INOS

INSTITUTE OF
OCEANOGRAPHY
AND ENVIRONMENT

Envision Marine Future

VISION

through oceanography

INOS aspires to achieve scientific excellence by providing ocean solution through scientific research that combines new technology and innovative approach that will leads to new understanding of the complex and constantly changing marine ecosystems.

HICOE

UNIVERSITI MALAYSIA TERENGGANU

UMT

DRONES

*changing the way we understand our oceans*

By Assoc. Prof. Dr. Aidy M Muslim
(Head of Remote Sensing Group)

Mapping ocean environments is an essential activity to help understand their health and monitor changes related to environmental drivers. In order to efficiently manage and protect critical ecosystems detailed information on distribution, extent and health of the environment is required. Large-scale studies on ecosystems such as corals reefs and their ecological communities require a satellite or airborne images with an excellent spatial resolution. This remote sensing approach is the process of detecting and monitoring the physical characteristics of the earth at a distance (typically from satellite or aircraft). Special cameras collect images, which help researchers "sense" things about the earth. Unmanned aerial vehicle (UAV)/ Drones is characterized by better spatial, temporal, and radiometric resolution than any airborne or satellite platform. Thanks to rapidly improving technology, durability and artificial intelligence, these unmanned systems also show significant promise in the field of ocean research. Researchers can save significant time and resources by collecting data, mapping and monitoring vast areas of ocean. Consumer UAV is equipped with standard RGB cameras capturing visible light which are for videography and capturing images. Research purposes require more diverse and sensitive sensor capable of capturing various data at different wavelengths. Technological advancement and miniaturization of sensors have enabled previously bulky sensors to be fitted on UAV's opening various research possibilities such as benthic, coastal and bathymetry mapping. Currently, various Multispectral, vision, LiDAR and photogrammetry camera sensors are commercially available.

WHAT YOU'LL FIND INSIDE:

CAN DRONE HELP US SAVE THE OCEAN?
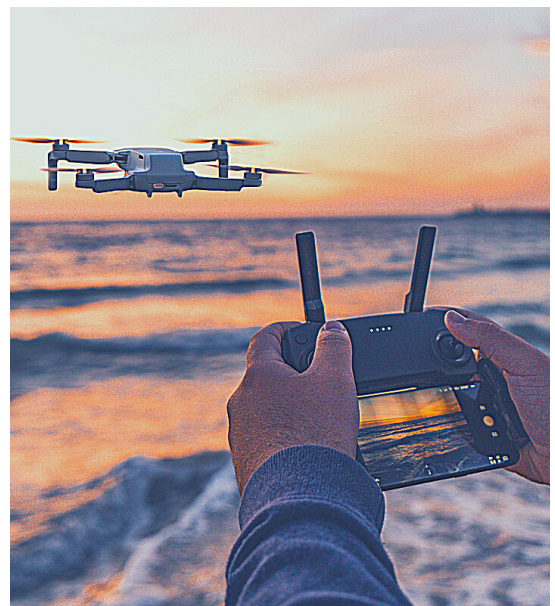
Can drone help us save the ocean?

The UAV team at the Institute of Oceanography and Environment (INOS) was established in 2015 with the idea of exploring potential applications, especially in the field of marine sciences. It all started with the purchase of a DJI Phantom 2 drone, and this has since been expanded to also consist of DJI Matrice 100, Foxtech VTOL and Tarot X4 960 Carbon Fiber quadcopter. To enable scientific data collection INOS has acquired several Multispectral cameras which includes Micasense RedEdge and MAPIR3 survey. Using these INOS has embarked on various projects amongst them Coastal erosion studies, Coral habitat mapping of various marine parks, 3D Mapping, Mangrove classification and bathymetric studies. Even though INOS has mostly focused on research activities, we also embark on consultancy and collaborative projects. Amongst our collaborators are The Department of Marine parks Malaysia, Department of Mineral and Geoscience Malaysia and local authorities.

To enhance capacity and promote the application of UAV technology, the team has conducted training to various government and private agencies on the basics, operational and research aspects of UAV. These initiatives hopefully, will ncourage and expose users to the capabilities and advantages of UAV in enabling better environmental monitoring.

