between the two.

INOS is a leader in oceanographic studies and has been conducting multi-disciplinary research mostly related to the oceanographic field ever since it was first established in 2001. Now a premiere centre of excellence in the country, one of its niche research areas is in the field of seabed mapping and hydrographic mapping.

Activities related to this niche area are carried out by one of INOS's research groups, the Ocean Mapping and Geospatial research group. The group provides data related to oceanography and seabed to other agencies, such as the Malaysian Fisheries Department, the Marine Park Department, port authorities, and the national museum.

HidroKinetik Technologies meanwhile is a leading player in providing hydrographic and geophysical surveys, marine engineering, and technical consultancy services in Southeast Asia. Well-known in the oil and gas industry, the company is part of HidroKinetik Group, which also owns Temasek Engineering, a specialist in marine sonar and telecommunication equipment, Temasek Allied Engineering, and Temasek HidroKinetik Sdn. Bhd. The company was established in 2019 to focus on the design, development, and manufacture of autonomous unmanned surface vessels (USVs).

With similar areas of specialization, INOS and HidroKinetik Technologies have been able to complement each other's expertise during collaborative projects.

First Visit

INOS's first visit to HidroKinetik Technologies back then was just an ordinary trip to have its research instruments serviced and repaired by the company. These were instruments INOS normally uses when conducting marine-related research, such as acoustic doppler (current profiler), current meter, and tide gauge. These instruments must always be in a good condition so they are always ready for research use.

During the visit, the company not only serviced the instruments, but it also shared with INOS useful information regarding proper maintenance of the instruments.

HidroKinetik Technologies was impressed when it found out INOS owns several other similar instruments and has been conducting large-scale hydrographic research.

The company later paid a visit to INOS to find out more about the institute. Convinced by what it saw during the visit, HidroKinetik Technologies invited INOS to carry out some of the company's projects.

With the company trusting INOS to conduct the projects and funding them, the institute successfully conducted oceanography studies in Kuala Selangor, current mapping and wave in Sabak Bernam, Selangor, and bathymetry mapping in Paka, Terengganu, where INOS researchers studied the underwater depth of the ocean floor.

The success of these projects led HidroKinetik Technologies to allocate more of the same to INOS to carry out. And like before, INOS successfully completed each of them.

One of these was the hydrographic mapping using multibeam echo sounders in Kijal, Terengganu. Hydrographic mapping involves measuring and describing the physical features of bodies of water and the land areas adjacent to them. The main method of obtaining hydrographic data is through surveying using multibeam echo sounders.

Another project was the excavation of artefacts from the shipwreck near Bidong Island. This collaboration involved both parties providing ocean solutions via scientific research that combined a new technology and an innovative strategy.



Visiting Hidrokinetik Technologies for the first time

New Opportunity for Product Introduction

The close connection with HidroKinetik Technology has also provided a new avenue for INOS to market one of its innovative products.

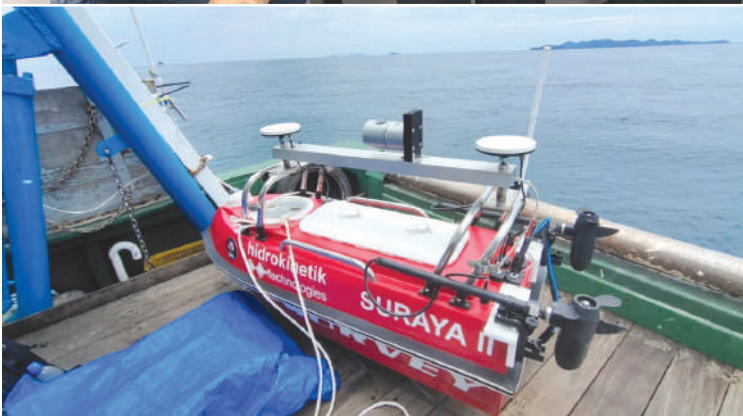
INOS, in collaboration with the First Institute of Oceanography (FIO), China, has developed the Malaysia Marine Forecast System (MFAST) to support maritime activities and prepare for hazards and disasters. Unlike the commercial Ocean Forecast Systems (OFS) that often lack accuracy at a local level, MFAST was designed to provide high-resolution forecast data. It is the first OFS in Malaysia to provide high-resolution ocean forecast data based on a wave-tide-circulation coupled model established by the Laboratory of Marine Sciences and Numerical Modelling at FIO.

MFAST has not only helped strengthen the partnership between INOS and HidroKinetik Technologies, but the innovative system has also helped the company collaborate with the other players in marine-related industry, such as oil and gas companies, that make use of an ocean forecast system in their daily operations.

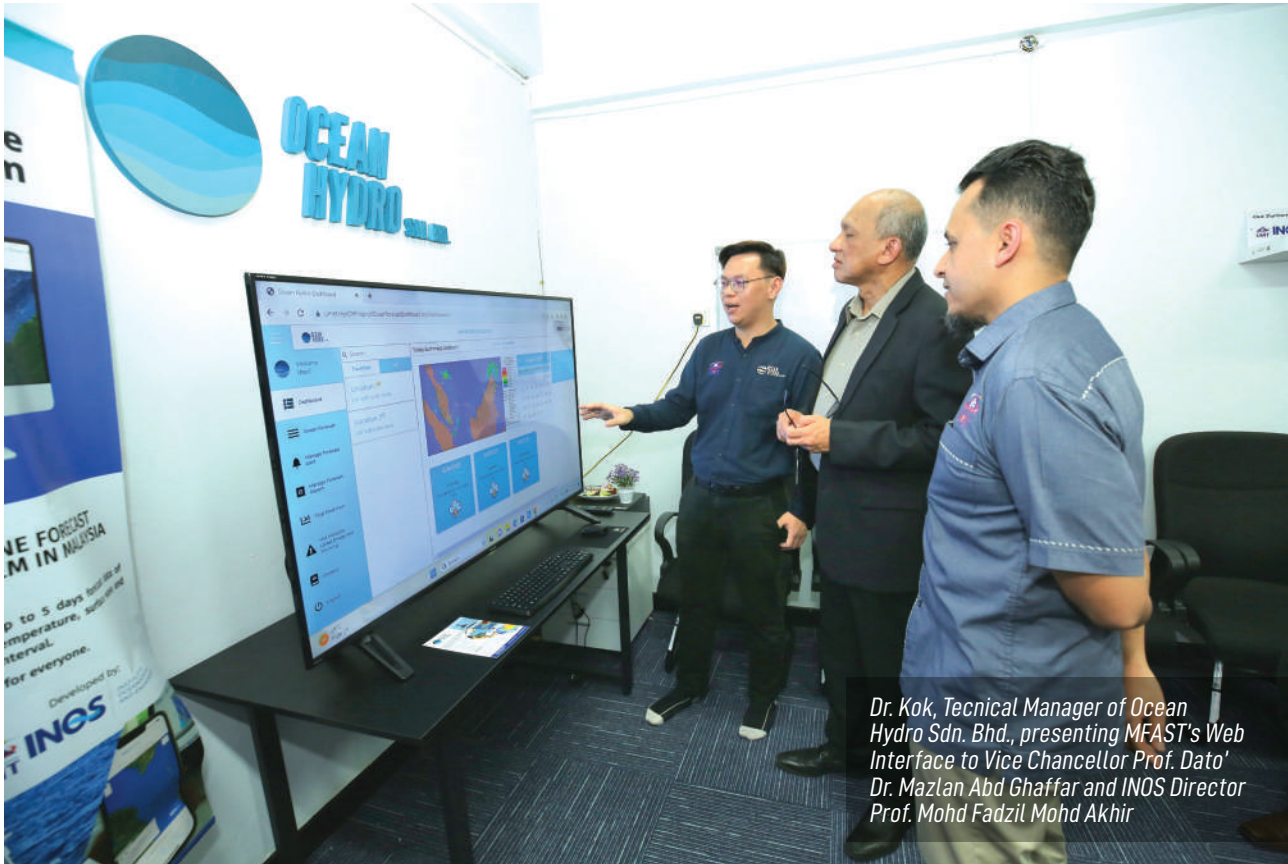
Through the partnership, the application of MFAST is expected to widen. In addition to the system currently being used by the oil and gas companies and government agencies related to fisheries, meteorology, and marine, MFAST will soon be used by other industry players.



