THE 3RD TROPICAL OCEAN AND MARINE SCIENCES INTERNATIONAL SYMPOSIUM

TOMSY2022

ABSTRACT BOOK

Ocean Research for a Sustainable Future

6 & 7 NOVEMBER 2022
UMT Convention Centre

OfficialUMT

Terokaan Seluas Lautan, Demi Kelestarian Sejagat | Ocean of Discoveries for Global Sustainability

Partners

Co-funded by the Erasmus+ Programme of the European Union

WELCOMING NOTE

Prof. Dato` Dr. Mazlan Bin Abd Ghaffar, FASc.
Vice Chancellor
Universiti Malaysia Terengganu

Assalamu'alaikum wbt and Greetings ,

It gives me great pleasure and honour to launch today, 6 November 2022, the 3rd Tropical Ocean and Marine Sciences International Symposium (TOMSY2022), with the theme 'Ocean Research for a Sustainable Future', organised by the Institute of Oceanography and Environment (INOS), Universiti Malaysia Terengganu (UMT).

Firstly, I would like to personally thank you for your participation in this fruitful symposium. I believed your years of research, your depth of understanding that shared during the presentation are inspiring all the audience of the 3rd TOMSY 2022.
The theme of this symposium is 'Ocean Research for a Sustainable Future''. I believed, the theme of this symposium did inspire us to reach the agenda in SDGs or known as Agenda 2030, especially on SDG 14 which underpins the aim "to Conserve and sustainably use the oceans, seas and marine resources for sustainable development".

Universiti Malaysia Terengganu (UMT) as a Higher Institution of Learning with Education and Research excellence in Malaysia, reaffirmed on our policy and strategic mission on ocean of discoveries for global sustainability as the DNA and catalyst towards achieving the UN Ocean Decade of Science 2030; the Science we need towards the Ocean and Future we want.

TOMSY2022 addresses wide-ranging and very interesting multi-disciplinary topics. Our keynote speaker is Prof. Dr. Biswajeet Pradhan, Director of Centre for Advanced Modelling and Geospatial Information Systems (CAMGIS), University of Technology Sydney, Australia. We are also fortunate to have Dr Salvatore Aricò from UNESCO's Natural Sciences Sector, Prof. Shing Yip (Joe) Lee from The Chinese University of Hong Kong, Mr. Mirza Hamza from Hidrokinetik Group and Professor Dr. Wan Izatul Asma Binti Wan Talaat from UMT.

Indeed, I am proud to say that as the High Centre of Excellence, the Institute of Oceanography and Environment (INOS) aspires to achieve scientific excellence by providing ocean solutions through scientific research that combines new technologies and innovative approaches. As an Institution of higher Learning, INOS also plays a role in capacity building and co-management through partnerships, which is becoming more significant during this challenging time. Again, INOS continued to be part of IOC UNESCO Ocean Teacher Global Academy for the project's second phase. Through OTGA, INOS will contribute to the implementation of SDG14 as its central aim by developing training packages that will support all Member States in addressing the challenges in implementing SDG14.

Finally, let us all work together to preserve our marine ecosystem for future generations while simultaneously creating good synergy between academia, industry, government and society and enhancing our international networking.

Wabillahi al-taufiq wal hidayah wassalamu'alaikum wa rahmatullahi wabarakatuh.

Thank you.

MESSSAGE

Prof. Gs. Ts. Dr. Aidy @ Mohamed Shawal bin M. Muslim

Chairman of TOMSY 2022

Universiti Malaysia Terengganu

Assalamu'alaikum wbt and Greetings ,

Welcome to TOMSY2022

First and foremost, as Chairman of the 3rd Tropical Ocean and Marine Sciences International Symposium (TOMSY2022), I have the honour to welcome you on behalf of the Organising Committee and Institute of Oceanography and Environment, Universiti Malaysia Terengganu. I would also like to extend our utmost gratitude for giving us your full support by participating in this Symposium. This year we are returning to normalcy after virtually hosting TOMSYS 2020 due to the pandemic.
I wish to express our appreciation to our partnersthe sponsors, Institute of Oceanography and Maritime Studies (INOCEM), International Islamic University Malaysia and Marine Coastal and Delta Sustainability for Southeast Asia of this conference for their engagement and financial assistance.

Since the coronavirus spread worldwide from 2019 to 2021, many scientific conferences were conducted either fully or partially virtual. Alhamdulillah, this year, we are finally able to meet each other for this scientific Symposium.
TOMSY is a platform that brings together leading academicians, researchers and scholars to exchange and share their experiences and results about all aspects of Ocean and marine sciences, especially in tropical areas. Scientists, not only from Malaysia but also from around the world, have come to this event to share and discuss their current research and interest.

This year's TOMSY2022 theme is 'Ocean Research for a Sustainable Future', focussing on the essential roles of the Ocean and its resources in contributing to our lives and the ecosystem. Our future generation must be given the same opportunity to live in a healthy environment and to enjoy the Ocean and its resources. This is a collective responsibility that we must not betray.

With this last remark, I hope this conference will help expand our knowledge in Marine Science and related fields, Thus contributing immensely to the betterment of the marine environment. This is in line with the goals of The United Nations Decade Of Ocean Sciences For Sustainable Development. On behalf of INOS and UMT, I would like to also thank the Organizing Committee and those involved with this Symposium.
Last but not least, I wish everyone a successful symposium.

Wabillahitaufik walhidayah wassalamualaikum warahmatullahi wabarakatuh.

Thank you.

WHAT IS TOMSY 2022?

OBJECTIVES

This symposium aims to bring together leading academic scientists, researchers, and research scholars to exchange and share their experiences and research results about all aspects of ocean and marine sciences especially in the tropical areas.

THEME

Ocean Research for a Sustainable Future

SUB-THEME

- Ecological Resilience
- Biology of Fishes
- Marine Engineering and Technology
- Satellite Oceanography
- Marine Pollution
- Ocean Governance
- Marine Coastal and Delta Sustainability for Southeast Asia
- Coastal Geomorphology
- Coastal and Shelf Seas Dynamics
- Ocean Literacy

Contents

Welcoming Note

Vice Chancellor, Universiti Malaysia Terengganu i

Message

Chairman TOMSY2022 ii

What is TOMSY2022 iii

Organizing Committee iv

Keynote and Plenary Speaker v

Program Summary vii

Pre-conferece Workshop ix

List of Oral Presentation Session 1

Title and Abstract 7

Advertisement 83

Sponsor 85

Partners 86

Organising Commitee

Patron
Prof. Dato' Dr. Mazlan Bin Abd Ghaffar, FASc.
Vice Chancellor, Universiti Malaysia Terengganu

Advisor
Prof. Chm. Dr. Marinah Binti Mohd Ariffin
Deputy Vice Chancellor (Research and Innovation)

Prof. Ts. Dr. Mohd Fadzil Bin Mohd Akhir
Director, Institute of Oceanography and Environment

Chairman
Prof. Gs. Ts Dr. Aidy @ Mohamed Shawal Bin M Muslim

Secretariat
Encik Mohd Zulkamal Radzi (Head)
Encik Mahamad Nasir Abdullah
Puan Nurul Hidayah Mat Zaki
Cik Rafidah Taha
Puan Nurhayati Mat Semawi
Encik Johari Mohamed Lela

Scientific Committee
Assoc. Prof. Dr. Mohd Uzair bin Rusli (Head)
Dr. Nazli Aziz
Assoc. Prof. Dr. Amin Beiranvand Pour
Dr. Mohamad Shawkat Hossain
Dr. Siti Tafzilmeriam Sheikh Abdul Kadir
Dr. Mohd Safuan Che Din
Encik Joseph Anak Bidai
Cik Nurzuhrah Binti Hassan

Promotion and Multimedia
Encik Mohd Azam Yaakob (Head)
Encik Muhammad Izuan Nadzri
Encik Ahmad Fakhrurrazi Mokhtar
Puan Noratikah Ab. Manaf

Bursary and Sponsorship
Encik Subarjo Merehojono (Head)
Puan Zuhaini Ali
Puan Norita Abdul Shukor

Logistic and Transportation
Encik Shukri Arsad (Head)
Encik Azri Muhamad
Encik Che Mohd Kamarul Anuar Che Abdullah
Encik Mohd Nasir Mohamad
Encik Ahmad Nazila Ali
Encik Abd Hafiz Zakari
Encik Tan Hock Seng

Protocol and Invitation Committee
Cik Azida Abdullah (Head)
Puan Nor Suhaila Mat Hassan
Cik Nur Faizah Muhammad
Puan Nor Hazinah Asbar

Banquet Committee
Puan Rosfazila Bakar (Head)
Encik Johari Mohamed Lela
Puan Zuhaini Ali
Encik Roslan Latif

Keynote Speaker

Plenary Speaker

Programme Summary

DAY 1 (Sunday, 6th Nov. 2022)

Time	Details		
0840 - 0900	Registration		
0900 - 0940	**Plenary I[##] - Mr. Mirza Hamza,** Technical Director at Hidrokinetik Group *"Industry and University Collaboration: How Partnership Drives Innovation"*		
0940 - 1030	**MARE Round Table Discussion[##]**		
1030 - 1050	Refreshment		
1045 - 1100	Arrival of VVIPs		
1100 - 1300	**Opening Ceremony[#]**		
1100 - 1110	National anthem, Prayer recitation		
1110 - 1120	Welcoming Speech by Prof. Gs. Ts. Dr. Aidy @ Mohamed Shawal bin M. Muslim, Chairman of TOMSY2020		
1120 – 1130	Welcoming Speech by Prof. Ts. Dr. Mohd Fadzil bin Mohd Akhir, *Director of Institute of Oceanography and Environment*		
1130 - 1145	Officiating Speech by Prof. Dato` Dr. Mazlan Bin Abd Ghaffar, Vice Chancellor of Universiti Malaysia Terengganu		
1145 - 1150	TOMSY Montage Presentation by INOS		
1150 - 1155	Introducing Keynote Speaker by Prof Aidy Muslim		
1155 – 1230	**Keynote Address[#] by Prof. Dr. Biswajeet Pradhan,** University of Technology Sydney, Australia *" Machine Learning and Spatial Intelligence in Urban and Coastal Applications"*		
1245 - 1300	**MOA Document Exchange Event between UMT and Hidrokinetik Technologies Sdn. Bhd.** Photo Session		
1300 - 1400	Lunch Break		
1400 - 1550	Session 1A[###] *Ecological Resilience* MB_ECO1-8	Session 1B[#] *Biology of Fishes* MB_FISH1-8	Session 1C[####] *Marine Engineering and Technology* MET1-7
1600 - 1640	**Plenary II[#] - Dr. Salvatore Aricò,** (Senior Programme Specialist for Biodiversity Assessments and Inter-Agency Coordination, UNESCO's Natural Sciences Sector) *"Not just ocean research, but also ocean policy - for a sustainable future"* ***Webex*** ***Link:*** ***https://umt.webex.com/umt/j.php?MTID=m6e1850ccf11065a48f527297b082b275***		
1640 - 1700	Welcoming Hi-Tea		

Venue: [#]*Dewan Persidangan 2;* [##] *Dewan Persidangan 3;* [###] *Bilik Seminar 1;* [####] *Dewan Seminar 1*

DAY 2 (Monday, 7th Nov. 2022)

Time	Details		
0900 - 0940	**Plenary III# - Prof. Shing Yip (Joe) Lee** (The Chinese University of Hong Kong) *"Mangrove microphytobenthos - a neglected driver of estuarine trophodynamics"* **Webex Link:** https://umt.webex.com/umt/j.php?MTID=m5a53c92c996217eba7a7eeed6d87983a		
0945 - 1120	Session 2A### *Satellite Oceanography* SAT1-7	Session 2B# *Marine Pollution I* MP1-7	Session 2C#### *Ocean Governance* OG1-7
1120 - 1140	Refreshment		
1140 – 1300	Session 3A### *Marine Coastal and Delta Sustainability for Southeast Asia* MARE1-7	Session 3B# *Marine Pollution II* POL1-6	Session 3C#### *Coastal Geomorphology* COAST1-7
1300 - 1400	Lunch Break		
1400 – 1440	**Plenary IV# - Prof. Dr. Wan Izatul Asma binti Wan Talaat,** Head of Centre for Ocean Governance, INOS. "The Role of Ocean Governance in Translating Science into Policies ~ Accelerating the National Delivery to the Ocean Decade"		
1445 – 1600	Session 4A### *MARE extended discussion room*	Session 4B# *Coastal and Shelf Seas Dynamics* COD1-7	Session 4C#### *Ocean Literacy* OL1-7
1600 - 1630	Refreshment		
1630 - 1700	**Closing Ceremony#**		

Venue: #*Dewan Persidangan 2;* ## *Dewan Persidangan 3;* ### *Bilik Seminar 1;* #### *Dewan Seminar 1*

UMT INOS

THE 3RD TROPICAL OCEAN AND MARINE SCIENCES INTERNATIONAL SYMPOSIUM

TOMSY2022

Pre-conference Workshop

05.11.2022 Saturday 2.00 - 5.00 pm

Prof. Dr. Biswajeet Pradhan
UTS, Australia

Title : Essential Tips for Publishing in High Impact Journals

Informatics Marine & Satellite Oceanography Laboratory (OSIM)

Prof. Ts. Dr. Mohd Fadzil bin Mohd Akhir
INOS

Title : Ocean Forecasts in Malaysian Waters through High Performing Computing

Ocean Modelling Lab

Prof. Gs. Ts. Dr. Aidy @ Mohamed Shawal bin M Muslim
INOS

Title : Environmental Monitoring from the Eyes of a Drone

Informatics Marine & Satellite Oceanography Laboratory (OSIM)

Dr. Nazli bin Aziz
INOS

Title : Simulation of Marine Spatial Planning (MSP) Implementation in Town Planning

Informatics Marine & Satellite Oceanography Laboratory (OSIM)

Ts. Dr. Azizi Ali
INOS

Title : Application of Underwater Acoustic Technology for Ocean Mapping Research

Ocean Modelling Lab

Dr. Maizah binti Mohd Abdullah
FSSM

Title : Stable Isotopes Approach in Trophic Ecology

Ocean Modelling Lab

LIST OF ORAL PRESENTATION SESSION TOMSY 2022						
No	**NAME**	**TITLE**	**ABSTRACT TITLE**	**INSTITUTION**	**EMAIL**	**ASSIGNED REF. NO. (SCIENTIFIC)**
SESSION 1A (Ecological Resilience)						
1	MOHAMAD SAUPI ISMAIL	MR	REEF HEALTH ASSESSMENT OF SEMBILAN ARCHIPELAGO, PERAK	FISHERIES RESEARCH INSTITUTE DEPARTMENT OF FISHERIES MALAYSIA	saupi@rocketmail.com	MB_ECO1
2	MEI LING KHOO	DR.	A CHECKLIST OF CORAL REEF FISHES AT PULAU SEMBILAN ARCHIPELAGO, PERAK	DEPARTMENT OF EARTH SCIENCES AND ENVIRONMENT, FACULTY OF SCIENCE AND TECHNOLOGY, UNIVERSITI KEBANGSAAN MALAYSIA, BANGI, SELANGOR, 43600	meilingkhoo@ukm.edu.my	MB_ECO2
3	NUR ARBAEEN MOHD JOHARI	MRS	COMMUNITY STRUTURE OF MACROFOULING ON "RIG-TO-REEF" ARTIFICIAL REEFS AT PULAU KAPAS WATERS, SOUTH CHINA SEA	UMT	arbaeenjohari@gmail.com	MB_ECO3
4	ZAINUDIN BACHOK	PROFESSOR	INFLUENCE OF SURROUNDING HABITAT ON THE FOOD SOURCES OF LONG-SPINED URCHIN, DIADEMA SETOSUM (LESKE,1778) AS INDICATE BY FATTY ACID MARKERS	INOS, UMT	zainudinb@umt.edu.my	MB_ECO4
5	AMIR SYAZWAN SHAWEL	MR.	INVERTEBRATES COMMUNITY AND ROLES AS AN ECOLOGICAL INDICTOR OF INTERTIDAL ECOSYSTEM IN TROPICS	IPMB, UMS	amir_syazwan_my21@iluv.ums.edu.my	MB_ECO5
6	NURULAFIFAH YAHYA	DR.	ORGANIC FOOD SOURCES OF MANGROVE CLAM, GELOINA EXPANSA (MOUSSON, 1849) IN THE MANGROVE OF SETIU WETLANDS, EAST COAST OF MALAYSIA AS INDICATED BY FATTY ACID MARKERS	INSTITUTE OF OCEAN AND EARTH SCIENCES (IOES), NO. C308, IGS BUILDING, CANSELERI UNIVERSITI MALAYA, WILAYAH PERSEKUTUAN KUALA LUMPUR, UNIVERSITI MALAYA	nurulafifah88@gmail.com	MB_ECO6
7	SURIYANTI SU NYUN PAU	DR.	VIBRIO ABUNDANCE IN RELATION TO PHYTOPLANKTON AND ENVIRONMENTAL PARAMETERS IN KEPULAUAN SEMBILAN PERAK	UKM	suriyanti@ukm.edu.my	MB_ECO7
8	NURUL FARHANA BINTI SANSUDIN	MS	ASSESSMENT OF SEROTONIN PRECURSORS AND SELECTIVE SEROTONIN REUPTAKE INHIBITOR (SSRI) FROM FLUOXETINE, TRYPTOPHAN, AND GLYCINE IN REDUCING CANNIBALISTIC BEHAVIOR AMONG HYBRID GROUPER (EPINEPHELUS LANCEOLATUS ♂) - (E. FUSCOGUTTATUS♀)JUVENILE	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	farhana.sansudin@live.iium.edu.my	MB_ECO8