With further advancement in UAV technology and reduction in cost, we believe its application is limitless. Increased flight time and better sensors will enable users to cost-effectively and continuously monitor our environment. In short, UAV is fundamentally changing the way we monitor and manage our environment.
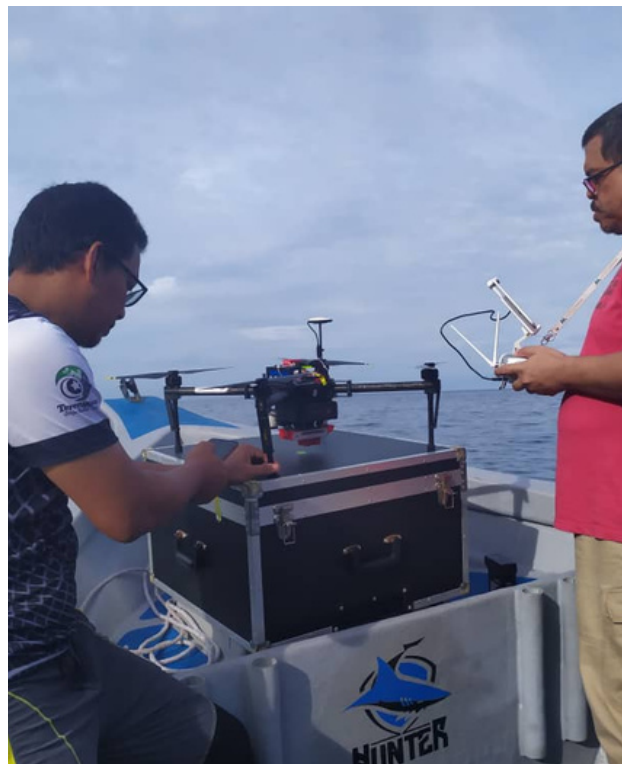
"Drone through ocean!"

COVID-19:

THE OCEANS TURN BLUER SINCE GLOBAL LOCKDOWN

By Assoc. Prof Dr. Mohd Fadzil Akhir (Director INOS)

The beach is about 1 km away from my home, and when the movement control order (MCO) eased some of its restrictions, I decided to go for a walk along the beach. I could not stop noticing something different as I enjoyed the morning breeze. There was very little debris scattered around.

Walking along the beautiful and white sandy beach always sounds inviting, but it used to be a little stressful especially when you were welcomed by plastics and rubbish. But this time around, the beach is cleaner. And that morning, I couldn't stop smiling all the way home.

There are many reports citing the same observation around the world. The vibrancy in which the planet has responded to the global lockdown, has revealed how quickly nature can recover if given a break. In some reports, people were surprised when they observed clearer water at the coast.

In the US, a team of scientists conducted a water quality analysis in one of the areas of waterways that were usually occupied with visitors. They were pleasantly surprised with what they discovered. It seems that some of the water quality has rebound exceptionally quickly.

In our region, less tourists means more turtles land on the beach to hatch. There were reports of increased endangered leatherback turtles nest discovered in Phuket. It records the highest number of nests in 20 years. Lowlights and less human disturbance somehow attract more turtles to land.

Similar pattern of higher turtle landing can be observed in Redang Island especially at Universiti Malaysia Terengganu Turtle Hatchery at Chagar Hutang beach. Here, we practice total silence and lights-off during night time and it has been proven that turtles prefer a quieter and beach without human disturbance.

It is not only ocean, rare aquatic species also enjoy cleaner environment. Asian small otter, an endangered species was also spotted at Putrajaya Lake recently. Otters are a protected species under Malaysian Law, and the numbers are decreasing because of human activities prior to COVID-19. This is another sign of cleaner nature.

With so many good things happening around our ocean now, it reflected the severe condition of our marine environment prior to COVID-19. We cannot deny the fact that it is all because of us; human.

A dreadful downside that we should be reminded is that around eight billion kilograms of plastic garbage enters our oceans each year. Other than affecting the life of marine animals, these plastic breaks up into smaller pieces, absorbing toxins along the way and getting eaten by marine animals. Ultimately these micro-plastics and toxins end up in the seafood on our plates.

Additionally, the ocean is in a deeper problem when we put in the rampant overfishing, pollution and coastal destruction into the equation. Humanity has inflicted severe damages on the oceans for centuries. This is even worse with the escalating climate crisisthat we are facing now.

"Have a heart like a deep ocean of secrets"

However, when the world was on a standbstill during MCO, it offers a glimpse of hope. The good sign is, with the resurgence of the world ocean so rapidly, it shows that with the right environmental mindset and action, it is possible to improve the health of our ocean.

Last April In the midst of COVID-19 lockdown, a group of European scientists published an interesting article in Nature journal claiming that the glory of our oceans could be restored within a generation with better knowledge and practice. The thorough systematic journal reviews observed that with systematised environmental management protocol, incredible improvement can take place in the ocean.