Exploring Synergy: Hidrokinetik Technologies' Visit to Ocean Hydro Sdn. Bhd. - Forging Innovation through the INOS and Hidrokinetik Technologies Sdn. Bhd. Partnership



Excavation of antiquities from a shipwreck off Bidong Island utilizing Hidrokinetik Technologies Sdn Bhd's Unmanned Surface Vehicle (USV) - Suraya II.



Dr. Kok, Technical Manager of Ocean Hydro Sdn. Bhd., presenting MFAST's Web Interface to Vice Chancellor Prof. Dato' Dr. Mazlan Abd Ghaffar and INOS Director Prof. Mohd Fadzil Mohd Akhir

Partnership Formalized

Having successfully worked together in several projects over the years, INOS and HidroKinetik Technologies agreed to formalize their partnership. On 23 November 2022, both parties signed a Memorandum of Agreement (MOA).

Under the MOA, which lasts for three years, both parties agreed to work together to achieve even more than before. The two agreed to jointly conduct marine surveys and hydrographic works, award industry-standard professional certificates, expose students to the latest marine survey and inspection technology, conduct research and development as well as trial implementations, and collaborate in other areas as deemed suitable.

On the part of INOS, the institute agreed to provide expertise to carry out marine and hydrographic surveys and analyses, facilitate the deployment and handling of marine and hydrographic works between the two parties, provide scientific expertise to the industry to increase innovative solutions, and facilitate access to scientific equipment, research site, and working space for research work and student activities.

As for HidroKinetik Technologies, the company agreed to provide marine and hydrographic consultation and instruments, such as a multibeam system, a single beam system, a positioning system, and a tide gauge, provide opportunities for relevant consultancy works, and provide maintenance and repairs for INOS's oceanography instruments.

What have been planned under the MOA are currently being implemented by INOS and HidroKinetik Technologies, and these are expected to be completed as scheduled.

Both parties will be working together for at least a couple more years, and it is highly likely the MOA will be renewed, considering the complementary nature of the relationship between the two has benefitted both thus far.

For the past five years, many research projects have been successfully completed as a result of INOS's collaboration with HidroKinetik Technologies SDN. BHD.

A simple visit by INOS to HidroKinetik Technologies has allowed the institute to put its expertise to work and help the company many times over. †

Caring for the Corals

Intensive research is carried out at UMT for coral reef conservation

By Prof. Dr. Zainudin Bachok, INOS

In one of the laboratory rooms at the Institute of Oceanography and Environment (INOS), wetsuits and SCUBA air compressors are neatly kept. There is a reason why INOS has them. These are used by its researchers when they dive underwater to conduct studies on coral reefs.

Coral reef research is one of the main activities carried out at the institute.

A coral reef, also known as the “rainforest of the sea,” is an important ecosystem in the ocean. It provides habitat for breeding and nursery grounds, food and shelter for marine organisms, and coastal protection.

Whereas the tropical rainforest is formed by plants, a coral reef is built by animals, an interesting fact that may surprise many people. Coral reefs are actually one of the largest biological structures on Earth.

The unique ecosystem is built by hard corals, living organisms that give a reef a three-dimensional structure. These hard corals are from the animal kingdom Animalia, and they have tentacles that can secrete rigid skeletons like humans and can grow.

One of the unique characteristics of these stony corals is that they are in a reciprocal relationship with tiny microorganisms known as symbiotic algae or “zooxanthellae.” The corals provide shelter for the algae, who live inside the coral tissues, and in return the algae provide food for the hosts. The algae help the corals to grow and provide them energy to build the coral skeleton, which eventually forms the basic framework of the ecosystem. A variety of coral growth forms then take place, such as massive, branched, encrusting, and several other forms.

In Malaysia, a country considered a hotspot for biodiversity especially marine organisms, there is about 4000 square kilometres of coral reef area, with various coral reef species and other marine organisms.



A group of divers epoxying a coral fragment. Coral transplantation involves transplanting a coral from a place with inhospitable conditions to a place where it has a higher chance of thriving.

Coral Reefs Facing Threats

Unfortunately, coral reefs in the country have been facing a variety of threats due to human activities and climate change.

Overfishing, destructive fishing practices, land-based pollution, and coastal developments have severely affected the coral reefs. So has the increase in sea surface temperature, leading to massive coral bleaching. This is a state where corals expel the algae living in their tissues, causing the corals to turn white. When corals bleach, they are not dead yet, but continued stress created by the warm water may subject them to mortality.

Conservation of the coral reefs is critical for the survival of various marine species underwater and the livelihoods of millions of people on land who depend on these fragile ecosystems. Therefore, to develop a strategic conservation management, a comprehensive understanding of the fundamentals of coral reef distribution is required.

The Coral Reef Ecology (CORE) research group at the Institute of Oceanography and Environment (INOS) aims to monitor and assess the reef ecosystem in the South China Sea as well as study the coral biology and socio-economic aspects. With more than 20 members, the group seeks to provide better insights into the complex interactions that build the resilience of the reef ecosystem in the South China Sea.

Ghost nets, also known as The Abandoned, Lost, or Otherwise Discarded Fishing Gear (ALDFG), can become entangled in fish, dolphins, sea turtles, sharks, dugongs, and other creatures, including occasionally human divers.