SESSION 1B (Biology of Fishes)						
1	ZAIDNUDDIN ILIAS	MR	ESTIMATION OF PULAU PAYAR MARINE PARK CORAL REEF FISHES BIOMASS USING VISUAL OBSERVATION	FISHERIES RESEARCH INSTITUTE DEPARTMENT OF FISHERIES MALAYSIA	zainuddin01@dof.gov.my	MB_FISH1
2	MUHAMMAD AFIQ FIRDAUS AMINUDIN	MR	BASELINE STUDY ON CORAL REEF FISH IN PULAU KAPAS, TERENGGANU, SOUTH CHINA SEA	INOS, UMT	fiqdaus99@gmail.com	MB_FISH2
3	NOR HAZIRAH MOHD ZUKI	MRS.	ONTOGENY OF MALE PARROTFISH (SCARUS GENUS) MATURATION AT PULAU BIDONG, SOUTH CHINA SEA	INOS, UMT	norhazirahzuki@gmail.com	MB_FISH3
4	NURAIN NAZIRATUL AKMA BINTI MOHAMAD DAUD	MS	A PRELIMINARY STUDY ON FEEDING FREQUENCY OF CLOWNFISH (AMPHIPRION OCELLARIS) USING ARTIFICIAL FOOD	NATIONAL UNIVERSITY OF MALAYSIA	p105355@siswa.ukm.edu.my	MB_FISH4
5	MOHAMMAD FAIZ AHMAD	MR.	FISH COMMUNITY STRUCTURE AT RIG-TO-REEF (R2R) ARTIFICIAL REEF OFF PULAU KAPAS, SOUTH CHINA SEA.	UMT	mfaizahmad27566@gmail.com	MB_FISH5
6	SITI TAFZILMERIAM BINTI SHEIKH ABDUL KADIR	DR.	LENGTH-WEIGHT RELATIONSHIP OF 30 MOST ABUNDANT FISH SPECIES IN THE SETIU WETLANDS, TERENGGANU, MALAYSIA	INOS, UMT	sititafzil@umt.edu.my	MB_FISH6
7	MUHAMMAD AIMAN BIN MAS'UD	MR.	DO DEPTH OF DEPLOYING ARTISANAL FISH TRAPS AFFECT BYCATCH DISTRIBUTION IN BIDONG ARCHIPELAGO?	UNIVERSITI MALAYSIA TERENGGANU	aiman.masud6395@gmail.com	MB_FISH7
8	SAIFULLAH ARIFIN JAAMAN	ASSOCIATE PROF. DR.	CETACEANS OF THE LUCONIA SHOALS NATIONAL PARK (LSNP), OFFSHORE SARAWAK, MALAYSIA	INOS, UMT	saifullahaj@umt.edu.my	MB_FISH8
SESSION 1C (Marine Engineering and Technolog)						
1	SITI AYISHAH THAMINAH	MS	NUMERICAL MODELLING ON THE PERFORMANCE OF SUBMERGED BREAKWATER USING THE SPH-BASED DUALSPHYSICS MODEL	INSTITUTE OF OCEANOGRAPHY AND MARITIME STUDIES (INOCEM), INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA,KAMPUNG CHEROK PALOH, , KUANTAN, PAHANG, 26610	thaminah1997@gmail.com	MET1
2	NOOR ASIAH MOHAMAD	MRS	THE EFFECT OF ROCK ARMOUR THICKNESS ON WAVE OVERTOPPING PERFORMANCE AT COASTAL REVETMENTS	UNIVERSITI PUTRA MALAYSIA	gs59282@student.upm.edu.my	MET2
3	MD NIZAM BIN ISMAIL	MR.	SEABED MAPPING OF PULAU SONGSONG AND TUKUN TERENDAK, YAN, KEDAH	FISHERIES RESEARCH INSTITUTE (FRI) BATU MAUNG, BATU MAUNG, PULAU PINANG, 11960	nizam7402@gmail.com	MET3
4	WAN NUR KHAIRUNNISA WAN MAT NOR	MS	MARINE LANDSCAPE MAPPING USING 3D PHOTOGRAMMETRY AT KARANG TENGAH	INOS, UMT	p4503@pps.umt.edu.my	MET4
5	MUHAMMAD MAZMIRUL ABD RAHMAN	MR.	SENSITIVITY ANALYSIS AND APPLICATION OF XBEACH AT CHEROK PALOH BEACH, PAHANG, MALAYSIA	KULLIYAH OF SCIENCE, INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, KUANTAN, PAHANG, 25300	mazmirul.94@gmail.com	MET5
6	MUHAMMAD ABDUL HAKIM MUHAMAD	MR.	IMPLEMENTATION OF TILTED MULTIBEAM ECHOSOUNDER DATA AND RANDOM FOREST FOR SHALLOW WATER MARINE HABITAT MAPPING	UNIVERSITI TEKNOLOGI MALAYSIA	hakim1991@graduate.utm.my	MET6
7	BRYAN YONG	MR.	LARGE-SCALE CORAL REEF HABITAT SUITABILITY MODEL USING MARINE LANDSCAPE MAPPING TO SUPPORT EFFECTIVE ECOSYSTEM-BASED MARINE MANAGEMENT	UMT	bryanyong@live.com.my	MET7

SESSION 2A (Satellite Oceanography)						
1	MOHAMMAD SHAWKAT HOSSAIN	DR.	ANNUAL, MONTHLY AND SEASONAL PROBABILITIES OF ACQUIRING CLOUD-FREE AND LOW-TIDE LANDSAT OBSERVATIONS FOR MAPPING SALTMARSH LAND COVER OVER SOUTH-EASTERN BANGLADESH FROM 1980 TO 2019	INOS, UMT	shawkat@umt.edu.my	SAT1
2	MUHAMMAD IZUAN NADZRI	MR.	EVALUATION OF TRMM AND GPM PRECIPITATION PRODUCT FROM HIGHLAND TO COASTAL AREA IN MALAYSIA	INOS, UMT	izuan.nadzri@umt.edu.my	SAT2
3	IDHAM KHALIL	MR.	MODELLING AND FORECASTING THE EFFECTS OF INCREASING SEA SURFACE TEMPERATURE ON CORAL BLEACHING IN THE INDO-PACIFIC REGION	FACULTY OF SCIENCE AND MARINE ENVIRONMENT, UMT	idham@umt.edu.my	SAT3
4	KU NOR AFIZA ASNIDA KU MANSOR	MS	DETECTION AND VISUALIZATION OF OCEANIC FRONTS IN PENINSULAR MALAYSIA USING SATELLITE DATA DURING MONSOON SEASON	UNIVERSITI MALAYSIA TERENGGANU	kufeezakumansor@gmail.com	SAT4
5	NURUL HIDAYAH MAT ZAKI	MRS.	ASSESSING OPTIMAL DOWNSCALING PARAMETERS FOR UAV-ORTHOMOSAIC PREPARATION TO ACHIEVE CORAL MAPS WITH GREATER ACCURACY	INOS, UMT	n.hidayah@umt.edu.my	SAT5
6	MD SUFFIAN IDRIS	DR.	OPTICAL WATER TYPE CLASSIFICATION SCHEME FOR MONITORING WATER QUALITY IN MALAYSIAN WATERS	FACULTY OF SCIENCE AND MARINE ENVIRONMENT, UMT	suffian@umt.edu.my	SAT6
7	YUZWAN MOHAMAD	MR.	DEVELOPMENT OF MARINE GEOSPATIAL DATA MODEL (MGDM) FOR LONG-TERM RESEARCH REPOSITORY: A CASE STUDY IN PULAU PINANG	UMT	yuzwanm@umt.edu.my	SAT7
SESSION 2B (Marine Pollution I)						
1	PAUL TEESALU	MR.	LDPE MICROPLASTICS INDUCED DIFFERENTIAL STRESS RESPONSES IN TWO AMPHIPOD SPECIES	ESTONIAN UNIVERSITY OF LIFE SCIENCES	paul.teesalu1@gmail.com	MP1
2	INTAN NOOR MUNIRA GHAZALI	MS	WIDESPREAD OCCURRENCE OF MICROPLASTIC IN ISLANDS ON THE NORTH COAST OF PENINSULAR MALAYSIA USING BIVALVE AS BIOINDICATOR	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	intanghazali27@gmail.com	MP2
3	WAN SITI MARDHIAH WAN JOHARI	MS	MICROPLASTICS ASSESSMENT USING ROCK OYSTER (SACCOSTREA CUCULLATA) IN TIOMAN ISLAND, PAHANG	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	mardhiahpg@gmail.com	MP3
4	YUSOF SHUAIB IBRAHIM	ASSOCIATE PROFESSOR DR.	MICROPLASTICS INGESTION BY ESTUARINE NEREIDID POLYCHAETE (NAMALYCASTIS SP.) FROM THE SOUTH CHINA SEA	UNIVERSITI MALAYSIA TERENGGANU	yusofshuaib@umt.edu.my	MP4
5	MUNIRAH MAT DERS	MS	ASSESSING SPATIAL VARIATION ON MICROPLASTICS ABUNDANCE IN KUANTAN RIVER WATER	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	fikriahf@iium.edu.my	MP5
6	ISMILA CHE ISHAK	MRS	THE CHALLENGES IN MARINE ECOSYSTEM	UNIVERSITI KUALA LUMPUR MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY, (UNIKL MIMET)	ismila@unikl.edu.my	MP6
7	HANIF AKBAR AWALUDDIN	MR.	SEASONAL VARIATION OF SPECIFIC ACTIVITY GLUTATHIONE S-TRANSFERASE IN GONAD OF DIADEMA SETOSUM	INOS, UMT	hanifakbar1401@gmail.com	MP7

SESSION 2C (Ocean Governance)						
1	BEHARA SATYANARAYANA	ASSOCIATE PROFESSOR DR.	CARBON STOCK OF MATANG MANGROVE FOREST RESERVE (MALAYSIA): WHAT IT SHOWS IN RELATION TO CENTURY OLD MANAGEMENT?	INOS, UMT	satyam@umt.edu.my	OG1
2	MOHD RODILA IBRAHIM	MR.	INDIVIDUAL MODEL SIMULATION ASSESSMENT TO FIND THE BEST TIMING FOR CUTTING AT MATANG MANGROVE TREES UNDER CURRENT MANAGEMENT	INOS/ PUSAT ASASI STEM, UNIVERSITI MALAYSIA TERENGGANU, KUALA NERUS	mdrodila@umt.edu.my	OG2
3	MOHD SAFUAN CHE DIN	DR.	CORAL REEF COMMUNITIES ASSESSMENT IN PULAU KAPAS MARINE PARK: LOOKING TOWARDS STRATEGIC REEF MANAGEMENT VIA ECOLOGICAL DATA APPROACH	INOS, UMT	chedinmohdsafuan@umt.edu.my	OG3
4	NUR ARIFAH NAJIHAH IBRAHIM	MS	IMPACT OF SEA LEVEL RISE TOWARDS VULNERABILITY AND SOCIO-ECONOMY OF PAHANG COASTLINE	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	arifah9591@gmail.com	OG4
5	NURUL SYAMIMI BINTI SAMSUDDIN	MRS	THE UTILIZATION OF TRADITIONAL KNOWLEDGE DUE TO CLIMATE CHANGE IMPACT TOWARDS ISLAND COMMUNITIES' SOCIAL WELLBEING: THE MEDIATING EFFECT OF ADAPTIVE CAPACITY	UNIVERSITI MALAYSIA TERENGGANU	Syamimi9916@gmail.com	OG5
6	HUSNI ALHAN MD SALIMUN	MR.	ASSESSING GOVERNANCE FEASIBILITY TO ADOPT MARINE SPATIAL PLANNING TOWARDS SUSTAINABLE OCEAN ECONOMY IN TERENGGANU, MALAYSIA	INOS, UMT	P5330@pps.umt.edu.my	OG6
7	WAN MOHAMAD AKIF WAN RUSELI	MR.	HIGH-RESOLUTION HABITAT SUITABILITY MODELLING TO SUPPORT MARINE SPATIAL PLANNING	INOS, UMT	p4528@pps.umt.edu.my	OG7
SESSION 3A (Marine Coastal and Delta Sustainability for Southeast Asia-MARE)						
1	ANTON SHKARUBA	DR.	MARE APPROACH TO HIGHER EDUCATION AND RESEARCH TRAINING AND THE FIRST RESULTS	ESTONIAN UNIVERSITY OF LIFE SCIENCES	anton.shkaruba@emu.ee	MARE1
2	HEE MIN TEH	DR.	IMMERSIVE LEARNING OF AN ENGINEERING DESIGN COURSE THROUGH A REAL-LIFE PROBLEM-BASED PROJECT	UNIVERSITI TEKNOLOGI PETRONAS	heemin.teh@utp.edu.my	MARE2
3	DANIELE LA ROSA	ASSOCIATE PROFESSOR DR.	SPATIAL PLANNING TO ADDRESS ECOSYSTEM SERVICES TRADE-OFFS IN COASTAL AREAS	UNIVERSITY OF CATANIA, ITALY	dlarosa@darc.unict.it	MARE3
4	NUR HIDAYAH ROSELI	DR.	FORMAL MARINE EDUCATION IN FIELD: IDENTIFYING PHYSICAL PROPERTIES AND CURRENT CIRCULATION IN BIDONG ISLAND, MALAYSIA	UNIVERSITI MALAYSIA TERENGGANU	nurhidayahroseli@umt.edu.my	MARE4
5	VINCENZO MACCARRONE	DR.	TOOLS FOR TRAINING THE FUTURE BLUE CITIZENSHIP	ITALIAN NATIONAL RESEARCH COUNCIL - INSTITUTE FOR MARINE BIOLOGICAL RESOURCES AND BIOTECHNOLOGY	vincenzo.maccarrone@cnr.it	MARE5
6	SHAMILA AZMAN	DR.	IMPACT OF COVID-19 ON TEACHING AND LEARNING IN ENVIRONMENTAL MANAGEMENT	UNIVERSITI TEKNOLOGI MALAYSIA	shamila@utm.my	MARE6
7	PIETRO SCANDURA	ASSOCIATE PROFESSOR DR.	NUMERICAL SIMULATION OF BREAKING WAVES THROUGH THE SPH METHOD	UNIVERSITY OF CATANIA, ITALY	pietro.scandura@unict.it	MARE7

SESSION 3B (Marine Pollution II)						
1	IZAN JAAFAR	DR.	CLASSIFICATION AND QUANTIFICATION OF MARINE DEBRIS FROM VOLUNTARY BEACH CLEAN-UP PROGRAM AT PANTAI PERANGINAN KELULUT, MARANG, TERENGGANU	FACULTY OF SCIENCE AND MARINE ENVIRONMENT, UNIVERSITI MALAYSIA TERENGGANU, KUALA NERUS, TERENGGANU, 21030 TERENGGANU	izanjaafar@umt.edu.my	POL1
2	KHAIRUL NIZAM MOHAMED	DR.	EFFECT OF NORTHEAST MONSOON TO THE DISTRIBUTION OF BIOAVAILABLE DFE(III) AT THE COAST OF PULAU REDANG, TERENGGANU	DEPARTMENT OF ENVIRONMENT, FACULTY OF FORESTRY AND ENVIRONMENT, UNIVERSITI PUTRA MALAYSIA , 43400 UPM , SERDANG, SELANGOR	k_nizam@upm.edu.my	POL2
3	SITI MUNIRAH JOHARI	MS	NUTRIENT INPUT INTO THE MALACCA STRAIT FROM NORTHERN AND SOUTHERN RIVER OF PENINSULAR MALAYSIA.	UNIVERSITI KEBANGSAAN MALAYSIA	p97869@siswa.ukm.edu.my	POL3
4	NABEELA ALI NASSER AL-AWLAQI	DR.	BIOREMEDIATION POTENTIAL OF BROWN SEAWEED, PADINA BORYANA: TOXICITY AND BIOACCUMULATION STUDIES OF COPPER	ADEN UNIVERSITY, UAE	nabeela.awlaqi@gmail.com	POL4
5	MUHAMMAD AFIQ AZMAN	MR.	THE PATHWAY OF MARINE LITTER ALONG PAHANG COASTLINE	INSTITUTE OF OCEANOGRAPHY AND MARITIME STUDIES (INOCEM), INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA,KAMPUNG CHEROK PALOH, , KUANTAN, PAHANG, 26610	mafiq.azman@live.iium.edu.my	POL5
6	ARVO TUVIKENE	ASSOCIATE PROFESSOR DR.	POLLUTANTS IN BALTIC SEA COMMERCIAL FISH CATCHES	ESTONIAN UNIVERSITY OF LIFE SCIENCES	arvo.tuvikene@emu.ee	POL6

SESSION 3C (Coastal Geomorphology)						
1	MILAD BAGHERI GHADIKOLAEI	DR.	HAZARD ASSESSMENT AND MODELLING OF EROSION AND SEA LEVEL RISE UNDER GLOBAL CLIMATE CHANGE CONDITIONS FOR COASTAL CITY MANAGEMENT	INOS, UMT	milad.bagheri.gh@gmail.com	COAST1
2	UMMI NAQIYAH SALIN	MS	MORPHOLOGICAL EVOLUTION ALONG SELECTED COASTS OF PAHANG AND JOHOR	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	umminaqiyahs@gmail.com	COAST2
3	MUHAMMAD HAZIQ MOHD SUBRI	MR.	INFLUENCE OF CLIMATE CHANGE TO BEACH MORPHOLOGY AT KEDAH AND MELAKA COAST	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	haziqsubri97@gmail.com	COAST3
4	EFFI HELMY ARIFFIN	ASSOCIATE PROFESSOR DR.	SUSTAINABLE NATURAL ARCHITECTURAL DESIGN FOR SAND DUNES RESTORATION BY SAND TRAPPING IN TERENGGANU COAST	INOS, UMT	effihelmy@umt.edu.my	COAST4
5	TOH SIAW HUI	MS	INVESTIGATION OF BEACH MORPHOLOGICAL CHANGES TREND IN THE EAST AND WEST COAST OF PENINSULAR MALAYSIA	UNIVERSITI MALAYSIA TERENGGANU	shtoh98@gmail.com	COAST5
6	SURESH GANDHI	PROFESSOR	BENTHIC FORAMINIFERAL TURN-OVER AND PALEOBATHYMETRIC VARIATION ACROSS CRETACEOUS/PALEOGENE BOUNDARY FROM CAUVERY BASIN, INDIA - AN INSIGHT TO K-PG TECTONIC REPURCUSSIONS	UNIVERSITY OF MADRAS, DEPARTMENT OF GEOLOGY, CHENNAI, INDIA	msureshgandhi@gmail.com	COAST6
7	HARIS ABDUL RAHIM	MR.	BEACH MORPHOLOGY AND EROSION ALONG TERENGGANU COAST	FACULTY OF ARCHITECTURE, PLANNING & SURVEYING, UNIVERSITI TEKNOLOGI MARA , 40450 SHAH ALAM, SELANGOR, MALAYSIA, SHAH ALAM, SELANGOR, 40450	harisrahim8@gmail.com	COAST7

SESSION 4B (Coastal and Shelf Seas Dynamics)						
1	NOIR P PURBA	MR	REVISITING WATERMASS IN EASTERN INDIAN OCEAN NEAR INDO-AUSTRALIAN BASIN	INOS, UMT	p4830@pps.umt.edu.my	COD1
2	POH HENG KOK	DR.	OVERVIEW OF THE UPWELLING FEATURES ALONG THE EAST COAST OF PENINSULAR MALAYSIA DURING THE SOUTHWEST MONSOON	HIDROKINETIK TECHNOLOGIES SDN. BHD.	pohhengkok@gmail.com	COD2
3	WINFRED MARSHAL	MR	THE IMPACTS OF CLIMATE CHANGE ON MARINE BIOGEOCHEMISTRY IN REGIONAL OCEANS: AN OVERVIEW	INOS, UMT	winfredmarshal11@gmail.com	COD3
4	MUHAMMAD NAIM MOHD SATAR	MR	PROGRESS ON UPWELLING STUDIES UNDER INFLUENCE OF CLIMATE CHANGE IN SOUTH CHINA SEA	INOS, UMT	mnaimsatar@gmail.com	COD4
5	ZURAINI ZAINOL	DR.	THE EFFECTS OF DIFFERENT INLET CONFIGURATIONS ON PARTICLES TRANSPORT AND RESIDENCE TIME IN A SHALLOW AND NARROW COASTAL LAGOON: A NUMERICAL-BASED INVESTIGATION	INOS, UMT	zuraini.z@umt.edu.my	COD5
6	MUHAMMAD HAFEEZ JEOFRY	DR.	21ST CENTURY SOUTHERN SOUTH CHINA SEA DYNAMIC SEA LEVEL FROM COUPLED MODEL INTERCOMPARISON PROJECT PHASE 6 (CMIP6)	FACULTY OF SCIENCE AND MARINE ENVIRONMENT, UNIVERSITI MALAYSIA TERENGGANU	hafeez.jeofry@umt.edu.my	COD6
7	AFIFI JOHARI	MR.	INTER-ANNUAL FEATURES OF THE PENINSULAR CURRENT FROM 2001 TO 2017	INOS, UMT	afifijohari17@gmail.com	COD7
SESSION 4C (Ocean Literacy)						
1	NAZLI AZIZ	DR.	LOCAL COMMUNITY'S AWARENESS OF LABUAN MARINE PARKS	INOS, UMT	nazli_aziz@umt.edu.my	OL1
2	AMEER FARHAN MOHD ARZAMAN	MR.	AWARENESS OF PROTECTIVE MECHANISMS AGAINST TRADITIONAL KNOWLEDGE OF MARINE RESOURCES AMONG COASTAL COMMUNITIES IN PENINSULAR MALAYSIA	UNIVERSITI MALAYSIA TERENGGANU	p4247@pps.umt.edu.my	OL2
3	NURUL NADHIRAH ISKANDAR	MS	LOCAL PERCEPTION AND KNOWLEDGE ON SOCIO-ECONOMIC IMPACTS OF SEA LEVEL RISE IN PANTAI CHERATING AND PANTAI PELINDUNG, PAHANG, MALAYSIA	INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	nadhirah.iskandar@live.iium.edu.my	OL3
4	NOR HAFZAN ABD RASID	MS	ASSESSING THE IMPACT OF SEA LEVEL RISE TO THE ISLAND COMMUNITIES ON PERHENTIAN ISLANDS AND REDANG ISLAND MALAYSIA	INOS, UMT	hafzan.abd@umt.edu.my	OL4
5	NURUL FARHANA ABDUL RAZAK	MS	EVALUATING THE ATTITUDE AND BEHAVIOUR OF REDANG ISLAND'S COMMUNITY TOWARDS SUSTAINABLE WASTE MANAGEMENT	INOS, UMT	frhana.abdrazak@gmail.com	OL5
6	AZZA JAUHAR AHMAD TAJUDDIN	DR.	TELLING OCEAN LITERACY STORIES TO COMMUNICATE SCIENCE: FOR CHILDREN BY CHILDREN	PUSAT PENDIDIKAN ASAS DAN LANJUTAN, UNIVERSITI MALAYSIA TERENGGANU	azzajauhar@umt.edu.my	OL6
7	NUR SALINA ISMAIL	MRS	ENHANCING OCEAN LITERACY THROUGH ART ACTIVITIES	PUSAT PENDIDIKAN ASAS DAN LANJUTAN, UNIVERSITI MALAYSIA TERENGGANU	p5141@pps.umt.edu.my	OL7