Of course this is a grand challenge. Such effort requires protection of large swathes of ocean, sustainable fishing and pollution controls and it might cost billions of ringgit. But one overarching message we can learn from the study is, if we stop and improve what we are doing now, we can turn the oceans around and it will come back to serve human wellbeing.

COVID-19
THE OCEANS TURN BLUER DURING THE GLOBAL LOCKDOWN

June is a special month for ocean. In this month alone we celebrate many facet of ocean related day, these include; World Ocean Day (June 8), Coral Triangle Day (June 9) , Sea Turtle Day (June 16)and World Hydrography Day (June 21). These are parts of the global effort to bring awareness regarding the responsibility of human in protecting our oceans. We hope to inform the public of the impact of human actions on the ocean and unite the world's population to come together and do something about our ocean.

The post-pandemic world will see plentiful blue oceans everywhere, let's hope this is the best time to reboot our ocean. Let's bring back the bluer and clearer ocean that we lost.

The article was first appeared on The New Strait Times, on the 24th of June 2020.

SOUTH CHINA SEA REPOSITORY AND REFERENCE CENTRE
(WHAT WE DO WITH 20,000 SPECIMENS?)

By Dr. Izwandy Idris (Head of Repository and Reference Centre)

The South China Sea Repository and Reference Centre (RRC) is akin to a natural history museum, except marine and aquatic organisms are the main focus in RRC. We received specimens collected in Malaysian seas by anyone. Nonetheless, we do not merely receive all specimens. Specimens (several individuals of the same species) that were accepted and deposited at RRC must have scientific values. For examples, new species in science or species from the area that have low information of its diversity or poisonous species like jellyfish, fireworms and crown of thorn. At present, we have more than 20,000 specimens from all over Malaysia. After a specimen was deposited at RRC, it will be assigned a 'Specimen Reference Number' (ID number) and all necessary data will be recorded in the database. All specimens then will be kept either in preservation solution (alcohol) or properly dried and then sent to one of our collection rooms. Periodically, specimens will be checked their condition to make sure they are in good condition. Specimens in the collection can damage because of fungi that growth due to humidity.

Specimens in RRC represents the diversity of marine life in Malaysia, and serve as physical pieces of evidence that these organisms ever exists. These specimens can further be accessed by future researchers to check the validity of the identification and used as references to similar organisms found in other areas. Moreover, specimens deposited can be used to determine possible alien or invasive species, used as bio-indicator or have economic potential for the nation. Some species, for example, cone shell is poisonous to human, but the venom can be used for treating pain. However, only certain cone shell has these abilities. Hence, specimens of cone shell in the repository can be used to differentiate of which cone shell is dangerous or benefited to human.

BRIEF OVERVIEW OF MACHINE LEARNING IN OCEANOGRAPHY

BY DR. ANKITA MISRA (POST-DOCTORAL RESEARCHER)

Oceans cover more than two-thirds of the globe, and the marine environment and ecosystems pose substantial global challenges that the oceanographers and researchers seek to address. The UN sustainability goal 14 clearly states the necessity for the sustainable development of the oceans and seas. The main aim of this article is to introduce marine science students to the fascinating world of machine learning that can help them solve oceanographic problems at all levels.

Typically, ocean science has its limitations and setbacks in terms of data collection at vast spatial and temporal scales, and in areas which are often remote or dangerous to access. Marine observations are constrained by sampling rates, while ocean models are restricted by the finite resolution and variables related to fluid dynamics. Techniques are required to extract information, extrapolate, or upgrade existing oceanographic datasets, to represent unexplained physical and biological processes. Machine learning (ML) approaches improve time series data by filling data gaps, correcting conflicting observations, biases and building better models than the existing ones. For example, in recent times, The Global Argo Observations system that includes 4000 widely distributed autonomous platform which generates enormous physical, biological and geochemical data crucial to understanding marine properties. Similarly, recent technological advances in instrumentation and computation allow researchers to collect large amount of data at varied scales.

Machine learning includes multiple algorithms, techniques and methodologies, which can be used to build efficient models to solve real-world oceanographic problems using such these datasets. Machine learning algorithms are designed to learn from the input datasets and make an accurate prediction about independent outputs. The primary advantage of the ML method over the conventional methods is that it can construct models, which are highly dimensional, nonlinear and have inherent complexities.

Oceans cover more than two-thirds of the globe, and the ML algorithms can be classified into 3 main types, (1) supervised learning, that uses the input data to find relationships that successfully derive outputs and is further divided into 2 major categories, classification and regression ; (2) Unsupervised classification, which involves machine training based on the similarities, patterns and trends existing in the data without any guidance and is categorized into clustering, dimensionality reduction c. anomaly detection; (3) Reinforcement Learning, wherein the agents learn the behaviour of the data intuitively and by checking the results.