Main Research Focuses

The main research focuses of the CORE research group include coral reef community structure, multiple stressors to the reef ecosystem, reef mapping, artificial reefs, coral reproductive biology and growth, stress response in corals, coral diseases, and socio-economic impact.

Coral reef studies by CORE researchers fall into three categories: broad-scale, medium-scale, and small-scale studies.

An example of broad-scale studies is mapping of marine habitat through acoustic and aerial surveys to obtain a large-scale assessment of the coral reef area. Mapping is conducted at three levels—the first level includes corals and non-corals, the second benthic, or bottom-of-the-sea life forms, and the third hard coral group type. This approach helps researchers to save a lot of time and resources.

Studies under the medium-scale category are more detailed, and one such example is coral reef community research, carried out to understand the ecological components of the ecosystem. In this type of studies, underwater video equipment is used to record and monitor important biotic and abiotic components in coral reefs. These two components form the ecosystems, the former comprising living things within an ecosystem, including plants, animals, and bacteria, while the latter consisting of non-living things, such as water, soil, and atmosphere. How these two components interact is crucial in an ecosystem.

Small-scale studies are mainly concerned with ecology, physiology, and biogeochemistry of corals, and the focus of these studies varies, ranging from coral species to cellular levels. Normally assessed in studies under this category are fatty acid biomarkers, oxidative stress, and trophic levels, which are the positions marine organisms occupy in a food web, or the number of steps they are from the start of the food chain. All these assessments are made using different scientific measurements.

Field surveys at coral reef ecosystems involve SCUBA diving, and surveys are conducted using innovative applications that complement traditional ecological approaches with advancement in techniques. These include coral video transect (CVT) technique, stereo-fish underwater video (Stereo-FUV) system, multi-beam echo sounder (MBES), unmanned aerial vehicle (UAV), and ultra-short baseline (USBL) underwater positioning system.

Each of these applications is used for different purposes. For example, the UAV, or popularly known as drone, is used to capture satellite or airborne images with excellent spatial resolution. The MBES is used in spatial mapping of seafloor habitats.



"Christmas tree worm" is the common name for marine worms that live on tropical coral reefs. Each worm has two brightly colored crowns protruding from its tubular body. They are important for the health of coral reefs and help protect the corals from invasive starfish while preventing the corals from being overgrown by algae.



The coral video transect method (CVT) consists of a field survey with a video camera along a line of fixed length, with the registered images subsequently analyzed with a computer.



When diving, you can move freely underwater and have the feeling of being part of marine life. Underwater photography is very useful when scientists need to study objects on the seabed over time.



Coral surrounded by marine sponges. Sponges are important inhabitants of coral reef ecosystems. A diverse sponge population can influence the water quality of the reef, as the sponges filter water, collect bacteria, and process carbon, nitrogen, and phosphorus.

Contributing to Coral Reef Research Community

As coral reef studies are continuously being conducted by the CORE group, the benefits resulting from the research activities are also enjoyed by the coral reef research community. One contribution from the CORE group is its advanced survey protocol invention. Where preceding methods are highly demanding, time-consuming, and suitable for archiving purposes, the new method of using digital waterproof camera, which underwent thorough scientific analysis, optimization techniques, and field testing, makes coral surveys more affordable and user-friendly.

The Coral Video Transect (CVT) technique, a self-developed standard operating procedure by the CORE group, is another method to use for reef site surveys beside the conventional methods. Using the new method has enabled the group to obtain data that provide a very important overview of the current reef condition regionally.

The CVT method has become a major achievement after being officially recognized by the government as a better alternative survey method in the country.

The CORE team also works closely with other agencies. The team has collaborated with the Malaysia Marine Park to produce a new indexing system to measure and monitor coral health. Four dimensions of Coral Resilience Index were jointly developed based on coral cover, fish, invertebrate, and plant presence in the reef areas. This indexing system is now being used to assess coral health nation-wide, to serve as a baseline assessment on coral community structure. This is crucial for identifying reef areas with known coral species susceptible to stress conditions.

The condition of almost all coral reefs in Malaysia is up to date. The team is creating a new indexing system to measure and monitor coral health, which is essential for the conservation and management of marine biodiversity. Long-term monitoring and integrated ecosystem observations of coral reefs provide important data that help coastal residents and coastal and marine management authorities understand the health of reefs, their dependence on their health and well-being, and the economic and social consequences of reef decline.

Coral reef research will remain one of the main activities at INOS as the institute seeks to help in coral reef conservation.

When wetsuits and SCUBA air compressors are missing from one of the laboratory rooms at the institute, that means the CORE group is using them underwater to conduct coral reef studies. ♣



Laying a Helping Hand

A PhD student's research provides useful findings that may help in wetland restoration and enhancement projects

By Prof. Ts. Dr. Mohd Fadzil Mohd Akhir, Director, Institute of Oceanography and Environment (INOS)

Dr Zuraini Zainol was on a boat, diligently measuring the speed and direction of the current of the Setiu Lagoon water as part of her data collection. Suddenly, the current metre she was using was knocked off by the boat's propeller, causing the device to disappear into the water. For a while, Dr Zuraini felt so dejected.

She was lucky that the instrument was later recovered, and luckier the captured data was not lost. That unfortunate experience was among the several she had to go through along her PhD journey.

Despite the many hiccups she faced, Dr Zuraini managed to successfully complete her research on the hydrodynamic and water quality at Terengganu's Setiu Wetlands.

Her research is considered significant as it is one of the too few studies covering the southeast area of the wetland. Her valuable work may provide help in managing wetland restoration and enhancement projects, determining the best possible location for productive aquaculture farms, and controlling pollution at the area.

Dr Zuraini's first introduction to oceanic studies occurred when she was studying marine science as an undergraduate at UMT. It did not take her long to develop a love for the field. After graduating with Distinction, she was offered to pursue her master's degree at UMT in physical oceanography, under the supervision of Professor Dr Mohd Fadzil Mohd Akhir, a researcher at the Institute of Oceanography and Environment (INOS) and one of the leading minds in oceanography in the country.

Based on her excellent track record, Dr Zuraini was subsequently awarded UMT's Tuanku Chancellor Scholarship to pursue her PhD study. Having developed a close bond with UMT, she chose to register as a PhD student at INOS, with the same Professor Fadzil as her supervisor.

When it came time to decide on her research, Dr Zuraini sought advice from her supervisor, and both agreed she would study the hydrodynamic and water quality at Setiu Wetland.