CETACEANS OF THE LUCONIA SHOALS NATIONAL PARK (LSNP), OFFSHORE SARAWAK, MALAYSIA

Saifullah Arifin Jaaman[1*], Azmi Marzuki Muda[1], Chew Wee Giap[2], Hairul Masrini Muhamad[3], James Bali[4], Mohd Azam Mat Yaacob[1], Muhammad Fadhli Mat Sobri[1], Nurlisa Azizul[1] and Wan Nurdalila Amani Wan Hassan[1]

[1]Marine Endangered Species Program, Institute of Oceanography and Environment (INOS), Universiti Malaysia Terengganu (UMT), 21030 Kuala Nerus, Terengganu. Malaysia
[2]Chemsain Konsultant Sdn. Bhd., 172 Rock Road, 93200 Kuching, Sarawak. Malaysia
[3]Borneo Marine Research Institute, Universiti Malaysia Sabah (UMS), Jalan UMS, 88400 Kota Kinabalu, Sabah. Malaysia
[4]Biodiversity Conservation and Research Division, Sarawak Forestry Corporation (SFC), Lot 218, KCLD, Jalan Tapang, Kota Sentosa, 93250 Kuching, Sarawak. Malaysia

**Corresponding author: saifullahaj@umt.edu.my*

Abstract: The Luconia Shoals National Park (LSNP) was gazetted as a marine park on 16 October 2018 by the Sarawak Government. It is located about 168 km to the northwest of Bintulu and has one of the largest reef complexes in the South China Sea. Apart from the unpublished sighting from the Beacon Project (2013-2015), the information on marine megafauna in the LSNP is considered unknown. Between 30th March and 3rd April 2021, a dedicated vessel-based survey was conducted covering a 347 km of transect line. The objective is to determine cetacean species, size and dynamics of the population in the study area. Cetacean species composition is diverse with a total of nine species recorded: Common Minke whale (*Balaenoptera acutorostrata*), Fraser's dolphin (*Lagenodelphis hosei*), Sperm whale (*Physeter macrocephalus*), False killer whale (*Pseudorca crassidens*), Pantropical spotted dolphin (*Stenella attenuata*), Spinner dolphin (*Stenella longirostris*), Rough-toothed dolphin (*Steno bredanensis*), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), and Short-finned pilot whales (*Globicephala macrorhynchus*). The Common Minke whale observed is the first confirmed sighting in Malaysian waters and may be the lowest latitude recorded for Minke whales in the Northern hemisphere. The sightings of Sperm whale, False Killer whale, and Rough-toothed dolphin made during this survey are the first confirmed record of live sighting in Sarawak waters. The high sighting rate for cetaceans (0.44 per 100 km.hrs) suggests that LSNP is being used by whales and dolphins for feeding, socializing, and breeding, which were observed during the survey. More frequent and longer survey duration during different seasons will provide more comprehensive information on the distribution and abundance of these animals and their correlation with the LSNP characteristics.

Keywords: cetacean; distribution; Luconia Shoals National Park, Sarawak; South China Sea.

Hazard Assessment and Modelling of Erosion and Sea Level Rise under Global Climate Change Conditions for Coastal City Management

Milad Bagheri[1], Zelina Z Ibrahim[2], Shattri Mansor[3], Latifah Abd Manaf[2], MF Akhir[1], WIAW Talaat[1],
Isabelle D. Wolf[4]

Institute of Oceanography and Environment (INOS), Universiti Malaysia Terengganu (U.M.T.), Kuala Terengganu 21030, Malaysia
Department of Civil Engineering, Faculty of Engineering, Universiti Putra Malaysia (U.P.M.), Seri Kembangan 43400, Malaysia
Department of Environment, Faculty of Forestry and Environment, Universiti Putra Malaysia (U.P.M.), Seri Kembangan 43400, Malaysia
School of Geography and Sustainable Communities, University of Wollongong, Northfields Avenue, Wollongong, NSW 2522, Australia; and Centre for Ecosystem Science, University of New South Wales, Sydney, N.S.W. 2052, Australia

**Corresponding author: milad.bagheri.gh@umt.edu.my*

Abstract: Sea-level rise in response to climate change and global warming severely impacts coastal cities through increased soil erosion and other hazards. Therefore, simulating threats in coastal locations is critical for coastal city management and planning. The NARX-Neural Network (NARX-NN) was used in conjunction with the Bruun model and G.I.S. methods to estimate the rate of sea-level rise, develop a coastal erosion model and coastal hazards maps, and simulate a sea-level increase with a maximum speed of 79.26 mm/year, and an average of about 25.34 mm/year, with a 1.48 m/year average erosion rate simulated from 2013-2020 along Merang kechil to Kuala Marang in Terengganu state coastal areas. According to the Bruun model, the area's most vulnerable to shoreline erosion are Kuala Nerus, Pendagan Buluh, and Kuala Ibai. Batu Rakit (Reach 1) has the highest rate of coastal erosion, at 28.16%, compared to 16.5 percent in Kuala Nerus (Reach 2) and 19.1% in Pengadang Buluh (Reach 3). The findings of this study might be utilized to build new coastal hazard erosion maps in a G.I.S. framework, which could then be used as part of Malaysia's East Coast zone vulnerability assessment. The findings may also aid in the prioritization of conservation efforts in afflicted areas or the decision to adapt to the effects of coastal erosion. This article presents a methodological framework and an erosion management prioritization system to help coastal managers, planners, and developers identify hazardous zones and improve coastal management plans using geospatial models.

Keywords: NARX-NN, Bruun model, G.I.S., Hazards assessment, Coastal city development

Revisiting the Water Mass Transformation in the Eastern of Indian Ocean

[1,2]Noir P. Purba, [1] Mohd Fadzil Akhir, [3,4]Widodo S. Pranowo, [2]Ibnu Faizal

[1]Institute of Oceanography and Environmental Studies, University Malaysia Terengganu 21030, Malaysia
[2]Department of Marine Science, Faculty of Fishery and Marine Science, Universitas Padjadjaran, Bandung, Indonesia
[3]Marine Research Center, Ministry of Marine Affairs and Fisheries of the Republic of Indonesia, Jakarta, Indonesia
[4]Department of Hydrography, Indonesia Naval Postgraduate School (STTAL), Jakarta, Indonesia
Email: noir.purba@unpad.ac.id

Abstract

The main purpose of this research was to identify and analyze the water mass transformation in EIO. The physical properties of ocean investigated were temperature, salinity, and geostrophic currents. Data downloaded from World Ocean Database updated 2018. The visualization and analysis with monthly spatial and vertical profiles from 1950 to 2018. The result showed that in the surface layer, the water mass dominated by Bengal Bay Water (BBW) (25.0–29C, 28.0–35.0%), Arabian Sea Water (ASW) (24.0–30.0C, 35.5–36.8%), and South Indian Central Water (SICW) (8.0–25.0C, 34.6– 35.8%). In the Intermediate Water, the water mass are Antarctic Intermediate Water (AAIW) (2–10C, 33.8–34.8%), Indonesian Intermediate Water (IIW) (3.5–5.5C, 34.6– 34.7%), Red Sea–Persian Gulf Intermediate Water (RSPGIW) (5–14C, 34.8–35.4%). In the deep water, the water mass dominated by Circumpolar Deep Water (CDW) (1.0–2.01C, 34.62–34.73%) that comes from Antartctic circulation.

Keywords: thermocline layer, Brunt-Vaisala frequency, Indonesia Throughflow, geostrophic currents.

Overview of the upwelling features along the east coast of Peninsular Malaysia during the southwest monsoon

Poh Heng Kok [1,*], Mohd Fadzil Akhir [2], Sarath Wijeratne [3], Fredolin T. Tangang [4], Charitha Pattiaratchi [3], Fangli Qiao [5], Nur Hidayah Roseli [2,6], Jing Xiang Chung [6], Fariz Syafiq Mohamad Ali [2], Nurul Rabitah Daud [7]

[1] Hidrokinetik Technologies Sdn Bhd, Centre for Unmanned Technologies, Kulliyyah of Engineering, International Islamic University Malaysia, Gombak, 53100 Kuala Lumpur, Malaysia.

[2] Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia.

[3] Ocean Graduate School & The UWA Ocean Institute, The University of Western Australia, Crawley, WA 6009, Australia.

[4] Department of Earth Sciences and Environment, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia.

[5] First Institute of Oceanography, Ministry of Natural Resources, Qingdao 266061, China.

[6] Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Malaysia.

[7] School of Civil Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.

[*] pohhengkok@gmail.com

Abstract

The upwelling area along the east coast of Peninsular Malaysia (ECPM) was characterised by an elongated patch of cooler water in the inshore region and thermohaline uplifting towards the coast and surface during the southwest monsoon. The alongshore prevailing winds generated offshore Ekman transport, and positive wind stress curl generated Ekman pumping during the southwest monsoon were found to be responsible for generating upwelling. The use of Ekman transport and Ekman pumping to characterise upwelling revealed that upwelling intensity increased in May and peaked in August before reducing in September, with decreasing intensity from the southern tip of the ECPM to 5 °N. The upwelling caused a significant difference in sea surface temperature (SST) between inshore and offshore regions, but this was not solely due to upwelling; cooler water flooding from the Java Sea between July and September also contributed to this condition, so the SST gradient between inshore and offshore regions was insufficient to characterise upwelling. Nonetheless, the southwest monsoon SST structure indicated that localised upwelling further cools the already cooled water from the Java Sea, proving its significant role in the generation of cooler water along the coast. The numerical ocean modelling was used to determine the major contributor of upwelling along the EPCM, and the results showed that Ekman transport was the major contributor of upwelling rather than wind stress curl and tide induced baroclinic pressure gradient force. The investigation of interannual variability of upwelling revealed that the delayed effect of the El Nio Southern Oscillation (ENSO) generated interannual variation of alongshore winds, which in turn caused interannual variation of upwelling along the ECPM.

Keywords: upwelling, east coast of Peninsular Malaysia, Ekman transport, Ekman pumping, ENSO

Immersive Learning of an Engineering Design Course Through a Real-Life Problem-Based Project

ABSTRACT:
Engineering design courses are renowned for its notorious difficulty, immersed and challenging workloads and complex problems. Many engineering students fail to connect the fundamental knowledge to their design practices. Design of Coastal Structures (DCS) is one of the elective courses offered to the UTP final year Civil Engineering undergraduate students. The course learning outcomes (CLO) require the students to observe coastal problems, assess the design concepts, create a feasible engineering solution, and develop detailed engineering design calculations. It is difficult to attain these CLOs without a design experience in solving a real problem. Taking advantage of the coastal erosion happened in Teluk Nipah of Pangkor Island, a structured real-life problem-based learning (PBL) project was designed and implemented to enhance the student learning experiences and academic performances. PBL is a student-centred, inquiry-based instructional model/pedagogy in which learners engage with an authentic problem that requires further research. This PBL project required the students to undertake a site investigation, data analysis, development of solutions and the detailed design calculations. The PBL process required the students to identify gaps in their knowledge, conduct research, apply their learning to develop solutions and present their findings. The participating students were empowered to conduct engagement sessions with the local authorities and community, understanding the pain points of both stakeholders. They planned and conducted site investigation and measurement at the problematic site, as well as data acquisition with the support of the local authorities. The collected data were processed, analysed and interpreted for establishment of some design parameters. They brainstormed within the group and developed the design concepts and the prototype for testing in a mini wave flume. After having a syndication session with the industry partners, the students developed the full set of detailed design calculations. Their findings were presented to the industry partners for their comments and improvement of their design, prior to final report submission. To bridge the gaps between theory and practical, adjunct lectures by industry partner and practitioners were conducted throughout the project period. The project provided a good coverage of cognitive, psychomotor and affective domains. This PBL project helped the students to master the relevant knowledge and technical skills adequately. The project successfully improved the median grades of all CLOs, and nurtured numerous positive personal traits, communication and positive sharing attitudes among the students. It is worthwhile to note that one of the students' designs was chosen to be the most sustainable engineering solution, subsequently leading to construction of a 50-m rock revetment at Coral Beach, Teluk Nipah in overcoming the coastal erosion problems. In short, the PBL project developed for the DCS course has met its objective to a high degree. This PBL initiative has led to a securing of 2 T&L grants, 4 publications, 5 dissemination practices at university and international levels, and 7 T&L awards. The proposed PBL program is currently being adopted to some other civil engineering design courses, as well as conventional courses that requires site experiences.

Reef health assessment of Sembilan Archipelago, Perak

Mohamad Saupi Ismail

Fisheries Research Institute, Departement of Fisheries Malaysia, Batu Maung, 11960 Pulau Pinang, Malaysia.
*Corresponding author: saupi@rocketmail.com

Abstract
The coral reef ecosystem of Sembilan Archipelago contributes substantially to the welfare of the local fishing community and eco-tourism. This archipelago, located off the south of Pangkor, is currently under growing pressures from anthropogenic effects. The reef health of the island was assessed using three ecosystem parameters namely benthic cover, fish biomass and microbes (*Vibrio*). A total of 15 sites around 8 islands (Pulau Agas, Pulau Batu Putih, Pulau Buluh, Pulau Lalang, Pulau Nipis, Pulau Payung, Pulau Rumbia and Pulau Saga) were surveyed in 2020. The results showed that the reefs around the archipelago were between poor and fair condition with the live coral covers ranged from 9.60% to 35.84%. Scleractinian corals were less than 30% at all sites. There were 46 species of scleractinians comprising of 11 families. *Diploastrea heliopora*, *Tubastrea aurea* and *Porites lutea* were the most dominant species. Reef morphology was strongly influenced by stress tolerant corals. For fish, 50 non-cryptic species of 23 families were recorded. Pomacentridae was the most dominant family with 12,570 fish, followed by Nemipteridae, Apogonidae, Lutjanidae and Serranidae. *Vibrio* around the archipelago was found highest at Pulau Buluh (mean: 89 cfu/ml) and lowest at Pulau Batu Putih (mean: 1 cfu/ml). The reef health assessment based on Coral Health Index (CHI) showed that only 3 islands (Pulau Agas, Pulau Batu Putih and Pulau Payung) had a value of more than 0.40, indicating a coral health status of fair. The other 5 islands were considered as being degraded. Overall, the coral reefs of Sembilan Archipelago could be classified as stressed, indicating an unhealthy disturbed reef. Hence, this archipelago deserves attention for conservation planning and reef protection.

Keywords: Coral Health Index, benthic cover, fish biomass, *Vibrio*, the Straits of Malacca

Estimation of Pulau Payar Marine Park Coral Reef Fishes Biomass Using Visual Observation

Z. Ilias, M.N. Ismail and M.S. Ismail

Fisheries Research Institute, Batu Maung 11960, Penang

**Corresponding author: zainuddin01@dof.gov.my*

Abstract: Coral reef fishes are an important reef health indicator. The fishes use the habitat for shelter and also as a nursery. However, coral reef fish studies only take a small percentage of the total number of marine studies in Malaysia. The study on biomass and diversity of fish species is only done by a few researchers. This study was conducted to obtain information on fish biomass in the coral reef of Pulau Payar Kedah by using the visual estimation method. A total of eight study locations were selected around Pulau Payar Marine Park, namely Pulau Kaca (PK)(2 sites), Pulau Payar (PP)(3 sites), Pulau Lembu (PL) (2 sites) and Pulau Segantang (PSG)(1 site). The fish species recorded are dominant commercial and coral fishes. Smaller and more cryptic fishes like blennies and gobies were not recorded because of the difficulty in identifying and recording them. Observations were done in an area of 250 square meters guided by a measuring tape placed parallel to the beach at each site. The observer stops several times during the observation to count, write and estimate the length of the fish. The fishes were identified to the genus and species level. Apart from that, the observer also ensures that the recorded fish group does not repeatedly enter and exit the observation zone. The result showed that the average fish biomass in the coral reef of Segantang Island (149.0975.7g/m2) was the highest followed by Payar Island (67.8570.1g/m2), Lembu Island (54.1734.6g/m2) and Kaca Island (42.10 22.5 g/m2). The five fish species that provided the highest biomass were *Lutjanus lutjanus, Epinephalus lanceolatus, Caesio cuning, Cephalopolis formosa and Neopomacentrus* sp.

Keywords: Pulau Payar Marine Park, coral fishes, visual observation, biomass

Spatial Planning to address Ecosystem Services Trade-offs in Coastal Areas

Daniele La Rosa[1] , Pietro Scandura[1]
[1]Department of Civil Engineering and Architecture, University of Catania, Italy

Coastal Areas are broad transitional landscapes under multiple pressure and undergoing dynamic changes driven by close and significant influence of terrestrial and marine actors. Coastal areas have high significant potential to provide ES and respond to different demands for ES, but they are also particular contexts where significant and different ES trade-offs occur. Majority of existing forms of spatial planning are not able to deal and address such trade-offs, which thus call for more innovative and effective governance approaches and mechanisms, aimed at achieving ES synergies and reducing ES conflicts.
This contribution discusses the characteristics of coastal areas in the context of spatial planning for the management of ES trade-offs. The drivers of ES trade-offs are presented and different trade-off relationships between and within the main ES types are analyzed. A specific urban focus is reserved to the interface between urban settlements and seascapes, where the most challenging of these trade-offs can happen and where it could be prior to concentrate policy and planning efforts. Finally, this contribution proposes a way forward from the current state-of-the-art of planning by providing recommendations for new governance mechanism able to address the trade-offs analyzed.

The Impacts of Climate Change on Marine Biogeochemistry in Regional Oceans: An Overview

W. Marshal[1*], M.F. Akhir[1] and N.H. Roseli[1,2]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: winfredmarshal11@gmail.com*

Abstract: Marine habitats and socio-economic structures that rely on that are significantly impacted by natural or human driven global climate change. In addition, on controlling climate, offering wealth for humanity and altering the global economic growth, the ocean's biogeochemistry plays an important role. With a focus on the five major regional oceans: Northwest Pacific, Northeast Pacific, Indian Ocean, Northwest Atlantic and Northeast Atlantic, this review offers knowledge on how ocean biogeochemical variations may likely develop in the future as a result of climate change. Marine physical modifications triggered by human-caused pollution are detectable. In order to identify long-term trends, time-series stations and ocean observatories suits the best, will give a wide variety of datasets. Given the importance of the oceans to climate change, our capacity to quantify the transformations that are occurring is glaringly insufficient and our poor knowledge of marine processes connected to climate. By exploring the ecological and sociological consequences of ocean biogeochemical transition, environmental analyses might offer a fuller explanation of how altering ocean environment functions may influence individual welfare. Here, a summary of these changes was covered with an emphasis of some that are projected to influence on how individuals and ecosystems function.

Keywords: biogeochemistry; climate change; future trend

Progress on Upwelling Studies under influence of Climate Change in South China Sea

M.N. Satar[1*], M.F Akhir[1], and J.X. Chung[2]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*

**Corresponding author: mnaimsatar@gmail.com*

Abstract: After Bakun Hypothesis was proposed in 1990 regarding an upwelling under climate change, various studies had been conducted in order to obtain the trend, current status, as well as future prediction of upwelling dynamics. Numerous studies focused mainly on the major upwelling areas which is Eastern Boundary Upwelling System (EBUS), while the small scale upwelling areas such as in South China Sea (SCS) had been left behind, despite the importance of upwelling in this area. Here, we used recent studies new synthesis describing climate change impacts on SCS. A very limited studies upwelling under the climate change scenario were which focused on are Vietnam, Taiwan Strait, Eastern Hainan and Eastern Guangdong. Vietnam area showed intensifying upwelling trend since 1950 as the data showed increasing trend of upwelling intensity while Taiwan Strait showed decreasing trend starting from the year 2000 as the Ekman transport started to decrease. Meanwhile separate studies in the eastern Hainan showed a contrast results where both increasing and decreasing trend of upwelling were found due to increasing of wind stress curl and decreasing of Asian Summer Monsoon intensity respectively. All of these limited studies lead to suggestion that a lot more studies need to be conducted including the future projection of upwelling by using climate models in order to develop more and new understanding on how the upwelling in SCS response to the climate change.