These algorithms require a good knowledge and background of the nature of data and excellent computational skills. However, in recent times, software like Matlab or open-source software like Python and R present great opportunities for early career researchers to build efficient ML models that can be used to study the various ocean phenomenon.

Cooperation with the UK for Microplastics monitoring

The Malaysian Microplastics Network (MyMiP) has been established by INOS, UMT with few researchers from Swinburne University of Technology Sarawak Campus, Universiti Kebangsaan Malaysia, Universiti Putra Malaysia and other NGOs. The MyMiP is part of the GCRF Global Research Translation Awards (GRTA) awarded to University of East Anglia under the project title "Meeting the SDGs: creating innovative infrastructures and policy solutions to support sustainable development in Global communities (GS-DEV)" funded by the United Kingdom Research and Innovation (UKRI).

The aim of the GTRA project is to build up microplastics monitoring capacity in Malaysia and to map microplastics contamination levels across this country. This project also aims to educate the community in reducing the single plastic used and to influence evidence-based policy decisions on waste management and strategy.

ERASMUS+ funding for innovation in teaching and learning

Marine Coastal and Delta Sustainability in Southeast Asia (MARE) is a project design to promote sustainable governance & management of coastal, delta & marine systems ICT-enhanced tertiary education. The project is funded under the ERASMUS+ grant scheme, where INOS is part of this 13 institutions partnership to work together under this cooperation. This venture is a 4-year project that focuses more on how to enhance and improvise current practice in teaching and learning in marine science. The MARE project will develop an e-learning system to enable sharing and dissemination of learning contents across the project network; series of webinars for master's and PhD students will be piloted and arranged as regular events; interactive e-courses with case studies' collections will be developed for each of the priority areas.

WOW 2020: Engaging the public on ocean awareness

June is always a busy month for INOS. This programme is a time of the year almost every single person in INOS works hand in hand to engage the public on ocean awareness program. Last year almost 1000 of the local community join our program at Tok Jembal in a variety of events. We looked forward to this year event and wanted things to be more meaningful and engaging even more people into our program. Nonetheless, the COVID-19 pandemic and the MCO has challenged us to rethink our approach.

June 8th is World Ocean Day every year. World Oceans Week (WOW) has been celebrated as an annual event for UMT since 2013. Nevertheless this year we conduct the program 100% online. Various activities take place from June 8 to June 18. The activities of WOW 2020 we set to fit different age of our community members. WOW is known as a medium for INOS to connect with the community and share about oceans and its importance.

Our slogan this year is; "WE CARE FOR OUR OCEANS" "KITA JAGA LAUT KITA"

The highlight of WOW this year is the main event which was held on 14th June 2020 (Sunday) where we have organized three hours live Facebook programme consists of three unique segments live streaming to the public. This programme includes;

LIVE 1 : "KE SANA KE SINI" DISCOVERING OUR OCEANS

This segment is the cross over interview session to multiple INOS researchers' location doing their scientific research works live telecast on board from UMT's Research Vessel, the coastal area along UMT beach, hatchery and laboratories. We share information on laboratories and equipment we use in INOS, and why it is crucial for oceanography study.

LIVE 2 : OUR OCEANS FRONTLINERS

Next is Forum on Oceans with our front liners and ocean icons. We engaged with the Ministry of Environment and Water and the ViceChancellor herself as a prominent champion of ocean issues in the country. Two of our alumni who are now working with NAVY under Paskal unit and MMEA also shared their experience being in the frontline of our oceans. Last but not least Terengganu Tourism Ambassador, Mat Dan shared a very wonderful insight on his experience being an ocean person when he decided to spend his life here in the coastal state of Terengganu.

LIVE 3 : WE CARE OUR OCEANS

This segment is the prize giving session for Drawing Competition and 1 Minute Video Competition. We celebrated the winner of the competition and the highlight of this event was the Winner for Video Competition that goes to a 12 years old girl, Rania Elyssa Zyree bt Muhammad Zaire from Bangi, Selangor. We talked to her and her parents to discover her passion for video editing and environmental awareness. The whole program will not become a reality without the support from our Media Kreatif team that help us throughout the entire event. The setting up of green screen studio, Facebook live preparation, live telecast from the lab and RV Discovery, all of it require significant technical capabilities, and the team have shown their professionalism and passion. Thank you to all that make this event possible.

Let's take care of our oceans.