23,000-hectare Wetland

Setiu Wetland is located in the state of Terengganu, Malaysia, about 60 kilometres northwest of the Kuala Terengganu city. It is a 23,000-hectare wetland, comprising mangroves, freshwater swamps, forests lining the riverbanks, brackish water lagoon with vegetated sand islands, seagrass beds, and sandy beaches. The two major freshwater inputs at Setiu Wetland are through the Setiu River and Berambak Lake. The wetland is connected to the South China Sea through a small river inlet of about 100 metres wide.

The economic activities of the locals at Setiu Wetland are primarily aquaculture-based, such as brackish water cage culture, pond culture, pen culture, and oyster farming. The upstream area of Setiu Wetland is dominated by agricultural activities, as evidenced by the presence of palm oil plantations.

Setiu Wetland has experienced shoreline alteration due to seasonal wave energy along the coastline, especially during the northeast monsoon, where continuous actions of wind, current, and nearshore waves have led to the opening and closing of the river mouths and the appearance of new islands within the wetland.

Dr Zuraini chose Setiu Wetland as her study's location because an understanding of hydrodynamic in this area is still sparse, despite all the previous studies conducted. More importantly, almost all the earlier studies were concentrated around the old river inlet located 4 kilometres to the north of the current river inlet, but the old inlet was naturally closed in 2015.

The repositioning of the river inlet has raised questions, such as how the current flow in the lagoon has changed and how capable this ecosystem is in maintaining its water quality since most of the sources of anthropogenic activities are situated at the old inlet.

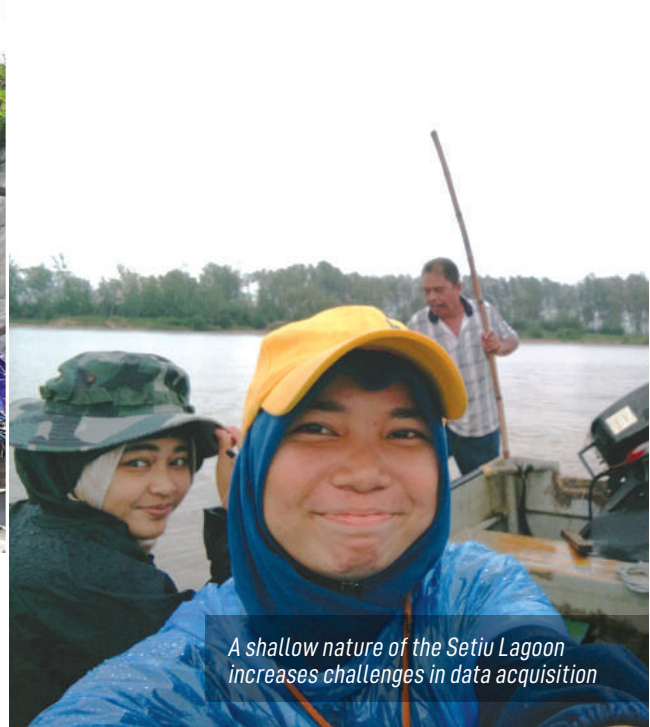
The old inlet is the area where all the seafood-based local delicacies industry and aquaculture activities are concentrated at. Previously, it can be assumed that any pollutants were easily flushed out from the wetland due to the nearby inlet. Somehow, the current inlet is located 4 km away from the old inlet, which raised a question on how the contaminants from these activities could be removed from the wetland.



Unique Setiu Wetlands with nine interconnected ecosystems



Setting up current meters for deployment



A shallow nature of the Setiu Lagoon increases challenges in data acquisition

Research Focus

Therefore, motivated by this issue, Dr Zuraini sought to understand the dynamics of Setiu Wetland from the new river inlet perspective and how efficiently this river mouth would function in removing the contaminants and pollutants from the water body.

Her research is important for several reasons, according to Dr Zuraini. Knowledge gained about the existing water motion and transport processes in Setiu Wetland will be useful in managing the wetland restoration and enhancement projects. In addition, hydrodynamic and ecological information can assist the Department of Fisheries and local committees in determining the best possible location for productive aquaculture farms, as Setiu Wetland is fast developing into a hub of aquaculture activities, and these will support the livelihood of the locals. Also, determination of residence time in Setiu Wetland is believed to help in coastal management and ecological sustainability purposes, especially those related to pollution control.

The study was guided by three objectives, namely, to investigate the tidal influence of Setiu Wetland towards changes in hydrodynamic and water quality, to investigate the residence time within the Setiu Lagoon and how it affects the phytoplankton biomass and nutrients concentration, and to identify the temporal and spatial scales of pollutant transport and distribution associated with river discharges from a coastal management and ecological sustainability perspective.

To achieve the objectives of her study, Dr Zuraini carried out research samplings at three different times of the year that corresponded with the dry period of northeast monsoon, southwest monsoon, and wet period of northeast monsoon, they being February, August, and December. Since the study also aimed to observe the interaction between seawater and freshwater, Dr Zuraini positioned ten sampling stations randomly within the four-kilometre river inlet area.

Dr Zuraini collected three kinds of data, which were measurements of physical parameters, nutrients and chlorophyll a analyses, and supplementary data. Physical parameters included temperature, salinity, depth, and current speed and direction. Water samples for nutrient and chlorophyll a analysis purposes were collected at 0.5 metre depth due to the shallow water. Supplementary data included daily rainfall amount and river flow, obtained from the Department of Irrigation and Drainage, and hourly water level, acquired from the tide table provided by National Hydrographic Centre.

Statistical analysis was performed on the environmental parameters to demonstrate relationships among variables. Numerical modelling was also executed to improve the restrictions of field observations while providing a better understanding of the dynamics of the water body.