Keywords: upwelling; climate change; South China Sea

Classification and quantification of marine debris from voluntary beach clean-up program at Pantai Peranginan Kelulut, Marang, Terengganu

Izan Jaafar[1*], Nazaitulshila Rasit[2], Mohd Nizam Lani[3]

Faculty of Science and Marine Environment
Faculty of Ocean Engineering Technology and Informatics
Faculty of Fisheries and Food Science

Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu

*Corresponding email :

izanjaafar@umt.edu.my

The promotion of East Coast States in Malaysia wealth with their beautiful beaches has increased the number of visitors at the vicinity of beach area. However low awareness on the importance of beach protection from pollution and environmental awareness on protecting marine habitat, marine debris were continuously found; hence endangered marine life and lessen the aesthetic value within beach spot. A voluntary beach clean-up program participated with more than 1000 people was conducted at Pantai Peranginan Kelulut, Marang, Terengganu. The area had never undergone such program that involved public participation. The collection and quantification of marine debris for plastics, paper, glass, tin/aluminium, polystyrene and others (diapers, fishing equipment, etc.) was carried out in a brief 20 minutes along 1.8 km distance area which was divided into three main areas namely beach, park and restaurants, made up to 36 points. The program involved 41 undergraduates and post graduate students of Universiti Malaysia Terengganu (UMT) as committee and facilitators. The total of massive 626 kg of marine debris was collected. The classification demonstrated that diapers, sandals, beach balls, fishing equipments, etc. were the most abundant items, which were 315 kg represented 50% of total marine debris collected, the rest were plastic: 132 kg (21%), glass: 79 kg (13%), papers: 42 kg (7%), polystyrene: 34 kg (6%), Tin/Aluminium: 24 kg (3%) respectively. Due to the high number of marine debris collected in a very short time, indicated that environmental awareness towards marine protection is still low, hence more such voluntary beach clean-up programs are highly needed to increase the environmental education among public and surrounding communities to lessen beach pollution.

Carbon stock of Matang Mangrove Forest Reserve (Malaysia): What it shows in relation to century old management?

G. Wolswijk[1,2], B. Satyanarayana[1,2], N.H.A. Rahim[1], A. Barrios Trullols[2], J. Hugé[2,3], V. Otero[2], R. Lucas[4], and F. Dahdouh-Guebas[2,5]

[1]*Mangrove Research Unit, Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Systems Ecology and Resource Management Research Unit, Université Libre de Bruxelles, B-1050 Brussels, Belgium*
[3]*Centre for Environmental Science, Hasselt University, Martelarenlaan 42, 3500 Hasselt, Belgium*
[4]*Department of Geography and Earth Sciences, Aberystwyth University, Aberystwyth SY23 2EJ, UK*
[5]*Ecology & Biodiversity Research Unit, Vrije Universiteit Brussel, B-1050 Brussels, Belgium.*

**Corresponding author: satyam@umt.edu.my*

Abstract: Matang Mangrove Forest Reserve (MMFR) in Peninsular Malaysia is well known for its historical management since 1902 for poles and charcoal production from *Rhizophora* spp. The silviculture involves a 30-year forest rotation cycle with two thinnings (at the age of 15 and 20 years for poles) and one final felling (at the age of 30 years for charcoal) that contribute to the emission of greenhouse gasses. The present study was therefore aimed at calculating carbon budget in the MMFR by taking into account the both accumulation and emission factors in the century old timber production system. In the case of emission factors, single activities in the silviculture system together with distribution/consumer-related activities in the timber supply chain were considered. Aboveground carbon estimates from the remote sensing data (Landsat TM and ETM+, JERS-1 SAR, ALOS PALSAR, ALOS-2 PALSAR-2, SRTM, TANDEM-X, andWorldView-2) and belowground carbon estimates from the fieldwork data were integrated to derive the total carbon stock. The aboveground biomass carbon stock of the productive zone (forest used for pole/charcoal) was found to be 1.4 TgC, while for the protective forest (undisturbed forest) it was at least equal to 1.2 TgC. The total soil carbon of ca. 32 TgC shows the potential of MMFR as a carbon sink. However, an estimated emission of nearly 152.80 Mg C ha^{-1} during charcoal production and up to 0.53 Mg C ha^{-1} during pole production gives rise to a total carbon loss of 1.8 TgC. So, if the productive forest alone is considered then the carbon budget will be negative and the ongoing silvicultural management turns out to be unsustainable. It needs at least 20% reduction in the area of mangrove exploitation to achieve the neutrality. However, if the carbon stock in both protective and productive zones are combined then the MMFR remains carbon positive. This clearly informs the importance of mangrove conservation for carbon storage and climate change mitigation.

Keywords: carbon emission; remote sensing; mangrove charcoal; mangrove poles

Baseline Study on Coral Reef Fish in Pulau Kapas, Terengganu, South China Sea

A.M. Afiq-Firdaus[1], C.D.M Safuan[1], A. M. Faiz[1], M. J. N. Arbaeen, A. Md. Noor[2], I. Md. Repin[2], and Z. Bachok[1*]

[1]Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia
[2]Marine Parks and Resource Management Devision, Ecosystem and Biodiversity Conservation Branch, Department of Fisheries Malaysia, 62628 Putrajaya, Malaysia

**Corresponding author: zainudinb@umt.edu.my*

Abstract: Studies on tropical coral reef fish assemblages in the southern South China Sea are still scanty. This study aims to determine the abundance and density of reef fishes at Pulau Kapas, Terengganu, east coast of Peninsular Malaysia. Fish surveys were conducted using Underwater Visual Census (UVC) technique with modification using video recording along the transect in July 2022 at 9 selected sites with separated into different groups North, West and East of Pulau Kapas. A total of 5,109 individuals, 67 reef fish species belonging to 18 families with a density of 10.218ind. m^{-2} were identified and counted from the surveys. Fish community displayed similarities at 90% by compared among stations and the with the index of diversity (*H'*) ranged from 0.275 to 2.392 and evenness (*J'*) from 0.099 to 0.863. The high abundance, and significant proportion diversity of fishes might indicate that the coral reef ecosystem at Pulau Kapas is in good condition. This study contributes significantly to the ecological data on fish assemblages of tropical coral reef ecosystems in the east coast of peninsular Malaysia, South China Sea.

Keywords: Abundance, Diversity, Coral reef fish, Pulau Kapas, South China Sea

Influence of surrounding habitat on the food sources of long-spined urchin, *Diadema setosum* (Leske,1778) as indicate by fatty acid markers

[1]Aminudin Muhammad Afiq-Firdaus, [1]Nurulafifah Yahya, [1]Mohd Nordin Ainul-Hayati, [1]Che Din Mohd Safuan, [1]Nor Hazirah Mohd Zuki, [2]Maizah M. Abdullah and [1,*]Zainudin Bachok

1Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu
2Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu

*Corresponding Author

ABSTRACT

Diadema setosum are typical sea urchin in Malaysian waters. The habitat ranged from a natural reef area to a man-made structure. Fatty acid (FA) analysis is an ecological tool widely used to assess diet in invertebrates. Therefore, this study aims to determine the fatty acid composition in *D. setosum* from two different habitats, Pulau Bidong reef and Universiti Malaysia Terengganu (UMT) breakwater. Sample collection were conducted in September 2019 and fatty acid were extracted from the gonads. The mean concentration of total FA in sea urchin did not differ significantly (p>0.05) between P. Bidong reef (105.31 mg g^{-1}) and UMT breakwater (130.18 mg g^{-1} dry wt.). A total of 36 fatty acid were identified and categorized into saturated fatty acids (SAFA, 85.34 – 111.04 mg g^{-1}), monounsaturated fatty acids (MUFA, 12.17 – 18.36 mg g^{-1}), polyunsaturated fatty acids (PUFA, 23.43 – 24.38 mg g^{-1}) and branched fatty acids (BFA, 1.42 – 1.56 mg g^{-1}). The food sources of sea urchin which categorized by FA markers were overgrowth macroalgae (C18:2n6 + C18:3n3 + C18:3n6), microalga mat (C20:2n6 + C20:3n3 + C20:3n6 + C22:2n6 + C22:6n3) and bacteria (MUFA + BFA). Mean concentration of FA markers indicates that macroalgae food sources were significantly higher in gonad of sea urchin collected from P. Bidong reef (18.40 36 mg g^{-1}) compared to UMT breakwater (7.53 mg g^{-1}). In contrast, microalgae markers higher for UMT Breakwater sea urchin (15.90 mg g^{-1}) than P. Bidong reef (5.98 mg g^{-1}). Mean concentration of FA indicates the bacterial food sources did not differ significantly in the sea urchin from both locality. Study conclude that *D. setosum* play significant role in grazing overgrowth macroalgae at reef ecosystem as well as generalist grazer on encrusting and algal mats at man-made structure. The urchin an ideal model organism to show the dietary FAs of invertebrate herbivore.

Effect of Northeast Monsoon to the Distribution of Bioavailable dFe(III) at the Coast of Pulau Redang, Terengganu

Nur Jannati Ramjam and Khairul Nizam Mohamed[*]

Department of Environmental, Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

[*]*Corresponding author: k_nizam@upm.edu.my*

Abstract

The distribution of bioavailable dFe(III) was determined at Pulau Redang, Terengganu. This study was carried out during March 2019 (post-monsoon) and October 2019 (pre-monsoon) to evaluate the possible effect of Northeast monsoon (NEM) towards the dFe(III) bioavailability. The determination was obtained using the newly developed adsorptive-cathodic stripping voltammetry (AdCSV) method. The results show a lower concentration of dFe(III) during post monsoon (4.51 – 26.03 pM) compared to pre-monsoon season (8.79 – 39.05 pM). However, there was no significant difference between both seasons. This indicated that NEM does not affect the distribution of Fe(III) bioavailability at our study area, probably due to the present of natural organic ligands that bind to the metal and stabilized the solubility of dFe(III) in the water column. This organic ligands play an important role in maintaining the concentration of dFe(III) in the water column.

Keyword: Fe(III), bioavailability, monsoon, organic ligands, coastal water

Ontogeny of Male Parrotfish (Scarus Genus) Maturation at Pulau Bidong, South China Sea

M. Z. Hazirah[1], S. A. Aripin[2], Z. Bachok[1*], T. Arai[3], J. Safiah[4]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Faculty of Fisheries and Food Science, University Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*
[3]*Environmental and Life Sciences Programme, Faculty of Science, Brunei Darussalam University, Tengku Link Street, Gadong, BE 1410, Brunei Darussalam.*
[4]*Institute of Tropical Aquaculture, University Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*

**Corresponding author: zainudinb@umt.edu.my*

Abstract: Parrotfish species of Scarus genus which are *Scarus rivulatus*, *Scarus qouyi* and *Scarus ghobban* are diandric protogynous hermaphrodite. Parrotfish *S. rivulatus*, *S. qouyi* and *S. ghobban* change sex from female to male (protogynous) and undergo two male adult phase (diandric) which are initial phase (IP) and terminal phase (TP). Both of this adult stage was differentiated externally through body colour. Gonad development of male parrotfish was differentiated by microscopic observation through the changes of spermatogenic cell present at each phase histologically. Gonad maturation phase of parrotfish was categorized into the transition phase developing, spawning, regressing and regenerating, differentiate separately between IP and TP adult phase. Results from histological examination revealed that gonad criteria of IP male were almost identical to TP male, but less Leydig cell and yellow-brown body were observed at gonad of IP male compared to TP male. However, all male gonad of Scarus genus at Pulau Bidong had showed the same microscopic criteria between three parrotfish species *S. rivulatus*, *S. qouyi* and *S. ghobban*. Commonly parrotfish are important herbivorous fish in coral reef ecosystem known as macroalgae controller and could be one of coral health indicators, also has been targeted for food fish especially for the male due to their size advantage. However, a study of male gonad maturation phase in parrotfish is still scarce and no study has been done in South China Sea region. Therefore, the aim of this research was to study on male gonad maturation phase of parrotfish of Scarus genus at South China Sea region.

Keywords: protogynous; diandric; maturation phase; histology; hermaphrodite

A Checklist of Coral Reef Fishes at Pulau Sembilan Archipelago, Perak

M.L. Khoo[1*], T.F. Tan[1], Z. Ilias[2] and M.S. Ismail[2*]

[1]Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor, Malaysia
[2]Fisheries Research Institute (FRI) Batu Maung, 11960, Penang, Malaysia.

**Corresponding author: meilingkhoo@ukm.edu.my, saupi@rocketmail.com*

Abstract: Understanding the reef fish population status is vital for ecosystem management to ensure sustainable use of coral reef resources. Therefore, this study aims to determine the species occurrence of reef fishes at Pulau Sembilan. Fish surveys were conducted using visual census technique during SCUBA at 8 islands of Pulau Sembilan archipelago, namely Pulau Lalang, Pulau Rumbia, Pulau Buloh, Pulau Batu Putih, Pulau Nipis, Pulau Saga, Pulau Agas and Pulau Payong. A total of 50 species from 23 families were identified. Family Pomacentridae has the highest diversity with 8 species, followed by Labridae, Caesionidae, Nemipteridae and Serranidae with 4 species each. Other families observed were Apogonidae, Chaetodontidae and Siganidae with 3 species each, followed by Lutjanidae and Syngnathidae with 2 species each. The number of species observed is low when compared to neighbouring islands with MPA status, mainly dominated by Pomacentridae fishes. The scarcity of key indicator reef fish families such as Scaridae, Chaetodontidae, and Serranidae may be an indication of overfishing and declining reef health in the Pulau Sembilan vicinity. Thus, further investigations and monitoring of the reef fish assemblages are recommended to better understand the dynamics of reef fish community in Pulau Sembilan for development of sustainable marine resource management strategies and enforcements.

Keywords: diversity; reef fish; Pulau Sembilan

INDIVIDUAL MODEL SIMULATION ASSESSMENT TO FIND THE BEST TIMING FOR CUTTING AT MATANG MANGROVE TREES UNDER CURRENT MANAGEMENT

Mohd Rodila Ibrahim[a,b,*], Uwe Grueters[c],Sulong Ibrahim [a], Behara Satyanarayana[a], Mohd Fadzil Akhir[a]

a *Mangrove Research Unit (MARU), Institute of Oceanography and Environment (INOS), University Malaysia Terengganu - UMT, Kuala Terengganu, Malaysia*
b STEM Foundation center, University Malaysia Terengganu - UMT, Kuala Terengganu, Malaysia
c Dendro-Institute Tharandt, Dresden University of Technology (TU Dresden), Peiner Strasse 8, D-01737, Tharandt, Germany

*mrodila@umt.edu.my

Abstract

Matang mangrove still consider as the best the managed mangrove forest in the world. *Rhizopora sp* were dominating the Matang mangrove area. The silvicultural system by 30 years crop rotation, reaped by clear felling of yearly coupes of a thousand hectares by withholding of stands for natural regeneration. Enrichment planting is accepted where required after 2 years clear felling. Thinning for the production of poles is approved at 15 and 20 years, harvested by clear felling of annual coupes. In this study we apply Individual based model simulation (mesoFON model) to find out the best timing for mangrove trees exploitation under the current management for poles and charcoal production. The result suggests that for the first thinning will be done at 14 years and for the second thinning was at 19 years according to the simulation. The increase and decrease in trunk size, tree height, number of trees and total mortality are affected by the time of the first and second thinning. Competition between tree stands can be reduced by suitable felling time. The complete cycle time can be reduced less than 30 years if the time of the first and second felling can be well determined with the production of tree specifications for pole and charcoal use.

Keywords: Individual-based model, Self-thinning timing, pole, charcoal

Coral Reef Communities Assessment in Pulau Kapas Marine Park: Looking Towards Strategic Reef Management via Ecological Data Approach

Che Din Mohd Safuan[1], Aminudin Muhammad Afiq-Firdaus[1], Ahmad Mohammad Faiz[1], Mohd Johari Nur Arbaeen[1], Wan Izatul Asma Wan Talaat[1], Zainudin Bachok[1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: chedinmohdsafuan@umt.edu.my*

Abstract: Information on coral health status is important to provide better understanding on coral reef communities as well as potential threats to the fragile ecosystem. The lack of scientific information regarding the coral status in Malaysia represents a limiting factor for the implementation of current and future coral reef management strategies. Pulau Kapas Marine Park (5°13'14.80"N, 103°15'55.31"E) is a popular tourist destination in Terengganu, located about six kilometers east of Marang Town. The marine park became a tourist destination and thus experienced a few physical developments to cater increasing number of tourists, despite being so close to the mainland. To date, natural and anthropogenic disturbances affecting the health of coral reef ecosystem in Pulau Kapas Marine Park. Therefore, this study attempts to update such information by evaluating the data of benthic coral reef communities to understand the coral health status and identifying the potential threats in the study area. It is hope that the inclusion of reef disturbance factors within the health status criteria will allows well-informed coral reef management decisions to be made, especially regarding the policies related to sustainable island developments and will spur more scientific research explorations that can facilitate the conservation of coral reef areas in Malaysia.

Keywords: coral reefs, coral health status, marine spatial planning, ocean governance

The Effects of Different Inlet Configurations on Particles Transport and Residence Time in a Shallow and Narrow Coastal Lagoon: A Numerical-Based Investigation

Z. Zainol[1] and M.F. Akhir[*1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: mfadzil@umt.edu.my*

Abstract: Setiu Lagoon experienced shoreline alterations, leading to the opening of a new inlet and the closing of the old one. To evaluate the effects of these alterations towards the tidal flow in this shallow and narrow lagoon, a numerical hydrodynamic model was developed. The model-predicted water level and current velocities were validated against field measurements, which yielded a high simulation skill. The transport of particles and its residence time under different inlet configurations were also investigated through the implementation of numerical tracers released from R1, R2 and R3, which represent different pollution sources. The results indicated that the particles transport and residence time in Setiu Lagoon varied spatially and temporally depending on the release locations, proximity to the inlet and tidal current strength. Comparing between scenarios, the flushing efficiency in the Setiu Lagoon was improved with the presence of both inlets, resulting in a shorter residence time of less than 50 days. The findings of this research are vital for understanding the water current flow and residence time in this restricted lagoon, while evaluating the possible adverse effects on its water quality. Although this work is a case-study based, the output is applicable to other lagoon systems with similar characteristics.

Keywords: residence time; particles transport; tidal currents; different inlet configurations; Setiu Lagoon

BENTHIC FORAMINIFERAL TURN-OVER AND PALEOBATHYMETRIC VARIATION ACROSS CREATECOUS/PALEOGENE BOUNDARY FROM CAUVERY BASIN, INDIA - AN INSIGHT TO K-Pg TECTONIC REPURCUSSIONS

ABSTRACT

Maya V Panicker and M.Suresh Gandhi

Department of Geology, University of Madras, Guindy Campus, Chennai – 600 025

msureshgandhi@gmail.com

Thermal subsidence is considered to have dominated the post-rift development of extensional basins due to the ceasing of substantial fault activity during the post-rift stage. The Cauvery Basin, located along the south-eastern fringe of peninsular India, reportedly entered the post rift stage during Early Albian (112 Ma) age, but exhibits significant deviations from typical post rift thermal subsidence signatures during the transition from terminal Cretaceous (Maastrichtian age) to Paleogene period i.e., across the Cretaceous-Paleogene (K-Pg) Boundary (66Ma).