GET PUBLISHED IN 'NATURE': VALUABLE EXPERIENCE PAIRING WITH A GROUP OF OUTSTANDING SCIENTISTS

By Mr. Mohd Safuan Che Din (PhD Candidate)

POSTGRADUATE ADVENTURE

Getting publish in a NATURE journal is a dream of many academician. It is something that I never thought to achieve during my postgraduate study. Being part of the co-author with top researchers from around the world and publishing in a well-known and high impact journal, is an experience that must be shared. I am hoping that this story will encourage other postgraduate to publish his/her research.

In brief, I am a postgraduate student in Institute of Oceanography and Environment (INOS), doing a PhD in coral ecology. I was grateful to be a postgraduate in INOS as I can proactively engaged in many research activities and get to know many researchers. Through this, I also got the opportunities to do some data collection related to coral reefs.

Back in 2015, Dr James Tan Chun Hong introduce me to Emily Darling (main author) from Wildlife Conservation Society which interested to compile the coral community database from the Indo-Pacific reefs. We decided to be part of the team and with other scientists from international universities, NGOs and government agencies from 51 countries to compile the data.

Working with researchers from all around the world is the first experience in my life. Email and 'Google document' were the medium used to connect each other. Reviewing the manuscript is like going to 'night market' as all 81 co-authors put their efforts in refining the manuscript. Working together with the top scientists that you commonly cite their papers were something quite extraordinary to me. Their ideals is totally mind blowing and I learnt a lot from them.

I believed having the largest dataset of coral community in the world would be an easy job to get publish in a high impact journal. But, things not going smoothly as expected. Our paper got rejected twice by the other high impact journal. But, we did not stop here. By using the criteria suggested by the previous journal and refinement of the manuscript, finally, the manuscript got accepted and published in the Nature Ecology and Evolution. It took us almost four years to publish this paper. The manuscript entitled "Social-environmental drivers inform strategic management of coral reefs in the Anthropocene", describing the coral abundance data in 2584 Indo-Pacific reefs and evaluate the impact of climate, social and environmental drivers to the ecology of coral reefs.

"Alone we can do little but together we can do more!" Making a publishable paper especially in a high-impact journal is not a one-man show. Opportunity to collaborate with other researchers is something that we should grab in order to learn new things beyond our expertise and knowledge. Apart from that, support from others especially supervisor will encourage you to keep on digging your research and make it publishable. Therefore, I would like to take this opportunity to thanks to Prof. Dr Zainudin Bachok who is the backbone of my research and special thanks goes to my beloved wife, families, as well as friends for their endless support. THANK YOU!

Keeping up with Online Viva

Due to the COVID-19 -Movement Control Order (MCO) UMT has issued a Learning and Teaching Action Plan with regards to the MCO. All viva-voce examination sessions for Masters and PhD program must be conducted online starting 15 April 2020 with the presence of all examination committee. During the period we manage to conduct 5 viva session with examiners coming from all over the world. A new experience that was both challenging and exciting. Congratulations to all, especially the candidates who passed their viva in a very different way

Prime Minister has announced the Movement Control Order (MCO) commencing on 18 March 2020

MERCURY CONTAMINATION IN MATANG MANGROVE FOREST, PERAK

PAPER HIGHLIGHTS

We recently published a fascinating finding of the presence of mercury in Matang Mangrove Forest, the largest mangrove area in Malaysia covering more than 40,000 hectares in the state of Perak. This finding was published in the Journal of Hazardous Materials (2020) entitled Distribution of mercury in sediments, plant and animal tissues in Matang Mangrove Reserve, Malaysia'. This research is part of our collaboration with Universite Libre de Brusslles, Universiti Firenze Italy and Vrije Universite Bruselles.

Mangrove ecosystems receive waste from domestic, agriculture and industrial sectors that may contain Hg pollution. Meanwhile, the charcoal production adjacent to mangroves also emit volatile compounds like Hg back into the ambient environment. Being the fact that Matang Mangrove Forest Reserve (MMFR) in Sate Perak, Peninsular Malaysia is under silvicultural management for Rhizophora poles/charcoal production (since 1902), the present study observed [Hg] in plant and animal tissues.
including surface sediments.

These are some of the highlights from the research finding;
- The study suggests that Rhizophora roots allow no/limited uptake and translocation of [Hg] into the plant's body.
- Higher [Hg] in leaves was due to atmospheric deposition
- Mangrove sediments in the MMFR are still unpolluted with reference to [Hg].
- Mangrove cockles from Kuala Sepetang also indicated no human health risk in term of [Hg].