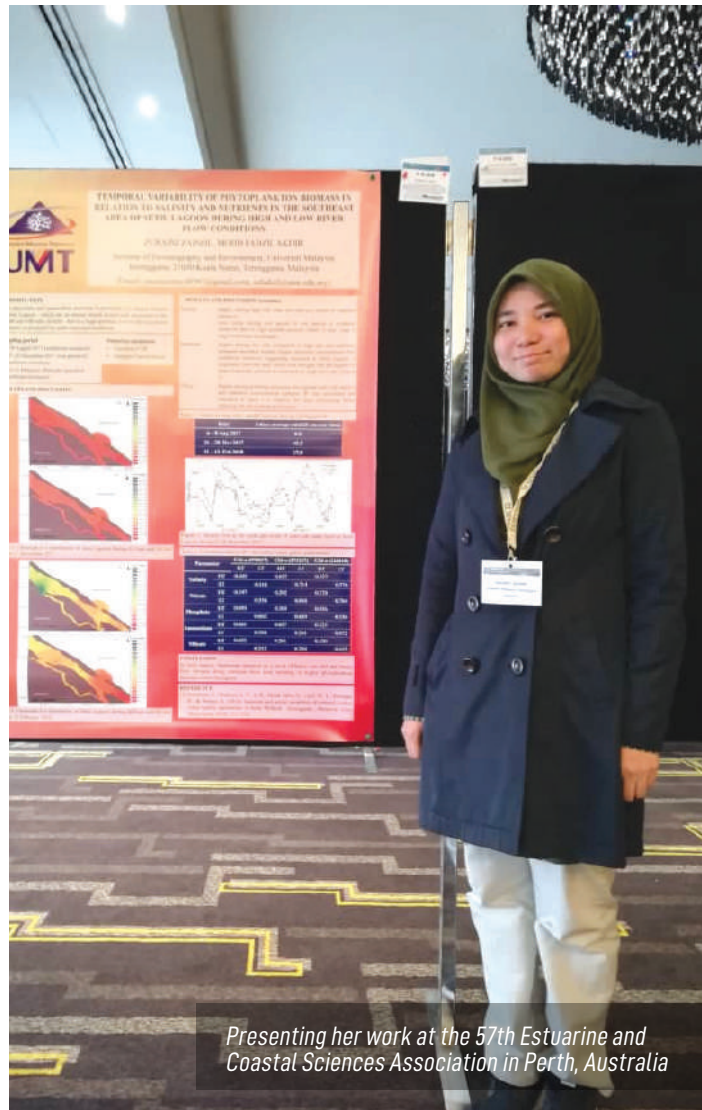
Meaningful Results

The results indicated that the current flow in Setiu Lagoon was dictated by the sea tides; it followed the ebb (the movement of the tide out to sea), flood, neap (a less than average tide occurring at the first and third quarters of the moon), and spring tide cycles. The larger size of Setiu River produced a slightly stronger tidal current at the south of the river inlet area. Freshwater discharge played a great role in modulating the physical characteristics of the lagoon, giving rise to the arrangement and formation of salt wedges, especially during the northeast monsoon, where heavy rainfalls were documented. Sufficient nutrients supplied through the river flows controlled the distribution of phytoplankton biomass (microscopic marine algae) in Setiu Lagoon. Longer water residence time near the aquaculture farms corresponded well with high chlorophyll *a* concentrations, thus raising a concern on its water quality due to the poor flushing and minimal water exchange. Further research with extensive field samplings and numerical experiments is required to strengthen the knowledge about this shallow and narrow coastal lagoon.

The output of the research has been published in reputable journals like the *Marine Pollution Bulletin* and the *Regional Studies in Marine Sciences*. Dr Zuraini has also presented her works at the 10th West Pacific International Scientific Conference, in Qingdao, China, and the 57th Estuarine and Coastal Sciences Association, in Perth, Australia.

Conducted at a location not yet widely explored by other scientists, Dr Zuraini's research may become the impetus for other studies at the area.

Her patience and resilience paid off when she was able to successfully complete her study at Setiu Wetland amidst several unfortunate incidents that disrupted her progress. ♣



Presenting her work at the 57th Estuarine and Coastal Sciences Association in Perth, Australia



Participating in the Tropical Ocean and Marine Sciences International Symposium (TOMSY) 2018 with Coastal Oceanography Dynamic (COD) research team members



Feeling at Home

An American student joins in the effort to conserve turtles while engaging himself in the local culture

By Mohd Uzair Rusli, Sea Turtle Research Unit (SEATRU)

“From a very young age, I had a great curiosity and admiration for nature.”

- Nicholas

Well immersed in the Malay culture, he may be spotted at times dressed in a Baju Melayu, a traditional shirt worn by Malay men, and a kain pelikat, a long, checkered cloth Malay men wear, wrapped around the waist, in place of a pair of trousers.

But it is easy to tell he is Caucasian, based on his overall appearance, especially his brown hair, white skin, and easily recognizable white man’s facial features.

Nicholas Tolen comes from New York, and he is a postgraduate student at UMT.

When people hear New York, they most often think of the big city, but Nicholas grew up in the suburbs north of New York City, where there are plenty of fields, forests, swamps, and streams to explore. The environment he was raised in played a major part in shaping his interests.

“From a very young age, I had a great curiosity and admiration for nature,” he said. “My parents would take my older brother and me to visit many national parks and seashores across the United States.”



At Sekolah Kebangsaan Pulau Perhentian - marine conservation educational outreach with the youngest generation of Malaysians. Photo by Shuana Tay

First Journey to Malaysia

Nicholas's journey to Malaysia began in 2015, when he was hired to help start the Perhentian Turtle Project at Perhentian Island in Terengganu.

"After working for several months at the island, swimming amongst the tropical coral reefs and taking photos of foraging sea turtles, I was captivated by the island's natural beauty," he said. "It was my first time travelling to Southeast Asia."

Nicholas was able to quickly immerse himself in the local culture, getting comfortable with the local residents and eating local food. He developed a liking for the local fruit Durian. He even celebrated Hari Raya, a Muslim festival, although he adheres to a different religion.

When he was working closely with the turtle conservation rangers from the Department of Fisheries at the island, he noticed that their hatchery management efforts were producing predominantly female-biased hatchlings, and that worried him.

So, he decided to investigate the causes. He enrolled as a master's degree student at UMT, with a clear research project already devised. He would be comparing the incubation temperature and the resulting sex ratio of hatchlings of relocated green turtle nests at the Perhentian Island and naturally laid nests at the Chagar Hutang Turtle Sanctuary, a site managed by the Sea Turtle Research Unit of INOS.

Awarded Master's Degree

Nicholas carried out his project as a postgraduate student at INOS and completed his Master of Science (Zoology) in June 2021.

He considered himself fortunate to have two supportive parents who understand his dream of studying marine biology abroad. "Malaysia, however, is roughly on the opposite side of the globe from New York, so it's a long and expensive flight for me to return home," he said.

The significance of his study towards the conservation of sea turtles is quite big. One of the major contributors to the population decline and local extinction of nesting leatherback turtles in Terengganu is the unattended feminization of hatchlings, said Nicholas.

Although the Malaysian government enacted hatchery management programmes to conserve and protect its dwindling leatherback turtles, they did not understand the effect incubation temperature has on the resulting sex ratio of hatchlings, he said. Over multiple decades of relocating eggs into open beach hatcheries, they produced female-biased hatchlings leading to the collapse of the local nesting population, he added.

His study determined the same trend of feminized hatchling production for green turtles in the region and suggested hatchery management solutions, like adding natural shade materials to help lower incubation temperature inside the Perhentian hatchery and help produce higher proportions of male hatchlings.

When he first started his research, Nicholas was fully aware of the challenges that would come with working on a conservation project such as his, as change would come gradually. To occupy his time between research activities, he built or fixed stuff for his project.

"Seeing a physical change can bring me a lot of personal satisfaction," he said. "So, I spent time creating new beach chairs, or even changing a broken faucet."