Previous studies in the Cauvery Basin across the K-Pg boundary indicated that the basin had been elevated and shallowed, with a bathymetry drop of around 80metres and lateral withdrawal of sea by about 50 km during Late Maastrichtian due to uplift and eastward tilting of the basin. This phenomenon was attributed to the rise of Reunion hot mantle plume which caused Deccan volcanic activity in central India. The eastward tilting of the basin resulting in relative sea level fall together appears to have triggered major canyon activity in the Cauvery Basin (Raju and Ravindran, 1990; Raju et al, 1991; 1994; 2004, Nagendra et al, 2017). In response to the fall in sea level during K-Pg boundary, a hiatus of 1 to 30 Ma was recorded in several parts of Cauvery basin while continuous sedimentation was observed in the north and central parts of the basin (like Pondicherry offshore, Bhuvanagiri, Portonova offshore and Nannilam area) where the drop in sea level is yet to be assessed (Raju et al, 1994). Recent study of benthic foraminifera from wells drilled in the axial part of Cauvery basin indicated a deepening bathymetry across the Cretaceous-Paleogene (K-Pg) boundary that was hitherto not reported by any researchers of Cauvery basin. This research work has been carried out in an attempt to establish a link between Relative Sea Level (RSL) changes and paleobathymetric variation across K-Pg boundary with the aid of high resolution benthic foraminiferal studies in Cauvery Basin.

21st Century Southern South China Sea Dynamic Sea Level from Coupled Model Intercomparison Project Phase 6 (CMIP6)

H. Jeofry[1,2*], M.N.I. Azran[1], S.A.S. Ali[3], M.Z. Ramli[4], M.F. Miskon[4], E.H. Ariffin[2], J. Mohamed, K. Yunus[4], and M.F. Akhir[2]

[1]*Paleoceanography Research Interest Group, Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Ocean Mapping & Geospatial, Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[3]*Faculty of Mechanical Engineering & Technology, Universiti Malaysia Perlis, 02600, Arau, Perlis, Malaysia*
[4] *Institute of Oceanography and Maritime Studies (INOCEM), Kulliyyah of Science, International Islamic University Malaysia, 25200 Kuantan, Malaysia*

**Corresponding author: hafeez.jeofry@umt.edu.my*

Abstract: Malaysia being a maritime nation, therefore, rising in sea levels from melting of large ice-sheet, glacier, thermal expansion, glacial isostatic adjustment, and contribution from land water storage would significantly pose a threat, affecting communities living at and near to the coastal environment. In this study, the performance of CMIP6 Global Climate Models (GCMs) in simulating the sea level rise in Malaysian Seas using various statistical methods is investigated. The models' performances are evaluated by carrying out the comparison between CMIP6 GCMs historical run for the period 1993-2010 against sea level measurements from the satellite altimetry AVISO+. Sea levels from CMIP6 models are then computed until the end of 21st century, based on SSP3-7.0. Due to its position, Malaysian Seas can be divided into 4 localities, consisting of the Strait of Malacca, South China Sea (SCS; Peninsular and East Malaysia) and Sulu Sea. Sea level trends are investigated upon reaching the end of the 21st century, year 2080 and 2100, where the model shows the same rising trend on all seas in the region upon reaching 2080 with a trend of 1.4 mm/year on Strait of Malacca, 1.3 mm/year on both SCS – Peninsular and East Malaysia and Sulu Sea at 1.3 mm/year. Reaching 2100, a slight increase in sea level trends were computed, on which the Strait of Malacca with a 1.7 mm/year, SCS – Peninsular Malaysia of 1.8 mm/year, SCS – East Malaysia of 1.7 mm/year and Sulu Sea at 1.5 mm/year rising in sea levels. Although the sea levels vary according to location in Malaysia, these data would help in providing an insight on Malaysian sea levels in the near future and end of 21st century.

Keywords: Sea level rise, CMIP6, SSP3-7.0, AVISO+, South China Sea

Seabed Mapping of Pulau Songsong and Tukun Terendak, Yan, Kedah

Md. Nizam Ismail[1], Jamil Tajam[2], Khairul Naim Abd Aziz[2], Zaidnuddin Ilias1, Mohamad Saupi Ismail[1]
[1]Fisheries Research Institute, Batu Maung, Penang
[2] Marine Research Station (MARES), Universiti Teknologi MARA (Perlis), Arau Campus, Perlis

Corresponding author: mdnizam@dof.gov.my

Pulau Songsong and Tukun Terendak located at Northern Straits of Malacca was studied on its seabed type in October 2021. The aim of this study was to classify the seabed areas by using remote sensing tool for marine survey, Acoustic Ground Discriminating System (AGDS), a single beam echo-sounder. Longitude and latitude coordinate were also recorded during surveys. Four clusters were develop to discriminate seabed type that is Cluster I (Coral), Cluster II (Rock), Cluster III (Sand) and Cluster IV (Silt/Clay) by using. A total of 21,405 points were successfully recorded using AGDS around Pulau Songsong (14,199 points) and Tukun Terendak (7,209 points). The survey line consisted of both parallel and perpendicular with a total area approximately was 685,740 m2. Pulau Songsong recorded Cluster I: 22,272 m^2 (3.85%); Cluster II: 26,196 m^2 (4.53%); Cluster III: 528,529 m^2 (91.45%); and Cluster IV: 932 m^2 (0.16%), while Tukun Terendak Cluster I: 2,116 m^2 (1.96%); Cluster II 7,479 m^2 (6.92%); Cluster III: 96,377 m^2 (89.19%); and Cluster IV: 2,082 m^2 (1.93%). The map was then generated using Surfer 13.0 software to demonstrate the seabed map. This spatial data generated from this study will become as baseline data and supporting document for a potentially new MPAs to fulfill our country commitment to the SDG Goal 14 (Life Below Water).
Keywords: Seabed discriminate, Mapping, New MPAs, Coastal Conservation

Annual, monthly and seasonal probabilities of acquiring cloud-free and low-tide Landsat observations for mapping saltmarsh land cover over south-eastern Bangladesh from 1980 to 2019

Sheikh Mohammed Rabiul Alam [a, b] and Mohammad Shawkat Hossain[a*]

[a]Institute of Oceanography and Environment (INOS), Universiti Malaysia Terengganu (UMT), 21030 Kuala Terengganu, Terengganu; Malaysia

[b]Wildlife Section, Bangladesh Forest Research Institute (BFRI), Chattogram 4211, Bangladesh

[*]Corresponding author: shawkat@umt.edu.my

Abstract

Although it is essential to estimate probabilities of acquiring at least one cloud-free (CFI) and low-tide image (LTI), previous studies rarely addressed in saltmarsh land cover (SLC) remote sensing. Based on the probabilistic analysis of 33-years of Landsat data acquired over the south-eastern Bangladesh, this study evaluated the chances of acquiring at least one CFI and LTI in a year, a month, a season, a pair of seasons, or a certain time-interval within a year. The results indicate that SLC applications are generally affected by CC and tide heights; an average yearly CF probability of 16% can be acquired under LT conditions. Seasonal variations in CFI are apparent and there is a significant shortage of clear observation during monsoon. The higher number of CFI may not guarantee a higher probability of LTI. The availability of both CFI and LTI can be remarkably improved if the present 16-days interval time of Landsat's acquisition is increased.

A Preliminary Study on Feeding Frequency of Clownfish (Amphiprion ocellaris) Using Artificial Food

N.N. Akma[1*] and M.L. Khoo[1,2]

[1]*Faculty of Earth Science and Environment, Faculty of Science and Technology, University Kebangsaan Malaysia 43600 Bangi, Selangor*
[2]*Marine Ecosystem Research Centre (EKOMAR), Faculty of Science and Technology, University Kebangsaan Malaysia.*

**Corresponding author: p105355@siswa.ukm.edu.my*

Abstract: The colourful clownfish and its intriguing interactions with sea anemones has caught attention from marine fish hobbyist worldwide, hence increased its demand. However, most supplies are wild caught. Unfortunately, ornamental fish farming is unpopular among local farmers because of high-cost feeding and unknown optimum feeding amount to keep the fish healthy. In this study, four different feeding frequencies of *Amphiprion ocellaris* experiment were conducted to determine the optimum feeding frequency using artificial food. Feeding frequency of 1,2,3 and 4 times daily was evaluated. Fishes were fed to satiation each time and the amount eaten were recorded. The growth in length were recorded every two weeks. During the eight-week period, the increment of fish length was detected every 4 weeks. All feeding frequencies produced a linear growth pattern. 1 time feeding frequency showed the highest percentage of growth in length with 6.5064%, followed by 5.37097% for 3 times feeding frequency, 3.98507% from 2 times feeding frequency and 2.06133% from 4 times feeding frequency. 1 time feeding frequency showed the highest mortality rate of 65%, only a pair of dominant fish survived, and the others 0% mortality observed. In conclusion, 3 times feeding frequency a day is an optimum feeding frequency of clownfish with highest percentage of growth and 0% mortality.

Keywords: *Amphiprion ocellaris*; Feeding frequency; Growth

Evaluation of TRMM and GPM precipitation product from highland to coastal area in Malaysia

M. I. Nadzri[1*], M. L. Tan[2], M. F. M. Akhir[1], A. M. Muslim[1], M. S. Hossain[1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*GeoInformatic Unit, Geography Section, School of Humanities, Universiti Sains Malaysia, 11800 USM, Pulau Pinang, Malaysia.*

**Corresponding author: izuan.nadzri@umt.edu.my*

Abstract: Continuity of homogenous accuracy if not enhancement of Tropical Rainfall Measurement Mission (TRMM) 3B43 are to be expected when the successor, Global Precipitation Measurement (GPM) Integrated Multi-satellitE Retrievals for GPM (IMERG) was released. With better sensor, spatio-temporal resolution, and new precipitation algorithm retrieval over complex terrain, thus it is crucial to evaluate the spatio-temporal accuracy before any applications. The evaluation was done over Malaysia from January 2014 to December 2019 using five statistical performance tools (Bias, Relative Bias, Mean Absolute Error=MAE, Root Mean Square Error=RMSE, correlation coefficient=R) according to monthly, seasonal, annual and elevation basis with ground rain gauge as reference. The result shows high correlation coefficient (TRMM 3B43=0.927, GPM IMERG=0.934), although, IMERG (Bias=19.26) overestimate more than TRMM (Bias=11.157) and TRMM have wider range of bias value. On seasonal basis, particularly during North East Monsoon season, R for both Satellite Precipitation Product (SPP) are reliable (R: TRMM=0.995, IMERG=0.986) paired with small Bias value among SPP (Bias: TRMM=12.038, IMERG=11.99). Next on annual basis, the R value slightly differ from each SPP with IMERG=0.977 and TRMM=0.97. Lastly, examining the influence of elevation of both SPP by clustering the SPP according to three elevation categories revealed sequentially, the error is high at middle (300m-600m), low (0m-300m) and high (>600m). Therefore, in this study, the current accuracy of SPP not only seasonal dependent, but also affected by topography. This study will contribute to more understanding and guidance on source of variation and how far have the previous and current SPP have improved.

Keywords: GPM; TRMM; elevation; satellite precipitation product, Malaysia

Modelling and forecasting the effects of increasing sea surface temperature on coral bleaching in the Indo-Pacific region

I.Khalil[1]*, AM.Muslim[2], MS. Hossain[2]

[1]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: idham@umt.edu.my*

Abstract: The Coral Triangle (CT) is one of the world's great tropical seas, located in the Indo-Pacific (IP) region. It is home to the richest marine ecosystem on Earth with a total of 76% reef-building coral species as well as 37% coral reef fish species. Unfortunately, this sensitive area is now vulnerable to Sea Surface Temperature (SST) warming. In relation to this, a considerable number of studies covering larger areas have suggested that warming trends are likely in the South China Sea and the Coral Triangle. This research explored the possible consequences of SST warming on the rich ecosystems of the IP region, specifically on bleaching of its coral reefs. In situ measurements of coral bleaching together with the monthly NOAA AVHRR Optimum Interpolation (OI) SST V2 dataset (OISSTv2) with a spatial resolution of 25 km were used to explore the relationship between coral bleaching and SST in the IP region. Three different categories of monthly mean SST were tested as potential covariates: minimum SST, mean SST and maximum SST, obtained from the OISSTv2 (1982 to 2016). The fitted logistic regression (LR) model revealed a significant and large correlation between coral bleaching and annual maximum monthly mean SST in the study area using the extensive and spatially well-distributed bleaching data from an online database and the time-series of AVHRR images. Predicted maps of coral bleaching based on the LR model were highly consistent with NOAA Coral Reef Watch (CRW) Degree heating Weeks (DHW) maps. However, some important discrepancies resulted from the more specific local fitting used in the LR model. The maximum SST was forecasted from 2020 to 2100 based on the Coupled Model Intercomparison Project Phase 5 (CMIP5) dataset under the Representative Concentration Pathways (RCP2.6) scenario. The fitted logistic regression model was employed to transform the forecasted maximum SST values into maps of the probability of coral bleaching from 2020 to 2100. The results provide considerable cause for concern, including the likelihood of widespread coral bleaching in many places in the IP region over the next 30 years.

Keywords: SST; space-time; coral bleaching; Coral Triangle; South China Sea

Detection and visualization of oceanic fronts in Peninsular Malaysia using satellite data during the monsoon season

K.N.A.A.K. Mansor[1*], F.S. Muhammad[1], N.F. Ibrahim and M.F. Akhir[2]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: mfadzil@umt.edu.my*

Abstract: Fishing stock is one of the crucial elements in the daily food intake of worldwide people, including among Malaysians. However, there are some restrictions on access to the resources, especially in terms of fishing techniques and the capability of small-scale fishermen. This study on one side aims to help the local fishermen to detect the highly productive area on open seas and on another aspect, clarify the data on the abundance of fish in the wet season using the satellite data. The objective of this study is to detect the location of the thermal front during Asian monsoon seasons and climate events, in relation to optimum chlorophyll-a and sea surface temperature (SST) readings. This study specifically compared data between Southwest monsoon and Northeast monsoon seasons in Peninsular Malaysia, during years of normal (without climatic event – 2003) and years with El Nino (2004), La Nina (2011), and IOD-positive (2012). As a result, the East Coast of Peninsular Malaysia (ECPM) recorded a cooler sea surface temperature as compared to the West Coast of Peninsular Malaysia (WCPM). The year of La Nina in 2011 documented the most intense front which almost completely covers the ECPM area. The thermal fronts in Peninsular Malaysia were considered temporary fronts whose locations changed over time. In relation to the distribution of chlorophyll, the chlorophyll's concentration in the ECPM area was high in all selected years but varied in intensity. Referring to the SST data, the chlorophyll appears to extend nearly to the coast of Kelantan in 2011 and it is still present in the other areas, but with a lower nutrient content as compared to the thermal front area. In a conclusion, the findings from the study highlighted that Malaysian waters are highly productive during the northeast monsoon season, based on the thermal front data. The assessment of the thermal front density and its seasonal distribution successfully provides useful information for locating persistent high-productivity areas that could serve as potential fishing grounds. These findings also may aid in the delineation of such high-productivity areas when satellite data is unavailable on cloudy days.

Keywords: satellite data; sea surface temperature; chlorophyll; Peninsular Malaysia; monsoon season

Assessing optimal downscaling parameters for UAV-orthomosaic preparation to achieve coral maps with greater accuracy

Nurul Hidayah Mat Zaki[1*] and Mohammad Shawkat Hossain[1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: n.hidayah@umt.edu.my*

Abstract: Since ortho-image constructed from unmanned aerial vehicles (UAV) acquired images has significant misalignment effect, an optimized and precise workflow (WF) is proposed in this study. Based on the parameters of photo alignment, sparse point cloud model, blending and seamline refinement, the 24 combinations of ortho-image producing methods were tested. The optimal WF is evaluated from the aspects of coral mapping accuracy, geometric fidelity, completeness, and efficiency. Statistical error analysis shows that blending and seamline refinement are the most relevant WF components that influence accuracy of orthorectification and consequently coral reef classification. The optimal WF found to be when 'highest' photo alignment, with 'high' tie points in the sparse cloud model are applied, in presence of blending and seamline refinements and can achieve 87.9% overall mapping accuracy. With the available photogrammetric software packages, the proposed WF can be used in mosaicking and mapping large scale macroalgae, seagrass and seaweed.

Keywords: DJI Matrice; multispectral UAV; MicaSense

Invertebrates Community and Roles as an Ecological Indicator of Intertidal Ecosystem in Tropics

A. S. Shawel, J. Madin*[†], E. Saleh, M. M. Matsomoto, S. R. M. Shaleh, A. H. B. P. Bagul and J. M. Alin

Borneo Marine Research Institute
[†]Small Island Research Centre
Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah Malaysia

**Corresponding author : jonmadin@ums.edu.my*

Abstract: The invertebrate community is the main component of the fauna on intertidal shore and are responsible for the dynamics of the ecosystem itself and its assemblages. This study investigates the structure of the invertebrate community in the intertidal zone located in Universiti Malaysia Sabah (Kota Kinabalu) where various human activities are often carried out and are expected to affect their population spatially and temporally. It uses a random quadrant sampling method to estimate the invertebrate population at seven different stations based on main composition of substrate and accessibility to human activity. Results indicates that there are more than 70 species of invertebrates belonging to 47 families and 62 genera were recorded. Station 4, which is mainly made up of rocky shores with some hard corals and sandy bottom, have the highest density of organisms per meter square (78 indiv/m^2), followed by station 1 (59 indiv/m^2), which is made up of rocky, sandy and seagrass substratum. Station 3 have the lowest density being made up of sandy beaches (4 indiv/m^2). The most dominant species was *Clibanarius snelliusi*, a left-handed hermit crab, followed by limpet (*Cellana testudinaria*) which mostly distributed in rocky substratum. Station 4 showed the highest species diversity and richness through the Shannon-Weiner diversity index (H=2.54), Simpson's diversity index (D=0.90) and Berger-Parker index (d=0.18) followed by station 7, which is made up of rocky substratum, with H=2.16, D=0.85 and d=0.31. The station with the lowest species diversity and richness is station 3 with H=0.63, D=0.35 and d=0.71. The results showed that rocky shores tend to have a higher density and species diversity as compared to other types of substrates such as sandy and seagrass substratum. However, anthropogenic factors, especially human activities, also have a critical impact on invertebrate populations in the intertidal zone. More study should be conducted to restore the population of invertebrates along intertidal shore in Sabah waters.
Keywords : invertebrates; intertidal; diversity; marine; Sabah

Marine Landscape Mapping using 3D Photogrammetry at Karang Tengah

W. N.K. Wan Mat Nor[1], A. Ali[1], Bachok. Z[1], Latif. R[1], Muhamad. A[1] and K. Ismail[2*].

[1]Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia
[2]Faculty of Science and Marine Environment, Universiti Malaysia Terengganu,21030 Kuala Nerus,
Terengganu, Malaysia
**Corresponding author: k.ismail@umt.edu.my*

Abstract: 3D photogrammetry is a powerful tool to extract new information for marine landscape mapping, and its visualization could give more impact and better understanding than a 2D image. The study area covers a broad range of habitats at Karang Tengah located between Pulau Bidong and Pulau Karah, Terengganu, Malaysia. Here, we present an approach for video acquisition using the "mow-the-lawn" concept conducted by professional divers and video positioning using Sonardyne Ultra-Short Baseline (USBL). The video equipment is set up using a frame attached with two GoPro Hero 8, two strobes, a pointer, a Sonardyne beacon and five floats. The video transect was laid 50 m each with a distance to the adjacent transect of 1.5 m, and the camera frame was constantly held at 1 m from the seafloor throughout the transect. Agisoft Metashape Pro software with the Structure from Motion (SfM) technique is used to create a 3D seafloor model. A dense point cloud build based on the image's positioning followed by the 3D polygonal mesh to create the object's surface. The reef's structure and other ecological properties surrounding it illustrated through the 3D model, serve as baseline data to evaluate the reef structure's heterogeneity at Karang Tengah. As such, the study opens to more advantageous methods for cost-effective and timely manner surveys in ecological baseline and monitoring studies.