"Malaysia, however, is roughly on the opposite side of the globe from New York, so it's a long and expensive flight for me to return home."

- Nicholas



At the Chagar Hutang research Station - collecting gonad tissue samples for hatchling sex ratio masters research project with SeaTRU. Photo by Bella Reboul



At kampung Pulau Perhentian - educational outreach booth at local village during World Oceans Day 2015. Photo by Kevin Heitzman



At the home of Rashidatul Nisa's family at Kampung Durian Bador, Kuala Berang, Terengganu - celebrating youngest brother birthday. Photo by Rashidatul Nisa Mohd Azhar

Staying Put in Malaysia

After completing his master's degree, Nicholas decided to remain in Malaysia. He admitted that the friendliness of the Malaysian people and the deliciousness of the local food kept him here.

He is currently pursuing his doctorate degree, also at UMT. Nicholas said it does not take him much to be happy. Sometimes it can be as simple as succeeding in his research ambitions or helping his colleagues achieve theirs.

For the time he has stayed in Terengganu, he said he is fortunate to have had many great experiences, and he looks forward to having new ones. The best experience according to him may have been eating a lot of fresh Durians at Sekayu Waterfall with his Terengganu friends.

He thinks international students should be open to new experiences and meeting new people. One of the best ways to do that is to have a meal with new acquaintances and familiar colleagues. That is why he believes the first Malay phrase international students should learn is "Jom kita makan!," which means "Let's go eat."

"It's a great way to be introduced to new foods you may not be brave enough to try for yourself or make a new lasting friendship with someone you may be too shy to approach alone," he said.

He has become so accustomed to the way of living and the culture here that he has not thought much about what it is like back home.

"But when it's cold, wet, and rainy here, I miss the comfort of my American lifestyle," he said.

It is uncertain if Nicholas will call Terengganu his forever home, but he will be at UMT for a while until he obtains his PhD.

Next time a Caucasian man is spotted wearing Baju Melayu and kain pelikat at a nearby area, the odds are high that he is Nicholas Tolen, a UMT student who has embraced the local culture. †



Making a Name for Himself

A young lecturer applies his scientific knowledge for sustainable use of marine resources

By Prof. Dr. Zainudin Bachok, INOS

“It is a field I have always had a strong passion for.”

- Dr. Mohd Safuan

His passion for marine organisms began when he was 10 years old. He loved to watch the documentary channel National Geographic, particularly when the shows were about ocean life. Since then, he had aimed to become a scientist. When his primary school teacher asked him about his ambition, that was what he told the teacher.

Today, Dr. Mohd Safuan Che Din is a young aspiring lecturer at the Institute of Oceanography and Environment (INOS), specializing in coral ecology.

“It is a field I have always had a strong passion for,” said Dr. Safuan, a native of Pahang, a state in the east coast of Malaysia.

To pursue his ambition, Dr. Safuan first enrolled at Universiti Teknologi MARA (UiTM), where he subsequently graduated with a Diploma in Science.

The first stage completed, he then furthered his study at UMT and graduated with a bachelor’s degree in marine biology.

In Love with UMT

Having enjoyed his moment as an undergraduate student at UMT, Dr. Safuan was persuaded to further his study to a master's level at the same university. It was during this time that he fell in love with coral reef study. One of his achievements was on a coral survey method called Coral Video Transect (CVT) technique. This technique has been applied extensively to survey coral reef areas in Malaysia.

A year after he had graduated with a master's degree, Dr. Safuan received a scholarship from UMT. He went for a doctoral study in marine science, focusing on coral reef ecology. During his PhD journey, he had published 15 research articles in Web of Science (WOS) and SCOPUS journals.

Apart from being academically excellent, Dr. Safuan was also active in other areas. He was selected as one of Malaysia's representatives for the Asia Youth Forum that was held in Yokohama, Japan. He also attended the Coral Health Index training in Bali, Indonesia and Asia Pacific Coral Reef Symposium in Cebu, Philippine.

Dr. Safuan also gained extensive research experience when he was appointed as a Research Assistant (RA) from 2012 until 2019 at UMT's INOS and School of Marine Science and Environment. As an RA, he had been involved in several research and consultancy projects in collaboration with several companies and agencies, such as Department of Fisheries Malaysia (DOFM), LUNDIN Malaysia, TIOXIDE Malaysia, and Malaysian Port Authorities.

Dr. Safuan obtained his PhD in August 2021 and was directly appointed as a post-doctoral researcher at INOS, where he was placed under the Centre for Ocean Governance (COG). At COG, he started to use his experience in coral reef ecology to conduct research on ocean governance. He started to apply ecological data for managing the ocean via Marine Spatial Planning (MSP).



As coral reef ecology, hard coral is the main organism being study by Dr. Safuan through understanding their community structure in coral reef area.



Attending Asia Pacific Coral Reef Symposium (APCRS2018) with other team members from UMT



Diving with his student and ex-supervisor in Pulau Bidong to study coral community in the island



Site visit with a team from Xiamen University, China for Malaysia Marine Spatial Planning's study.

Appointed as Lecturer

After ten months with COG, Dr. Safuan was then appointed as lecturer at INOS. This has allowed him to improve his skill on linking the science with the management. He is currently involved in research projects related to management plans, such as Malaysia Marine Spatial Planning for Kuala Terengganu-Kuala Nerus (MMSP KT-KN), and marine parks in Malaysia, such as Labuan Marine Park and Pulau Kapas Marine Park.

On top of this, Dr. Safuan has been applying coral reef dataset obtained from CVT method to provide information for creating a specific zoning, so that informed and coordinated decisions can be made about how to use marine resources sustainably. He believes that, through interdisciplinary research, understanding on the conflict between user and environment can be deepened.

“The ocean governance can be improved via the application of specific zoning, which is beneficial for sustainability of the marine ecosystem,” he said.

As part of INOS-COG team, Dr. Safuan thrives on connecting science with ocean governance, which is in line with United Nations Ocean Decade and SDG14, to provide a better solution in managing the ocean space.

Aside from research activities, Dr. Safuan has also been actively involved in consultancy projects. He is currently working on coral reef community surveys for big-name oil and gas companies, such as SHELL and PETRONAS. His previous project was at Luconia Shoal National Park (LSNP), an offshore coral reef in Sarawak.

Coral Reef Research and Consultation Activities

Because of his active involvement in coral reef research and consultation activities, Dr. Safuan was appointed as a resource person by the Ministry of Energy and Natural Resources Malaysia at an expert consultation forum by ASEAN Centre of Biodiversity. He was also invited as a trainer of coral survey using the CVT technique to teach government staff from DOFM and international students from TROPIMUNDO (Erasmus Mundus Joint Master Degree in Tropical Biodiversity and Ecosystem) programme as well as from Heriot Watt University.