Keywords: Structure from Motion (SFM); Ecological; Underwater video camera; 3D reconstruction; Coral reef mapping

Inter-annual features of the Peninsular Current from 2001 to 2017

A. Johari [1], M. F. Akhir [1]*

[1] *Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: mfadzil@umt.edu.my*

Abstract: Peninsular Current is monsoonal reversed, which flows southward (northward) along the east coast of Peninsular Malaysia (ECPM) during the northeast (southwest) monsoon season. By using a large spatial and temporal resolutions of MyROMS dataset from 2001 to 2017, the Peninsular Current feature is comprehensively described. Additional parameters such as longitude of axis, depth, and width of Peninsular Current 'jet' were applied together with a conventional observation of estimated volume transport. From the monthly average observation, the simultaneous trend of the volume transport, depth, and width of Peninsular Current is observed throughout the months. During the northeast monsoon (southwest monsoon) which occurs from November to April (May to October), the depth became shallower and the width became narrower, as the southward (northward) flow is weakened. November showed the most prominent features of the southward flow off the Peninsular Current with a highest value of southward transport, closest longitude of axis towards the shoreline, and the deepest depth of Peninsular Current 'jet'. Although the Peninsular Current 'jet' width in November is smaller than December, January, and February, however it standard deviation was the smallest. On the other hand, during the southwest monsoon, August demonstrated the prominent feature of the northward flow off the Peninsular Current with a highest value of northward volume transport, farthest longitude of axis from shoreline, deepest depth, and widest 'jet' features. Meanwhile, analysis on the El-Nino years shows stronger southward flow during the northeast monsoon relative to the southwest monsoon. Overall, this study is important for the precision of Peninsular Current features itself and can provide a beneficial overview of oceanographic process within vicinity.

Keywords: Peninsular Current; MyROMS, inter-annual; monsoon; jet

Nutrient Input into the Malacca Strait from Northern and Southern River of Peninsular Malaysia

S.M. Johari[1], M.A. Che Abd Rahim[1], A.N. Shahruddin[1], N.A. Kamaruddin[1], C.A.R. Mohamed[1*], S. Liu[2] and X. Shi[2].

[1]Department of Earth Science and Environment, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43000 Bangi, Selangor, Malaysia.
[2]First Institute of Oceanography (FIO), State of Oceanography (SOA), No. 6, Xianxialing Road, High Science and Technology Industrial District, Qingdao 266061, P.R. China.

**Corresponding author: carmohd@ukm.edu.my*

Abstract: Nitrate, phosphate, and ammonia is the abundant nutrients found in the river and coastal water due to human anthropogenic activities. The aim of this study was to quantify the physical characteristics and to assess the nutrients distributed in the river and coastal water located in the north and south coasts of Peninsular Malaysia. On-site physical parameters and surface water samples taken in July 2020 from Perak River and delta, Kedah was in March 2021 and Johor was in March and May 2022 for the strait and river, respectively. Samples taken analyzed using reagent pillow and Hach kit for nutrients concentration. Data recorded slightly warm temperature in sampling location during March and May compared to July sampling. Lower DO recorded in all rivers with 3 – 7 mg/L except in Kedah with better oxygen content (5 – 8 mg/L). The Johor Strait recorded the worst DO content with only 1.9 mg/L. The highest NO_3 and NH_4 in Perak River (37.9 mg/L and 6.4 mg/L, respectively) released by coal-fired power plant located in Manjung, Perak. Oil palm plantation in river surrounding known to have the capability to release NO_x into the atmosphere and into the freshwater environment, which explains the highest NO_3 in river.

Keywords: nitrate; ammonia; phosphate; river; anthropogenic

FORMAL MARINE EDUCATION IN FIELD: IDENTIFYING PHYSICAL PROPERTIES AND CURRENT CIRCULATION IN BIDONG ISLAND, MALAYSIA

N.H. Roseli[1,2*] and Y. Mohamad[1]

[1]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: nurhidayahroseli@umt.edu.my*

Abstract: Marine education delivers information on marine key concept and issues at different educational level (primary school, secondary school, university). The common teaching and learning process in classroom usually involve student and teacher engagement through lecture or tutorial. Meanwhile, in higher educational level, field-based learning is included in formal marine education for students to get hands-on experiences. This study is designed to construct a comprehensive teaching and learning framework for formal education in marine environment focusing on physical oceanography sub-field. In this study the framework is designed based on specific learning outcome *"students are able to apply practical skills at field and use the physical oceanography theories to identify physical properties and current circulation in seawater".* Data and information used in this study was obtained from seven field works done in Bidong Island, Malaysia (2019 – 2022). The designed framework includes proper procedure in planning the research, sampling preparation, data collection, equipment handling, data analysis, assessment method as well as teacher-student roles and responsibility. The framework would help in aligning learning goals with teaching activities, student engagement and integrate assessment into learning.

Keywords: Marine Education; Field-based Learning; Physical Oceanography; Practical Skills; Bidong Island

Organic Food Sources of Mangrove Clam, *Geloina expansa* (Mousson, 1849) in the Mangrove of Setiu Wetlands, East Coast of Malaysia as Indicated by Fatty Acid Markers

Nurulafifah Yahya[1], Aminudin Muhammad Afiq-Firdaus[1], Che Din Mohd Safuan[1], Maizah M. Abdullah[2], Izwandy Idris[1], Zainudin Bachok[1,*]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

[2]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu*

**Corresponding author: zainudinb@umt.edu.my*

Abstract:

Fatty acid profiles in *Geloina expansa* and surrounding environment in the mangrove of Setiu Wetlands from January to December 2016 were determined. A total of 42 fatty acid compounds were identified in all samples. Comparison of fatty acid markers that assigned to orgnic food sources (i.e. microalgae, macroalgae, detritus and bacteria) in animal tissues, surface sediment and suspended particulate materials shows significant insight on preferred food sources of mangrove clam. This filter feeder bivalve consumed higher microalgae sources compared to others food based on high C16:0, C16:1, C20:5n3, and C22:6n3 in the samples. The plant markers detected in the samples suggested from the mangrove detritus present in the ecosystem. Even though the concentration of other markers were low, but it indicates that *G. expansa* also depend on other food sources.

Keywords: Bivalve, feeding ecology, mud clam, South China Sea

Tools for training the future blue citizenship

V.Maccarrone[*1],

[1.]*National Research Council-Institute for Marine Biological Resources and Biotechnology (CNR-IRBIM),via Luigi Vaccara, 61 91026 Mazara del Vallo (TP), Italy*

**Corresponding author: vincenzo.maccarrone@cnr.it*

Abstract: This template gives formatting guidelines for authors preparing the abstract in Tropical Ocean and

Abstract: Ocean citizenship describes a relationship between our everyday lives and the health of the coastal and marine environment, a relationship that have to be taught and learned.
Role playing games (RPG) are games which simulate given circumstances where participants/ players can take and choose to play in different roles. RPG have been used by educators to support their teaching as RPG allow to explore with different practical situations and in so doing allow to learn content. Ones objective to use RPG in integrated coastal zone management is to introduce the concept of blue citizenship, blue growth, sustainability and resiliencie in a practical way, motivating the youth to use in a responsible way renewable end not renewable marine resources and learning the relationships among users, stakeholders and public bodies. Since 2011, a role-playing game, a board game and a digital interactive simulation platform have been developed: the MSP Challenge editions. This RPG have been used successfully in workshops, conferences, education, as well as for real life stakeholder engagement.
The plasticity of game rules, methods and materials to be use can be reduced and adapted to different audiences (from primary school to University), becoming an useful tool for build the new blue citizenship sustainable communities.

Keywords: ICZM; MSP; blue citizenship; role play game;

Numerical Modelling on the performance of submerged breakwater using the SPH-based DualSPHysics model

S.A.T. Hikmatullah Sahib[1], M.Z. Ramli[2*], M.S. Ab Razak[3], M.F. Miskon[1], K. Yunus[1], E.H. Ariffin[4], and M.H. Jeofry[4]

[1]*Department of Marine Science, Kuliyyah of Science, International Islamic University Malaysia, 25200, Kuantan, Pahang, Malaysia*
[2]*Institute of Oceanography and Maritime Studies (INOCEM), International Islamic University Malaysia, 26610, Kuantan, Pahang, Malaysia*
[3]*Department of Civil Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400, Serdang, Malaysia*
[4]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: mzbr@iium.edu.my*

Abstract: Implementation of coastal structures are known to mitigate issues of coastal erosion and impacts of sea waves during storm events on coastal areas. Among the various coastal structures implemented in Malaysia, the submerged breakwater called as WABCORE is being studied. This structure was originally designed by the National Hydraulic Research Institute of Malaysia and has been implemented at the shores of Pulau Tinggi, Johor, Malaysia. The objective of this study is to identify the wave transmission coefficient of the improved WABCORE structure under a variety of wave conditions. The effect of wave steepness (Hi/L) parameter on the wave transmission coefficient would also be highlighted. The study also considers the arrangement of the WABCORE structures, whereby the structures are stacked in a 4:3:2 (broad) and 3:2:1 (narrow) manner. This study implements the use of an open-source code known as DualSPHysics to simulate the various conditions. The results signify that the WABCORE structure is capable of dissipating waves despite its various condition.

Keywords: Coastal Structure; Submerged Breakwater; Wave Transmission Coefficient; DualSPHysics; Numerical Modelling

Numerical simulation of breaking waves through the SPH method

P. Scandura[1*], C. Altomare[2], G. Viccione[3] and D. La Rosa[1]

[1]*Department of Civil and Environmental Engineering, University of Catania, 95123, Catania, Italy*
[2]*Politecnical University of Catalonia, 08034, Barcelona, Spain*
[3]*University of Salerno, 84084, Fisciano, Italy*

**Corresponding author: pietro.scandura@unict.it*

Abstract: In this study, the Smoothed Particle Hydrodynamic (SPH) based DualSPHysics model is adopted to simulate breaking waves on a coastal bar. This is a type of sedimentary structure common to several coastal environments, which has a great influence on the nearshore hydrodynamics. The advantage of the SPH method, for simulating wave breaking, over other approaches such as the finite volume method, is its Lagrangian nature, which provides a natural way to simulate complex free surface flows. One of the novelties of this study is the verification of the numerical results based on detailed experimental data obtained in a wave flume at a scale close to the nature. Moreover, the model makes it possible to gain additional insights on this flow, as the measurements did not cover the entire fluid domain. The wave height is 0.55 m and the wave period 6 s. The results indicate that breaking occurs as a plunging breaker. The comparisons show a good agreement between experiments and numerical simulation for both the free surface elevation and the velocity field. The numerical results show that a recirculating cell is generated in the bar trough due to the wave breaking, which constitutes the main mechanism causing the growth or decay of the bar amplitude.
The videos and images provided by this study, in addition to constituting results of scientific interest, can be effective teaching material in coastal dynamics courses, as they clearly show the physical processes involved when a wave breaks on a beach.

Keywords: breaking waves; coastal bar; SPH; teaching material

Optical Water Type Classification Scheme for Monitoring Water Quality in Malaysian Waters

M.S. Idris[1*]

[1]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: suffian@umt.edu.my*

Abstract: Optical Water Types (OWT) provides an effective mechanism to partition water masses with similar optical characteristics, regardless of the source region and seasons. OWT can be considered as a representation of water quality conditions related to different trophic states, turbidity levels and dissolved organic matter (DOM), which is relevant for assessing and monitoring water quality changes. This study presents the OWT classification scheme for Malaysian waters based on the in-situ measurements of reflectance spectra. This newly developed OWT divides waters into five distinct types (very clear, clear, moderate, turbid and very turbid), which varied considerably according to the concentration of optically significant biogeochemical constituents. The validation analysis based on coincident satellite radiances and in-situ data shows that OWTs were well distinguishable by the MODIS sensor with the estimation accuracy of more than 94%. To demonstrate the applicability of monitoring water quality, the satellite-derived OWT scheme was applied to the study area. In the eastern coast of Peninsula Malaysia (ECPM), OWTs are dominated by oligotrophic, clear waters that varied spatially and seasonally by the monsoons. Especially in the southern Straits of Malacca (SoM) region, OWTs could indicate large-scale eutrophication and very turbid waters caused by freshwater discharge and sediment resuspension. The applicability of this optical-based classification scheme does not limit to ocean waters but could be used operationally for large-scale water quality assessments for inland and coastal waters with similar optical properties.

Keywords: optical water type; water quality; ocean color; sit; Malaysia waters

Bioremediation potential of brown seaweed, *Padina boryana*: toxicity and bioaccumulation studies of copper

Nabeela Ali Nasser Al-Awlaqi[1,2] and Noor Azhar Mohamed Shazili[1*]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Department of Biology, Faculty of Science, Aden University, Khor Maksar, Aden, Republic of Yemen*

**Corresponding author: Nazhar@umt.edu.my*

Abstract: This study was designed to evaluate the impact of various concentration of Cu^{+2} (4, 20 and 40 ppb) on *Padina boryana* at varying seawater pH (4-9) in laboratory exposure for 21 days. Growth rate, chlorophyll contents, and bioaccumulation factor were evaluated. The growth response rate of *P. boryana* was significantly different ($p < 0.05$) across days of test, different level of treatment and interaction effect at various pH level. Overall, the highest growth rate (3.3552 ± 0.0524) % day^{-1} was observed at pH 8 while the lowest growth rate (-0.2084 ± 0.0205) % day^{-1} was recorded at pH 4. The highest chlorophyll content (13.9217 ± 0.6300) µgcm^{-2} was measured at the lowest test concentration of 4 ppb of Cu^{+2} at pH 7 after 15 days exposure. The lowest chlorophyll content (-0.8160 ± 0.7326) µgcm^{-2} was measured from the highest test concentration of 40 ppb of Cu^{+2} after 21 days of exposure. The BCF for Cu in *P. boryana* was significantly different (p-value <0.05) across the days and the three different treatments of Cu^{+2}. It can be concluded that *P. boryana* has a high tolerance to Cu^{+2} and can be regarded as an attractive adsorbate option for the biosorption of heavy metal contaminants.

Keywords: Padina boryana; Cu^{+2}; Growth rate; chlorophyll contents; bioaccumulation factor.

Fish Community Structure at 'Rig to Reef' Artificial Reef off Pulau Kapas Waters, South China Sea

M.F. Ahmad[1*], and Z. Bachok[2]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: mfaizahmad27566@gmail.com*

Abstract: Two artificial reefs from the Rig-to-Reef (R2R) artificial reef project were deployed 1.6 nautical miles off Pulau Kapas, Terengganu named KAPAL 18 (TK1), and KAPAL 43 (TK2). Both artificial reefs are the first R2R project in East Peninsular Malaysia hence there are no data on the marine life there thus the result will provide new information on fish community structure around the R2R in East Peninsular Malaysia. The sampling was conducted in April, July, and October 2019 using the underwater videography (stationary) and Underwater Visual Census (UVC). Both artificial reefs fish community structure was compared using Plymouth Routines In Multivariate Ecological Research (PRIMER 6) software. A total of 85,699 individuals were counted where's the highest abundance of fish individuals was in TK1 with a total number of 45,140 individuals, while TK2 only recorded a total of 40,529 individuals. 21 families, 30 genera, and 43 species of fishes were identified in this present study from two sampling site. There were 23 species recorded in TK1 and 27 species were recorded in TK2. Lutjanidae (snapper) has the highest fish species count with six species. The fish species were sorted into three categories: IUCN status (NE, Not Evaluated; LC, Least Concern; DD, Data Deficient; NT, Near Threaten; VU; Vulnerable), feeding habits (carnivores, herbivores, omnivores, planktivores and corallivores) and commercial value (HC, highly commercial; C, commercial; MC minor commercial; NC, non-commercial). Two fish species were label NT and VU which were Pateobatis jenkinsii and Chiloscyllium punctatum. The composition of carnivores was the highest (63%) followed by planktivore (16%), corallivore (12%), herbivore (7%) and omnivore (2%). Minor commercial fish were the highest (58%) followed by commercial (33%), non-commercial (7%) and highly commercial (2%). To obtain similarity among stations a dendrogram was constructed.

Keywords: Rig to Reef; Underwater Visual Census (UVC); biodiversity; abundance; Pulau Kapas

COMMUNITY STRUTURE OF MACROFOULING ON "RIG-TO-REEF" ARTIFICIAL REEFS AT PULAU KAPAS WATERS, SOUTH CHINA SEA

N.A.M. Johari[1*], Z. Bachok[1], M.F. Ahmad[1], M.A.F. Aminudin[1], M.S.C. Din[1] and M.F.M. Sobri[1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: arbaeenjohari@gmail.com*

Abstract: Decommissioning oil rig structures, KAPAL 18 (TK 1) and KAPAL 43 (TK 2) were the first "Rig-to-Reef" (R2R) ever placed in the east coast of Peninsular Malaysia. They were deployed in the 2016 approximately 1.6 nautical miles south-eastern off Pulau Kapas, Terengganu. However, until now there were no recorded data on the marine organisms around these artificial reefs. This study aims to determine the present status of biodiversity and abundance, compare the macrofouling community structure and determine the relationship between sessile and motile macrofouling as well as to evaluate the short-term changes at two different sizes R2R artificial reef structures at Pulau Kapas waters, Terengganu. The sample collections were conducted in April, July and October 2019 using photo quadrant and scrapping methods at three selected permanent points of each R2R structure. The photo quadrant images were analysed using Coral Point Count with Excel extension (CPCe) and samples that were collected were identified to the lowest taxonomic classification. 42 genera from 39 families were identified. 41 genera were found at TK 2 while 36 genera were found at TK 1. The composition of macrofouling was mainly dominated by barnacles, bivalves and algae. The results were then classified based on their mobility which were sessile and motile and analysed based on the colonisation after three years and three months interval. After three years of being deployed, both artificial reefs had recorded a total of 11 sessile and 15 motile genera in April with a total density of 4,665.83 ind/m2 and 1,154.59 ind/m2 respectively. The changes in April-July 2019 had recorded a total of 14 sessile and 15 motile genera at both artificial reefs with a total of 5,306.39 ind/m2 and 1,362.84 ind/m2 respectively. In, July-October 2019, there were 13 sessile and 14 motile genera recorded at both artificial reefs and the density had increased to 8,037.35 ind/m2 and 1,439.29 ind/m2 respectively. The results had given the present status for the first "Rig-to-Reef" artificial reefs structure deployed in the east coast of Peninsular Malaysia and contribute to the knowledge of the macrofouling colonisation on decommissioned oil rig structure as artificial reefs.

Keywords: Macrofouling; colonisation; Rig-to-Reef; diversity; abundance

Implementation of Tilted Multibeam Echosounder Data and Random Forest for Shallow Water Marine Habitat Mapping

M. A. H. Muhamad[1*], and R. Che Hasan[1]

[1]*Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia*

**Corresponding author: hakim1991@graduate.utm.my*

Abstract: Wide coverage maps of the seafloor are essential for monitoring and managing marine environments, especially for very shallow water areas that have a variety of marine habitats. The existing data acquisition method, multibeam echosounder (MBES), is only able to generate a full coverage map within accessible-only areas due to the safe navigation factor during the MBES survey. The common practice to perform multibeam echosounder (MBES) surveys to extend the MBES coverage area in very shallow water area, is to tilt the sonar head to a certain angle, such that the outer beam is perpendicular to the nadir. Thus, this practice is used in this study to extend the coverage of the MBES survey and produce a wide coverage marine habitat map. In this study, Tioman Marine Park on the east coast of Peninsular Malaysia was used as a study area, and full MBES coverage was obtained across the study area. Bathymetry and backscatter were obtained by using the Kongsberg EM2040 MBES system, and were used to produce 11 MBES predictors, including aspect, curvature, ruggedness index, slope, backscatter mosaic 8-bit, angular range analysis (ARA) parameters (i.e., characterization and phi), gray-level co-occurrence matrix (GLCM) texture features (i.e., correlation, entropy, homogeneity, and mean). By incorporating the ground truth data and MBES predictors, a random forest (RF) algorithm was used to perform the supervised classification. The findings from variable importance analysis indicated that MBES predictors derived from bathymetry, such as bathymetric map (100%), ruggedness index (28.8%), and slope (16.6%), were more important to develop supervised classified image than other MBES predictors. Additionally, this study investigated the contribution of tilted MBES dataset when creating supervised classified image and their impact on marine feature detection and the overall accuracy of the model. The findings show that tilted MBES data resulted in good agreement feature detection and the best overall accuracy (98.0%). The results show how important it is to include the tilted MBES dataset when managing marine environments, especially near the coast where the water is very shallow.

Keywords: multibeam echosounder; tilted; random forest

Development of Marine Geospatial Data Model (MGDM) For Long-Term Research Repository: A Case Study in Pulau Bidong

Y. Mohamad[1], K. Ismail[1], and M.I. Khalil[1]

[1]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: yuzwanm@umt.edu.my*

Abstract: Spatial Data Infrastructure (SDI) is a framework of policies, institutional arrangements, technologies, and data, making it possible to share and use geographic information effectively via standardizing formats and protocols for accessibility and interoperability. SDI enables the integration of information from multiple disciplines for multiple purposes. However, it can be limited due to a scarcity of datasets and has not been fully integrated. For example, long-term periodical research sampling and project data often were collected without systematic cataloguing. Here, codings and attributes were developed for Marine Geospatial Data Model (MGDM). The study also involved the development of a WebGIS portal using ArcGIS online to enable end users with a simple, intuitive, and user-oriented interface to access the geodatabase. An integrated geodatabase was developed to store available marine and environmental datasets of Pulau Bidong. As a result, the MGDM will be centralized and systematically structured with formatting coordination for easy access. A Geodatabase in ArcGIS was created to organize the datasets in tables, raster, and vector format. The Geodatabase was developed conforming to "Malaysia Standard MS1759:2015, Geographic Information/geomatics – Feature and Attribute Codes". The project could potentially be implemented for a more comprehensive end-user and contribution to its metadata expansion.

Keywords: SDI, Geographic Information System, Geodatabase, WebGIS, ArcGIS Online

Trajectory of Floating Marine Litter along Pahang Coastline

M.A. Azman[1], M.Z. Ramli[2*], H.B. Goh[3] and Z. Zainol[4]

[1]*Department of Marine Science, International Islamic University Malaysia, 25200, Kuantan, Pahang, Malaysia*
[2]*Institute of Oceanography and Maritime Studies, International Islamic University Malaysia, 26610, Kuantan, Pahang, Malaysia*
[3]*Global Water Consultants Sdn. Bhd., 57000, Bandar Tasik Selatan, Kuala Lumpur, Malaysia*
[4]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: mzbr@iium.edu.my*

Abstract: Marine debris issues have been one of the major problems that every nation is facing around the world Several studies have reported the accumulation of marine debris both in Peninsular and East of Malaysia in terms of its distribution on different places, temporal and seasons effect and the major debris type found on Malaysian coastline. However, the study on route and trajectories of floating debris in Malaysia remains to be accomplished. In this study intensively focused the pattern of marine litter pathway, distribution and sources by a numerical approach that could be a better view and improve our knowledge on the behaviour and fate of marine debris in our coastline. Particle tracking model was used to provide 1) the possible sources of floating marine debris, 2) the distribution of floating marine debris during different seasons, and 3) the trajectory of marine debris released from our coastline. The Delft3D software was used to achieve the objectives of this study by using the lagrangian particle tracking module coupled with secondary data from ECMWF. Hydrodynamic and particle simulation has shown the agreement towards in-situ data observation.

Keywords: marine debris, plastic, numerical modelling, Malaysia

Sensitivity Analysis and Application of XBeach at Cherok Paloh Beach, Pahang, Malaysia

M.M. Abd Rahman[1], M.Z. Ramli[1,2*], and M.S. Ab Razak[3]

[1]Department of Marine Science, Kulliyyah of Science, International Islamic University Malaysia, 25300, Kuantan, Pahang, Malaysia.
[2]Institute of Oceanography and Maritime Studies (INOCEM), International Islamic University Malaysia, Kampung Cherok Paloh, 26060, Kuantan, Pahang, Malaysia.
[3]Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Malaysia.

**Corresponding author: mzbr@iium.edu.my*

Abstract: XBeach, a coastal response numerical model, developed to stimulate the nearshore and coastal processes. It is 2HD open-source process-based which includes short wave propagation, sediment transport, flow and bathymetry changes from difference wave spectral and flow boundary conditions. The mode is focus on horizontal circulations and effects of coastal evolution due to anthropogenic measures. In this case, the application of XBeach was used at Cherok Paloh Beach located in Pahang, Malaysia. The model stimulated an extreme storm event during Typhoon Rai, 11 to 21 December 2021. The case of the event was tested using 1D beach erosion test during the storm conditions. The evaluation of the sensitivity analysis for the profile (morphological changes) was compared and determine using an error indicator (Brier Skill Score) proposed by van Rijn et al., (2003). The sensitivity was tested using different morphological influenced parameters (facua, wetslp and dryslp) and been compared with the final beach profile to calculate the BSS. Based on the BSS, the validated value obtained then replicated to other 1D profile around Cherok Paloh Beach. Based on stimulated the default parameters tested shows overestimated erosion volume. The result obtained from the BSS, it revealed that the best model was obtained by changing the calibration parameter facua and wetslp.

Keywords: Geomorphology; Storm Surge; Numerical; XBeach; Typhoon Rai

Beach Morphology and Erosion Along Terengganu Coast

Nurul Aina Abdullah[1], Haris Abdul Rahim[1], Nor Aizam Adnan[1], Siti Aekbal Salleh[1], Fazly Amri Mohd2[2]

[1]*Centre of Studies Surveying Science and Geomatics, Faculty of Architecture Planning and Surveying, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia.*

[2]*Centre of Studies Surveying Science and Geomatics, Faculty of Architecture Planning and Surveying, Universiti Teknologi MARA Arau, Perlis, Malaysia.*

**Corresponding author: harisrahim@uitm.edu.my*

Abstract: Terengganu is the east coast of the peninsular Malaysia has been an attraction for many people to carry out economic activities such as tourism industry, agriculture, food, and industry. This study applied high resolution imagery like Landsat-8 OLI image using Remote Sensing and Geographic Information System (GIS) technique to monitor the coastline changes along five study locations. This study to quantify the coastal slope and erosion rate between three different years which are 2013, 2017 and 2021 along Terengganu coasts. The five significant coasts namely Pantai Rusila, Pantai Chendering, Pantai Batu Buruk, Pantai Seberang Takir and Pantai Menggabang Telipot. The aim of the study is the quantify beach profiling (geomorphology) and erosion at Terengganu which are from Pantai Rusila (Marang) to Pantai Menggabang Telipot (Kuala Nerus) for years 2013 to 2021. However, the coastal areas are exposed to the higher erosion process that accretion rate from -2.015 to -5.966 meter per year. The Google Earth had been used to derive the elevation profile to obtain value slope profile. The information of the coastal slope for surface was generated by calculating distance and elevation of the coasts. Hence, this study proven that satellite based platform which are Google Earth and SRTM can be used for the determination of coastline especially on the coastal slope and erosion rate.

Keywords: erosion; GIS; geomorphology; elevation; coastline

Tourist's Perception Towards Ecotourism Development And Management In Labuan Marine Park

W. Y. Lua1, N.H.A. Rasid1, W.I.A. W. Talaat1, and N. Aziz1,2*

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Faculty of Business, Economics and Social Development, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

Marine Park is an area where certain human activities are limited for the purpose of protection and conservation of habitats and species. It is an effective and vital measure to prevent the continuous declination of fisheries resources due to natural disasters and human activities. At the same time, it creates economic opportunities, namely tourism sector. The existence of marine parks promotes ecotourism and spread awareness on the importance of marine environment to tourists. Tourist's perception regarding the development of ecotourism in marine parks must be considered to balance the need for marine protection and conservation with their satisfaction in marine parks. Efficient management and development of marine parks can indirectly curb the degradation and destruction of ecosystems in the area. Hence, this study aims to explore the perception of tourists towards the development and management of ecotourism in Labuan Marine Park. This study employs quantitative approach, via questionnaire survey. The data was analyzed using SPSS software through descriptive and inferential statistical procedures. The survey was conducted within the local community in Federal Territory of Labuan, with a total sample of 101 respondents from nine villages. The findings showed that 97% of the respondents know that marine park is intended for marine conservation, and 95% know that marine park is managed by the Department of Fisheries. In addition, 55.4% of the respondents 'Strongly Agreed' that Labuan Marine Park had deteriorated due to surrounding developments. As a conclusion, the developments of marine parks should be monitored and regulated so that it meets the demand from tourists, and at the same time did not harm the surrounding marine ecosystems

Keywords: ecotourism; Labuan marine park; sustainability; tourist; awareness

Large-Scale Coral Reef Habitat Suitability Model using Multiscale Marine Landscape Mapping to Support Effective Ecosystem-based Marine Management

B. Yong[1*], and K. Ismail[1]

[1]*Faculty of Science and Marine Environment (FSME), Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia.*

[*]*Corresponding author: p4936@pps.umt.edu.my*

Abstract: Marine landscape classification models that use only abiotic data at their native spatial resolution lack sufficient ground- truth and tend to miss or skew from key conservation areas during marine spatial planning. This study aimed to determine whether spatial distribution modelling can be combined with multiscale, automated, and objective marine landscape classification to accurately determine ecologically relevant marine landscape clusters in Tioman Marine Park of Malaysia. Primary and secondary abiotic variables were collected and processed from multibeam bathymetry and backscatter data, ocean colour satellite imagery, and or hydrodynamic data models. The variables were replicated at 6 window analysis sizes and reduced using Principal Components Analysis (PCA) before undergoing K-means machine learning clustering to obtain thematic marine landscape map. Maximum Entropy spatial distribution modelling (MaxEnt) was then used to predict the probability of coral reef presence using ground-truth data. Parallel models were run to isolate and test each control and window analysis sizes The MaxEnt model based on PCA-derived and K-means clustered smarine landscape clusters had a very high explanatory power, AUC = 0.973 (0.001), in explaining coral reef habitat suitability. Removing both the K-means clustering and PCA yields higher accuracy AUC = 0.984 (0.003), but are observed to have Models for window analysis sizes of 1, 5, 15, 25, 35, 45, and 55 all have AUC values above 0.94, but only show marginally different explanatory power differences. Variables of higher window analysis sizes tend to have less data artefacts and have higher AUC values. The three most significant variables for predicting coral reef habitat suitability are observed to be slope (35 window analysis size), backscatter angular range (35 window analysis size), and negative profile curvature (55 window analysis size). Given the thematic nature of marine spatial planning for coral reef, coral reef seascape models suffice as a source of baseline spatial unit that delineates potential conservation priority zones.

Keywords: Marine Landscape, Coral Reef, Maximum Entropy, Multiscale, Marine Spatial Planning

High-resolution Habitat Suitability Modelling to support Marine Spatial Planning

W.R.W.M. Akif [1] and K. Ismail[1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: p4528@pps.umt.edu.my*

Abstract: Reef-building corals play an important role in shallow tropical seas by providing an environmental basis for the ecosystem. Acropora is one of the largest extant genera of reef-building corals, and among the most widespread in the Indo-Pacific oceans. Out of all the coral families, Acropora has a better growth rate than the others. This has led to the emergence of modelling methods to predict the occurrence of suitable habitat for the conservation planning in data-sparse areas. Habitat suitability modelling is being used to predict distribution patterns of coral reef, where data are particularly sparse, and the models are considered useful for marine ecosystem management. UMT marine research station is located in Pulau Bidong, approximately 30 km off Terengganu coast and multiple studies have been carried out to better understand the coral reef ecosystem in and around the research station. As a UMT marine research station, multiple studies have been carried out to understand the coral reef ecosystem at Pulau Bidong. The maximum entropy modelling was used to predict the distribution of genus Acropora at a spatial resolution of 19.75 m. Coral occurrences were extracted from video data and multiple terrain parameters were derived from multibeam bathymetry data. Outcome of the model shows the prediction of genus Acropora spatial distribution around Pulau Bidong in relation to the terrain based environmental variables. Results show that rugosity (76.1%), depth (14.9%) and slope (7.9%) played a significant role in driving the genus Acropora spatial distribution. These predictions provide an important background for marine spatial management for future planning.

Keywords: coral reef, Habitat Suitability Modelling, MaxEnt, mapping,

LDPE microplastics induced differential stress responses in two amphipod species

B. Rani-Borges[1,2], R. Meitern[3], **P. Teesalu**[4*], M.Raudna-Kristoffersen[3], R. Kreitsberg[3,4], M. Heinlaan[5], A. Tuvikene[4], A. Ivask[1]

[1] *Institute of Science and Technology, São Paulo State University, UNESP, 3 de Março Avenue 511, Alto da Boa Vista, Sorocaba, São Paulo 18087-180, Brazil*
[2] *Institute of Molecular and Cell Biology, University of Tartu, Riia 23, 51010 Tartu, Estonia*
[3] *Department of Zoology, Institute of Ecology and Earth Sciences, University of Tartu, J. Liivi tn 2, 50409 Tartu, Estonia*
[4] *Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Kreutzwaldi 5, 51014 Tartu, Estonia*
[5] *National Institute of Chemical Physics and Biophysics, Akadeemia tee 23, 12618 Tallinn, Estonia*

**Corresponding author:* paul.teesalu1@gmail.com

Abstract: The lack of microplastics (MP) toxicity studies involving environmentally relevant concentrations and exposure times is concerning. Here we analyzed the potential adverse effects of LDPE MP at environmentally relevant concentration and during sub-chronic exposure to two amphipods *Gmelinoides fasciatus* and *Gammarus lacustris*. These two species compete with each other and occur in freshwater and brackish water. 14-day exposure to 2 µg/L (8 particles/L corresponding to low exposure) and 2 mg/L (~8400 particles/L, corresponding to high exposure) of 53-100 µm LDPE MP were used to assess the ingestion and egestion of MP, evaluate its effects on amphipod mortality, swimming ability and oxidative stress level. Both amphipod species were effectively ingesting and egesting LDPE MP. On average, 0.8 and 2.5 MP particles were identified in the intestines of each amphipod exposed to 2 µg/L and 2 mg/L LDPE MP, respectively. Increased mortality of both amphipods was observed at 2 mg/L LDPE MP exposure and in case of *G. lacustris* also at 2 µg/L. The effect of LDPE on swimming activity was observed only in case of *G. fasciatus*. Oxidative stress marker enzymes SOD, GPx and reduced glutathione GSH varied according to amphipod species and LDPE MP concentration. In general *G. lacustris* was more sensitive towards LDPE MP induced oxidative stress and induced higher number of oxidative stress markers. Overall, the results suggest that in MP polluted environments, *G. lacustris* may lose its already naturally low competitiveness and become overcompeted by other more resistant species.

Keywords: Invertebrates, crustaceans, swimming activity, physiological change, paraquat.

Pollutants in Baltic Sea commercial fish catches

A.Tuvikene[1*],, R. Freiberg[1], E. Usin[2], M. Nurmik[2], P. Teesalu[1]

[1]*Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Kreutzwaldi 5, 51006 Tartu, Estonia*

[2]Centre for Environmental analyses, Marja 4d, 10617 Tallinn

**Corresponding author: arvo.tuvikene@emu.ee*

Abstract: The content of priority pollutants in several commercial fish species was investigated, with special attention to human food safety. The contents of pollutants specified in Regulation 1881/2006 of the European Commission were checked in fish. High levels of dioxins and dioxin-like PCBs influence the recommendations for eating Baltic Sea fish the most. The dependence of the concentration of pollutants on fish length and fatness was analysed for Baltic herring (*Clupea harengus membras*), sprat (*Sprattus sprattus balticus*), Atlantic salmon (*Salmo salar*) and river lamprey (*Lampetra fluviatilis*). In the case of herring, both spring and autumn spawning herring were analysed. Highest concentrations of the named pollutants among the studied fish were found in Atlantic salmon and river lamprey which both compose a minor part in the diet of the average Estonian eating on average 136 g of fish per week, thus the risk from dioxins and dioxin-like PCBs remains negligible. Still, establishing national consistent monitoring for food safety in wild fish is of primary importance.

Keywords: Baltic Sea, commercial fish, priority pollutants, food safety.

Widespread Occurrence of Microplastic in Islands on the North coast of Peninsular Malaysia using Bivalve as Bioindicator

Intan N.M.G.[1*], Fuad M. [2], A.Razali [3], N.A.Hassan [4], Wan Siti Mardhiah W.J. [1], K. Yunus [1], M.Z.Ramli [2]

[1]Department of Marine Science, Kulliyyah of Science, International Islamic University Malaysia (IIUM), Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang.
[2] INOCEM, Kulliyyah of Science, International Islamic University Malaysia (IIUM), Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang.
[3]Department of Chemistry, Kulliyyah of Science, International Islamic University Malaysia (IIUM), Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang.
[4]Department of Community Medicine, Kulliyyah of Medicine, International Islamic University Malaysia (IIUM), Kuantan Campus, Bandar Indera Mahkota, 25200 Kuantan, Pahang.

**Corresponding author: fuadm@iium.edu.my*

Abstract: Microplastic availability in the marine environment threatens marine organisms and humans. It had been observed in human blood and feces, which indicated that microplastics were able to infiltrate into the human food chain. Previous research on microplastic in Langkawi coastal waters has been proven by analyzing rock oysters as bioindicators. This study aimed to determine the quantity and diversity of microplastics in *Saccostrea cucullata* in islands on the North coast of Peninsular Malaysia by determining microplastic abundance, types, and polymer composition and the potential health risk of microplastic by consuming *Saccostrea cucullata* that had been contaminated. The hazard quotient (HQ) used in this study was a pilot test to understand the impact of microplastics consumed by humans. *Saccostrea cucullata* were collected from 9 selected rocky shores along the coastal waters of Langkawi and Penang. The digestion protocol used was 50mL of 10% (w/w) potassium hydroxide (KOH) solution with a heating temperature of 60^0C for 24 hours and a floatation technique for 8 hours with 50% potassium iodide (KI). Isolated particles collected from the soft tissue of *Saccostrea cucullata* were examined under a stereo microscope for physical identification and characterized by ATR-FTIR for polymer identification. Of 39 particles found, 59% were confirmed as polymers, and the rest were unidentifiable. Microplastic abundance was 0.0499 to 0.4029 items/wet weight and 0.0667 to 0.4333 items/individual. Typical physical characteristics of microplastic found were filament-shaped, black with sizes between 167.93 µm and 11268 µm. The HQ values for all the sampling sites were unacceptable and exceeded 1. The data collected served as a baseline for investigating microplastic contamination in islands on the North coast of Peninsular Malaysia. The study presented in the manuscript was fully funded by the Fundamental Research Grant (FRGS19-057-1744), Ministry of Higher Education (MOHE), Malaysian Government.

Keywords: Microplastics; Rocky shore, *S. cucullata*; FTIR analysis; Health risk analysis

Microplastics Assessment Using Rock Oyster (*Saccostrea* cucullata) in Tioman Island, Pahang

W. S. Mardhiah[1], Fuad. M.*[2], M. H. Khairuddin[1] A. Razali[3], N. A. Hassan[4], Intan N. M. G.[1], Kamaruzzaman Y.[1], Zahir R[1].

[1]*Department of Marine Science, Kulliyyah of Science, International Islamic University Malaysia (IIUM), Bandar Indera Mahkota 25200 Kuantan, Pahang.*
[2]*Institute of Oceanography and Maritime Studies (INOCEM), Kulliyyah of Science, IIUM, Kg Cherok Paloh 26100 Kuantan.*
[3]*Department of Chemistry, Kulliyyah of Science, IIUM, Bandar Indera Mahkota 25200 Kuantan, Pahang.*
[4]*Department of Community Medicine, Kulliyyah of Medicine, IIUM, Bandar Indera Mahkota 25200 Kuantan, Pahang*
**Corresponding author: fuadm@iium.edu.my*

Abstract: Microplastics are industrial contaminants that have a diameter of less than 5 mm. They are originated from either directly manufactured as one of ingredients of products or broken down from large size plastics. The ubiquitous presence of microplastics in the marine environment raises concerns about their influence on the food chain as it could transferred vertically through food chain from planktons to human food. The contamination impact of microplastic using rock oysters (*Saccostrea cucullata*) as bioindicator on Tioman Island coastal water was explored in this study. The analysis revealed that rock oyster samples from eight sampling locations throughout Tioman Island were contaminated with microplastic. Microplastics were found at 0.02 items/g and 0.02 items/individual in rock oyster samples obtained from Tioman Island on average. The most common microplastic was fibres, which were followed by films of various sizes and colours. The presence of microplastic in seafood would have harmful effects on human health. As a result, a thorough examination of microplastic contamination in seafood should be carried out in order to gain a better knowledge of the consequences as well as for future reference. This study's findings can be utilized to establish a baseline level of microplastic contamination in Tioman Island's rock oyster.