In the near future, Dr. Safuan sees himself having increased his academic leadership capabilities, through a comprehensive research, knowledge transfer, and mentoring activities.

“My next ambition is to be among renowned academic leaders in the field of coral reef ecology, nationally and internationally,” he said.

As a child, Dr. Safuan had an aim of becoming a scientist, and today he has stayed true to it. He works as one at INOS, specializing in coral reef ecology. And he has steadily been making a name for himself in the field.

For what he is today and will be in the future, perhaps he should thank National Geographic. It was the channel that first introduced him to ocean life. ⚡



Having collaboration with Sarawak Forestry Department to monitor coral reef and reef ball in Sarawak.



Having his first experience of diving in offshore coral reefs in Luconia Shoal National Park as part of consultation activities with oil and gas company in Malaysia

Educating the World

Being a UNESCO-endorsed regional training centre has allowed an institute at UMT to share its knowledge of oceanography with the world

By Prof. Gs. Ts. Dr. Aidy @ Mohamed Shawal M Muslim, Lecturer, Institute of Oceanography and Environment (INOS)

For the past eight years, the Institute of Oceanography and Environment (INOS) has been playing an important role at the world's stage.

And in doing so it has trained people from 30 countries.

Since 2014, INOS has been appointed as one of the OceanTeacher Global Academy (OTGA) Regional Training Centres, providing training for the Asia-Pacific region.

The ocean is an important resource. It covers more than 70% of the earth's surface and plays a crucial role in regulating the earth's climate and supporting biodiversity. Despite its importance, the ocean is still poorly understood, and its vast resources and potential are yet to be fully harnessed.

Recognizing the significance of the ocean, INOS has been working tirelessly to bridge the knowledge gap and build capacity related to ocean research and services.

INOS is a leading institution in Malaysia, committed to advancing the knowledge and understanding of the ocean and environment. Since its establishment, INOS has played a vital role in building equitable capacity related to ocean research, observations, and services.



Professor Aidy and Mr. Zulkamal attending the OTGA Training of Trainers for Regional Training Centres

INOS Part of OTGA Project

INOS is part of the OceanTeacher Global Academy (OTGA) Project under the International Oceanographic Data and Information Exchange (IODE), UNESCO.

OTGA is a global initiative established under the UN Decade of Ocean Science for Sustainable Development. It aims to increase national and regional capacity in coastal and marine sciences, services, and management by providing customised training for ocean experts and professionals. To this end, OTGA created a global network of regional and specialised training centres (RTCs and STCs) that deliver high-quality training programmes tailored to meet the specific needs of participants.

In 2014, efforts were made to shape the network of OTGA regional training centres. Site visits were conducted to assess various factors that would influence the selection process. These factors included infrastructure, event-related services,

human resources, relevant experience and history related to the Intergovernmental Oceanographic Commission (IOC) and IODE, practical and legal issues, and the sustainability of the prospective training centres.

By evaluating these factors, OTGA aimed to ensure that the selected regional training centres would be equipped with the necessary resources and capabilities to provide high-quality training and promote the sharing of knowledge and expertise in oceanography.

The OTGA training programmes are designed to cater to the needs of both developing and developed countries and are open to participants from all regions of the world. The programmes are suitable for individuals working in government agencies, non-governmental organisations, private sector companies, and academic institutions, among others.



OTGA participants visiting INOS-South China Sea Repository and Reference Centre (RRC)



Professor Aidy presenting the OTGA programme at the IODE-XXV Science Conference

Appointed as Regional Training Centre

INOS was formally established as a regional training centre in 2014, with the purpose of providing training in the Asia-Pacific region, with support of about RM 1 million.

As an OTGA regional training centre, INOS provides a wide range of training programmes and courses in various fields related to oceanography, marine sciences, and coastal management. These training programmes are designed to equip individuals with the knowledge, skills, and tools necessary to effectively manage and conserve ocean resources.

Some of the topics covered include marine biodiversity, ocean observation, ocean data management, marine spatial planning, marine pollution, climate change, and sustainable fisheries management, among others.

The training programmes are delivered through a variety of formats, including face-to-face workshops, online courses, and blended learning approaches.

The programmes are designed to cater to the needs of a diverse audience involved in ocean-related activities. The target participants include researchers, scientists, educators, policymakers, coastal managers, marine industry professionals, and other stakeholders interested in enhancing their knowledge and skills in oceanography, marine sciences, and coastal management.

One of the most significant achievements of INOS as OTGA training centre is the diversity of its participants. By welcoming participants from different countries and backgrounds, INOS is fostering equitable capacity building, ensuring that all regions have access to the resources and knowledge needed to advance ocean research and services. This is vital, given the significant challenges facing the ocean, including climate change, overfishing, and pollution.

The training instructors/facilitators are experts in their respective fields and have a wealth of knowledge and experience in oceanography, marine sciences, and coastal management. They are mostly UMT specialists, while several are regional experts. Many of them are affiliated with leading research institutions, universities, and organizations involved in ocean-related activities.



Professor Aidy chairing the OTGA Steering Group meeting in Oostende, Belgium

INOS OTGA Training Centre





Digital Repositories: the Pathway from Open Access to Digital Asset Management (23-27 September 2018)

OTGA Training Course-Digital Repositories: The Pathway from open Access to Digital Asset Management

Positive Feedback

For its training, INOS has received positive feedback from past participants, the number totalling 200 to date, and also instructors/facilitators. Participants have praised INOS for providing high-quality training programmes that are well-structured, comprehensive, and practical. The positive feedback highlights the value and impact of the training programmes in promoting knowledge exchange, capacity building, and sustainable ocean management.

As an OTGA regional training centre, INOS has access to a wide range of training courses, workshops, and resources related to ocean science, technology, and data management. This has helped INOS researchers to stay up to date with the latest advancements in the field and to develop new skills and expertise.

Being an OTGA regional training centre also provides a platform for INOS to connect and collaborate with peers and experts from around the world. Through this, INOS has developed new partnerships, shared knowledge and best practices, and collaborated on research projects.

Being part of the OTGA network has also raised the profile of INOS within the marine science community, thereby helping attract new funding opportunities and collaborations.

Overall, being an OTGA has enable INOS to enhance its capacity to conduct high-quality research and to contribute to the global effort to understand and manage the world's oceans.

Since the first appointment in 2014, INOS has carried out its role as an OTGA regional training centre to the best of its ability.

And the institute will surely continue to play this important role well into the future, training more people from more countries about all things oceans. ♣



The OTGA Training Course: Foundations of Coastal and Marine Spatial Planning in INOS



OTGA participants taking the opportunity to visit INOS Research Gallery



The Much Awaited Guests

The sea turtles have chosen the beaches in Terengganu as their nesting spots each year

*By Mohd Uzair Rusli & Syamsyahidah Samsol,
Sea Turtle Research Unit (SEATRU)*

From April to October every year, visitors flock to the beach at night.

They wait patiently and quietly, and when the time comes, they are rewarded with the opportunity to witness something not easily found elsewhere—the sea turtles laying their eggs.

It has been reported as many as 1000 tourists would gather on the white sand to watch a single female turtle dig a nest with its rear flippers and deposit roughly 100 golf-ball-sized eggs into it.

The sea turtles have become an integral part of Terengganu, making the state unique and helping it become an interesting holiday destination.

The life cycle of sea turtles is complex, convoluted, and perplexing to humans. Sea turtle hatchlings will leave the shore and roam the ocean, never returning to their natal beach until they achieve sexual maturity at about 20-25 years old. Adults travel thousands of kilometres and only return to their nesting ground every 2 to 3 years to deposit eggs. Because of the unique behaviour known as “natal beach homing,” sea turtles born in Terengganu will return to their birthplace when it is time to nest.

Terengganu’s geographical location has made it possible for the turtles to land on one of its beaches to lay their eggs each year.

The state is located on the east coast of Peninsular Malaysia. It is bordered in the east by the South China Sea, giving it a coastline spanning nearly 224 kilometres, with many white sandy beaches.



See sea turtles start their journey from egg to ocean – a simple, unforgettable experience by the shore

Favourite Spot for Nesting

One of the beaches is located at Rantau Abang, a small village 80 kilometres away from Kuala Terengganu. The beach has become a favourite spot for the turtles to land and nest.

Rantau Abang beach has been known as one of the best places in the world for leatherback turtle nesting since the 1960s. Tourists have herded the beach to get a closer look at the giant turtles with the scientific name *Dermochelys coriacea*. Leatherback turtles are named for their shell, which is leather-like rather than hard like other turtles.

In the 1980s, the state government made sea turtle watching more accessible to the general public, resulting in an influx of tourists from all over the world who are eager to look up close these critically endangered animals.

A government reserve for hatcheries was established to allow hawkers to set up kiosks and capitalize on the turtle obsession by the public.

The locals have their own version of why the leatherback turtles would only come to nest at Rantau Abang beach. The turtles are said to be attracted by a mysterious stone on a little hill at a village off the coast. The stone, called Batu Penyu, which means turtle stone, is also popular among tourists.

In some parts of the world, turtles are revered and respected, so there are many stories and folklore involving the unique sea creatures. In Terengganu, some turtle-related stories have been passed down from a generation to another throughout the years. For example, the number of sea turtle nests and eggs produced during a season can be estimated by the elderlies based on the number of coconuts produced.

Modern science can now explain this by linking the effects of La Nina and El Nino, the hot and cold climate patterns, to the ocean's annual productivity. The higher the ocean's productivity is during La Nina, the higher the number of sea turtle eggs produced.



Swimming alongside friendly turtles in Teluk Dalam, Pulau Redang – a dreamy adventure for ocean lovers!

A Boost to State's Tourism Sector

The presence of turtles has been a boost to the state's tourism sector. Tourists would come to Terengganu to have a personal connection with these iconic species, making tourism one of the main contributors to the state's economy.

In addition to turtle watching at Rantau Abang beach, there is also a new attraction at Redang Island marine park reserve. At Teluk Dalam, located at the northern end of Redang Island, visitors are offered an experience not found elsewhere, that being swimming or snorkelling with sea turtles, and feeding them. During public holidays, countless tourists take resort packages or come for a day trip from the mainland jetty.

As the number of tourists with interest in sea turtles continue to rise, it is significant to recognize the importance of conservation efforts to protect these wondrous animals and the habitats in which they live.

The International Union for the Conservation of Nature (IUCN) has determined that six of the seven different species of sea turtles are currently classified as either endangered or critically endangered globally. Hence, it is necessary to safeguard these beautiful animals and their homes.

Terengganu's turtle-based tourism has undoubtedly led to a significant boost in the state's economy. Yet, most of the hazards posed to the animals and tourists' interactions with the sea turtles are potentially devastating. Tourists can cause many risks by feeding the turtles and snorkelling, which can lead to turtles' habitat destruction.

We know that sea turtles typically migrate, but at Teluk Dalam, roughly 12 juvenile green turtles reside there. It is unknown yet the effects of feeding and swimming with the sea turtles, as this is a newly emerging tourism product.

Initiative by UMT SEATRU

In response, the Sea Turtle Research Unit (SEATRU) of UMT's Institute of Oceanography and Environment has taken the initiative to begin assessing the health conditions of the sea turtles that roam around Teluk Dalam at Redang Island.

The research entails several activities, such as exterior examination, measuring of body size and weight, and blood collection for conducting a health analysis.

The Chagar Hutang Turtle Sanctuary is another noteworthy attraction at Pulau Redang. Several scientific discoveries have been made at this research facility. The sanctuary is an example of how preserving sea turtle nesting grounds may provide educational opportunities for the surrounding communities, encouraging a more environmentally responsible behaviour.

At the sanctuary, a dedicated area for learning about turtle science has been created. Tourists may consider going to the national science gallery, a turtle science gallery in a natural setting. A science communicator will walk the visitors through the entire exhibition. Tourists can also participate in nest analysis alongside the turtle rangers. One of the highlight moments is when visitors have the opportunity to hold the newly hatched baby turtles in the nest.

The public can gain extra experience by enrolling in a one-week volunteer programme and interacting with sea turtle biologists at this research station. Regardless of their background, people can serve as turtle rangers. They will create a once-in-a-lifetime memory of doing night-time beach patrol, measuring nesting mothers, watching thousands of sea turtle babies crawl down the beach, and participating in leisure activities with newly met volunteer friends.

The sea turtles have always been associated with Terengganu and have played an important part in making the state one of the preferred holiday destinations. The presence of the unique creatures on its beaches has allowed Terengganu to offer an extensive range of sea turtle experience tourism products, providing income for the state as well as the locals.

For as long as the turtles choose to come ashore in Terengganu, there will be visitors flocking the beaches, to witness something not easily found elsewhere—the sea turtles laying their eggs. ♡



SEATRU connects with the community to protect sea turtles and their habitats through the Public Viewing Lab



Turtle Lab



SEATRU connects with the community to protect sea turtles and their habitats through the Outdoor Classroom



Science corner at Chagar Hutang



UMT-MMS Sea Turtle Conservation Programme

RM880

Cost including volunteer t-shirt, certificate, facilities, foods, accommodation at Chagar Hutang, and return boat transfers to Redang Island

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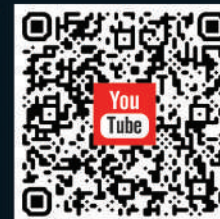
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