Keywords: Rock oyster; microplastics; Tioman island

IMPACT OF SEA LEVEL RISE TOWARDS VULNERABILITY AND SOCIO-ECONOMY OF PAHANG COASTLINE

N.A.N. Ibrahim[1*], J. Mohamed[1], and M.F. Miskon[2]

[1] *Institute of Oceanography and Maritime Studies, International Islamic Universiti Malaysia, 26610, Kuantan, Pahang, Malaysia*

**Corresponding author: Arifahnajihah.i@live.iium.edu.my*

Abstract: Due to the significant impact of climate change, sea level rise has emerged as one of the biggest threats and most worrying challenges to the sustainable development of coastal area. The coastal infrastructure is currently being substantially impacted by sea level rise due to coastal flooding and erosion. The mixed method approach was used in this study to determine the sea level rise impact on the vulnerability and socio-economic of the coastal community in Pahang. A questionnaire survey was used to examine the selected coastal community perceptions and knowledge of the sea level rise impact on their daily socioeconomic. A map of the coastal vulnerability index (CVI) for the Pahang coastline was created by observing the shoreline in person and superimposing it over a satellite image. The change in coastline indirectly affects the socioeconomic of coastal communities. Several sea level rise impacts were found during this study, but most of the coastal communities were not aware of the causes. Coastal changes from the CVI map were found to affect the daily lives of the coastal community. This study will help the local authorities and coastal users with proper coastal zone management facing rising sea levels.

Keywords: sea level rise; vulnerability; socioeconomic impacts; erosion;

Length-Weight Relationship Of 30 Most Abundant Fish Species In The Setiu Wetlands, Terengganu, Malaysia

S.A.K. Siti TafzilMeriam[1,2*], S. H. Nur Farah[3], M.L. Husain[1,2], M.A. Ambak, H. Motomura[4], and M.A. Ghaffar[5]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Mangrove Research Unit (MARU), Institute of Oceanography & Environment (INOS), Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*
[3]*IOI City Farm, AT-6, Level 2 IOI City Mall, Lbh IRC, Ioi Resort, 62502 Sepang, Putrajaya*
[4]*The Kagoshima University Museum, 1-21-30 Korimoto, Kagoshima 890-0065, Japan*
[5]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*
[6]*Institute of Tropical Aquaculture Tropical and Fisheries (AKUATROP), Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia.*

**Corresponding author: sititafzil@umt.edu.my*

Abstract: Assessment of length-weight relationships of 30 most dominant and commonest fish species was conducted from samples collected monthly from June 2011 to July, 2012. A total of 10,885 fish specimens comprising of 30 fish species belonging to 19 families were caught using gill nets, trawls and fish trap. The results obtained showed that the exponent b values varied between 2.150 for *Ambassis kopsii* and 4.024 for *Secutor ruconius*. Seven-teen fish species exhibited positive allometric growth, 11 fish species were negative allometric growth and 2 fish species had isometric growth. The 30 abundant and commonest fish species from the Setiu Wetlands were presented for the first reference of length-weight relationships, and most of the fish specimens were juveniles that indicating the role of wetlands as a nursery area. This study has provided an important data on length-weight relationship to compare the population of the same species from the different areas environments.

Keywords: Allometric growth; fish populations; length-weight relationship; Setiu Wetlands

Awareness of Protective Mechanisms Against Traditional Knowledge of Marine Resources Among Coastal Communities in Peninsular Malaysia

A.F.M. Arzaman[1], H.S. Salleh[1*], N.H.N. Mat[1], and W.I.A.W. Talaat[2]

[1]*Faculty of Business, Economics, and Social Development, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*
[2]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: hayatul@umt.edu.my*

Abstract: Traditional knowledge is vital as a cultural identity of the local community in Malaysia toward sustainable development. Nevertheless, it appears to be increasingly disregarded and less protected against traditional knowledge of marine resources in the modern era. This study aims to explore the awareness of protective mechanisms against the use of traditional knowledge based on marine resources among coastal communities. A qualitative research approach was employed and a total of 117 respondents were interviewed. A method of convenient and purposive sampling was utilized to identify respondents, and thematic analysis was employed for data analysis. The findings of the study revealed that awareness of copyright and traditional knowledge protective mechanisms is still low among coastal populations. Despite this, the majority of respondents are aware of the significance of safeguarding marine resources to ensure that they are preserved for future generations and livelihoods. The potential of traditional knowledge based on marine resources illustrated an opportunity for these practices and traditions to become their property and trademark without being exploited by third parties among coastal communities. This study has the potential to switch the opinion among local communities on the significance of protecting biodiversity and intellectual property rights for their well-being. The implications of this study can be seen from the theoretical and policy implications. Based on the findings of this study, it is recommended to broaden the scope of the investigation to include the Borneo region in Malaysia in order to collect a greater variety of viewpoints. Additionally, a quantitative method may be utilized in order to obtain a wider range of perspectives.

Keywords: traditional knowledge; marine resources; protective mechanism; coastal communities

Morphological Evolution Along Selected Coasts of Pahang and Johor

U.N. Salin[1], M.Z. Ramli[2], S.A.T. Hikmatullah Sahib[2], and N.A.N. Ibrahim[2]
[1]*Department of Marine Science, Kuliyyah of Science, International Islamic University of Malaysia, Malaysia*
[2]*Institute of Oceanography and Maritime Studies (INOCEM), International Islamic University of Malaysia, Malaysia.*

Abstract: Morphological evolution of a coast occurs naturally and could be exacerbated by anthropogenic activities. In a natural setting, the evolution would be able to recover by itself with time but due to the influence of human activities, these recoveries tend to not occur. Furthermore, the issue of sea level rise that has been continuously highlighted is an example of the said natural factors that has been exacerbated by human activities. The potential increase in sea level rise may cause detrimental effects such as worsening conditions of monsoon seasons and the occurrence of wave overtopping on coastal areas. Over the past few years, the effects of monsoon towards the Malaysian coastal area that has caused damage to properties, roads, and other infrastructures. This study highlights the changes that occur to the selected coasts of Pahang and Johor during the different monsoon seasons of 2021 and 2022. Sampling sites are chosen due to the presence of coastal structures such as revetment, groynes, seawall, and geobag which were identified via satellite imagery and site observation. The results signify that during the Northeast monsoon, most of the coasts experience erosion with the greatest change to be found at Hulu Tering, Pahang and Tanjung Kempit, Johor.

Keywords: Morphological evolution; Sea Level Rise; Beach profiling; East Coast Peninsular Malaysia

Vibrio abundance in relation to phytoplankton and environmental parameters in Kepulauan Sembilan Perak

Suriyanti Su Nyun Pau[1,2], Teng Shi Yii[1], Nur-Ain Omar[1], Nur Farah Zaini[1], Nur Khayyirah Zamri[1], Khoo Mei Ling[1,2*], Rozaimi Jamaluddin[1,2], Zaidnuddin Ilias, Md. Nizam Ismail, Mohamad Saupi Ismail[3]

[1] Department of Earth Sciences and Environment, Faculty of Science and Technology, Univesiti Kebangsaan Malaysia, 43000 Bangi, Selangor.

[2] Marine Ecosystem Research Centre Pusat (EKOMAR), Faculty of Science and Technology, Univesiti Kebangsaan Malaysia.

[3] Fisheries Research Institute, Batu Maung, 11960 Pulau Pinang, Malaysia.

*Corresponding author: meilingkhoo@ukm.edu.my

Abstract

Vibrio population dynamics varies biogeographically depending on the environmental conditions and bacterial-algal interaction. Many studies had mainly focused on the temperature and salinity influences on *Vibrio* temporal distribution but its association with the phytoplankton community is still unclear. This study emphasized on the *Vibrio* abundance in Kepulauan Sembilan and aimed to elucidate its relationship with environmental parameters and phytoplankton assembly. The seawater physical parameters were collected in-situ and the nutrients and Chl-a saturation were analyzed using standard procedures in the laboratory. Vibrio sample were collected in sterile bottles and inoculated aseptically on CDVP plates and incubated at 37 ºC for 24 hours. The grown colonies of *Vibrio* were manually counted and expressed in CFU/ml. Quantitative phytoplankton samples were collected using a 1L Vandorn sampler and enumerated microscopically. The total count of *Vibrio* was 291 CFU/ml and recorded the highest abundance in PBL. Meanwhile, Phytoplankton total abundance was 2.04 $\times 10^4$ cells L^{-1} comprising 71% diatoms and 29% dinoflagellates. PCA analysis showed positive correlation of *Vibrio* to temperature, phytoplankton abundance and Nitrate concentration. It was found that *Vibrio* preference towards the warmest water in PBL at 30 ºC were linked with the presence of high biovolume *Dytilum* diatom species. Consequently, *Vibrio* relationship with Nitrate concentration could be a result from bacterial-algal interaction in oligotrophic ocean. This study conclude that the biogeographic variability of *Vibrio* was attributed to warmer waters and possibly highly affected by the limiting nutrients that affect the phytoplankton species most favoured for *Vibrio* attachment. This study indicate that estimation of *Vibrio* abundance should take into account the phytoplankton composition in the survey area.

Keywords: biovolume; diatoms; nitrate; temperature; tropics

THE UTILIZATION OF TRADITIONAL KNOWLEDGE DUE TO CLIMATE CHANGE IMPACT TOWARDS ISLAND COMMUNITIES' SOCIAL WELLBEING: THE MEDIATING EFFECT OF ADAPTIVE CAPACITY

Nurul Syamimi Samsuddin, Hayatul Safrah Salleh Wan Izatul Asma Wan Talaat and Jumadil Saputra

Faculty of Bussiness,Economics and Social Development, Universiti Malaysia Terengganu, 21030 Kuala Terengganu Malaysia

Institute of oceanography and Environment, Universiti Malaysia Terengganu, 21030 Kuala Terengganu Malaysia

Abstract: Climate change is undeniably the greatest issues and the impacts of climate change are growing, and particularly in Malaysia, studies show around the globe, increasingly unpredictable weather patterns and extreme weather events are observed. Since knowledge of the traditional knowledge on climate change could affect the success of implementation and mitigation options, it is essential to conducts assessments to gather such information and adaption. This study uncovers the potential of traditional knowledge from the perspective of island communities in Terengganu, Malaysia, on Pulau Redang and Pulau Perhentian, and explores how island communities use traditional knowledge to monitor and respond to local climate change. For this reason, two islands were chosen for this study as the size of the island and its topographical features play a key role in climate change. The knowledge level of respondents was covering level of awareness, their perceptions on climate change issues, their adaptation measures, their socioeconomic activity and the effect on their lives. It also sought to identify respondents' views and perceptions of how traditional knowledge can be used to address the impacts of climate change on social wellbeing. Data was collected through a closed-ended questionnaire and analysed using SmartPLS software to test the hypotheses. The results showed that traditional knowledge (cultural beliefs, cultural practises and personality traits) significantly supported the impact of climate change on social wellbeing and adaptive capacity mediated the relationship between traditional knowledge (cultural beliefs, cultural practises and personality traits) and climate change on social wellbeing in the island communities of Pulau Redang and Pulau Perhentian. Thus, Traditional knowledge (TK) has a positive influence on the impact of climate change on social wellbeing. Accordingly, communities preserve their traditional knowledge through cultural practises, cultural beliefs and personality traits that are passed on orally from one generation to the next.

Keywords: Climate Change, Traditional Knowledge, Personality Traits, Adaptive Capacity, Ocean Governance.

Do Depth of Deploying Artisanal Fish Traps Affect Bycatch Distribution in Bidong Archipelago?

M. M. Aiman[1], Noraeini Hj. Mokhtar[2], Mazlan Abd. Ghaffar[3], Ahmad Fitriadhy[4], and Moe Shwe Sin[5] and Hisam Fazrul[6*]

[1,6]*Faculty of Fisheries and Food Science, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*

[2]*Institute of Oceanography and Environent, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*

[3]*Institute of Tropical Aquaculture and Fisheries, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*

[4]*Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*

[5]*Faculty of Business, Economics and Social Development, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia.*

**Corresponding author: aiman.masud6395@gmail.com*

Abstract: Fish traps are commonly used to entrapped high commercial value of demersal fishes. Most of the fish trap are left for several days in the open sea. The fish landing from artisanal fish traps will contribute to high composition of bycatch. However, incidental catch of non-targeted species or bycatch which have highly threaten to the health of fish population and crucial for sustainable fisheries, and regrettably lacking bycatch data in coastal area. The study aims to assess the bycatch composition of artisanal fish traps in Bidong Archipelago in Terengganu, East Coast of Peninsular Malaysia. The sampling was carried from January to February 2022. There were nine sampling stations at Bidong Archipelago with different water depth (10m, 15m, 20m). Each station include~~d~~ with 0ne fish trap with the height, width, length dimension of 1.0 m x 1.3 m x 1.5m respectively. The traps were designed using mesh wire with mesh size of 2.54cm and funnel was made up as oval shape with wide of 6cm and the length of 25cm with 25cm depth, respectively. A total of 201 bycatch individuals from 10 fish species were recorded, and the most dominant species of bycatch recorded were *Arothron stellatus* (71; 35.3%) followed by *Chiloscyllium punctatum* (70; 34.8%) and *Scarus ghobban* (17; 8.5%), respectively. The most abundance bycatch recorded were depth of 10 meter with 97 individuals (48.3%) from total of 201 total bycatch. Therefore, depth of 10 meter contribute to high composition of bycatch. The result of this study indicates that depth does affect the composition of bycatch by the artisanal fish traps. Thus, selection on fishing area for artisanal fish traps must be more precise towards sustainable coastal fisheries management.

Keywords: Coastal Fisheries, Fish traps, bycatch

Assessment of serotonin precursors and selective serotonin reuptake inhibitor (SSRI) from fluoxetine, tryptophan, and glycine in reducing cannibalistic behavior among hybrid grouper (*Epinephelus lanceolatus* ♂) - (*E. fuscoguttatus*♀) juvenile

Abstract

Cannibalism is a predatory feeding action that involves killing and eating individuals of the same species. The phenomena seem serious in grouper hatchery especially at nursery stage. Experimental was design to assess the effect of serotonin to reduce occurrences of cannibalism. Hence, the study was conducted to evaluate the serotonin precursors and serotonin reuptake inhibitor through fluoxetine, tryptophan and glycine. Juvenile hybrid groupers were divided into six treatment groups with duplicate. Group 1 receive fluoxetine treatment, Group 2 - tryptophan, Group 3 - glycine, Group 4 - fluoxetine + tryptophan, Group 5 - fluoxetine + glycine, while Group 6 will be a negative control. The data taken for analysis included survival rate (SR), feed conversion ratio (FCR) and specific growth rate (SGR). Several samples of blood serum were taken from hybrid grouper juvenile for the quantification of serotonin level by using Serotonin ELISA kit. Result from the present experiment showed that tryptophan supplemented diet (1%) significantly ($p<0.05$) increased the survival rate of hybrid grouper juvenile from 20.50% in control group to 47% in tryptophan without affecting the growth performance. Other treatment, only showed a slight increase in the survival as compared to control group but not statistically significant ($p<0.05$). Group 3 that supplemented with 1% glycine showed increment in serotonin level and survival rate but not significant. The two tryptophan supplemented groups, Group 2 and 4 showed a high serotonin concentration as compared to others. Mix treatment group did not show any significant increase in the serotonin level and also the survival rate of hybrid grouper juvenile. Based on the results of the study, diet supplemented with 1% of tryptophan can increase the serotonin level in blood serum of hybrid grouper juvenile and subsequently result in better survival rate.

Key words: Serotonin, Cannibalism, Growth performance, Hybrid grouper

INFLUENCE OF CLIMATE CHANGE TO BEACH MORPHOLOGY AT KEDAH AND MELAKA COAST

Muhammad Haziq Bin Mohd Subri

IIUM Kuantan Campus, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25200 Kuantan, Pahang Darul Makmur, Malaysia.

Corresponding author: haziqsubri97@gmail.com

Abstract: Climate change has cause severe impacts on the coastal region like erosion. The changes on beach morphology are linked to number of parameters such as waves, current, tides, wind, and periodic storm. Also, sea level rise (SLR) is one of the most concerning effects from climate change along with the parameters. Therefore, this study is to investigate the beach morphological changes (beach profile) in different seasonal monsoons (NEM and SWM) at the coast of Kedah and Melaka. The investigation on beach morphological changes were done in December 2021, February, April, August, October, and December 2022 at selected sites through total station reading and aerial images (drone). The result shows that the beach morphology have experienced either erosion or accretion during the period of study. In conclusion, the climate changes do influence the changes on the beach morphology during the study period.

Keywords: Climate change; seasonal monsoons, beach profile; Kedah; Melaka

Microplastics ingestion by estuarine nereidid polychaete (*Namalycastis* sp.) from the South China Sea

Y.S. Ibrahim[1*], S.R. Hamzah[1], R. S. Altrawneh, S. T. Anuar, W.M.A. Wan Mohd Khalik and P. Kolandhasamy[2]

[1]Microplastic Research Interest Group, Faculty of science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia
[2] Coastal and Marine Ecology Division, Gujarat Institute of Desert Ecology, Bhuj-Kachchh 370001, India

**Corresponding author: yusofshuaib@umt.edu.my*

Abstract: This research investigated the microplastics (MPs) ingestion by estuarine polychaete (*Namalycastis* sp.) in Setiu Wetlands, South China Sea. Samples were collected bimonthly between November 2016 and November 2017, from six sampling stations covering from southern to the northern parts of Setiu Wetlands. MPs in 95 specimens of polychaetes were extracted following the digestion process in an alkaline solution (10 M NaOH). The samples were identified by physical characterisation (microscopic observation and Scanning Electron Microscope (SEM)), and chemical characterisation (LUMOS Fourier Transform Infrared Microscope (μ-FTIR). A total of 3277 items of MPs was found from *Namalycastis* sp. Filament shape and transparent colour, identified as polypropylene and polyamide, were dominated in all samples. Principal component analysis demonstrated the dominance of microplastics probably because of the influx of the open sea and from the aquaculture activities, reflected the potential risk to living organisms in Setiu Wetlands. This finding provided valuable baseline knowledge on the distribution of MPs in Malaysian wetlands and South China Sea.

Keywords: Microplastic contamination; Bait worms; Rotten nypa; South China Sea; Polypropylene

Local Perception and Knowledge on Socio-economic Impacts of Sea Level Rise in Pantai Cherating and Pantai Pelindung, Pahang, Malaysia

I. N. Nadhirah[1*], M. Juliana[2], M. M. Fuad[2], I. A. Najihah[1] and H. H. Salwani[1] [1]Department of Marine Science, Kulliyyah of Science, International Islamic University Malaysia, 25200, Kuantan, Pahang
[2]Institute of Oceanography and Maritime Study (INOCEM), Kulliyyah of Science, International Islamic University Malaysia, 25200, Kuantan, Pahang
*Corresponding author: nadhirah.iskandar@live.iium.edu.my

Abstract: Sea level rise is a challenge faced by all coastal communities and the impacts of sea level rise include coastal erosion and coastal flooding during monsoon season. It is important to construct regulations and policies to reduce the socio-economic impact of sea level rise towards coastal communities. Public participation in coastal management is critical in mitigating the impact of sea level rise effectively. However, no studies have been found to determine coastal community perception and economic loss. This study aims to determine the local community's perception and knowledge of sea level rise and identify the types and values of socio-economic loss experienced by the locals due to sea level rise. Tourism operators and local communities that reside 2 km from the shoreline in Pantai Cherating and Pantai Pelindung were selected as respondents of a questionnaire survey. The questionnaire has been structured in four items: the knowledge, perception and adaptation of sea level rise and the impact towards their daily life and economic income. From our observations, the respondents have moderate interpretation in terms of knowledge and perception of sea level rise. The economic loss faced by tourism operators includes destruction of buildings and they build hard structures as their own initiative to minimize the level rise impact. Thus, this study is critical in determining the next action that should be taken in the management of coastal areas that are at high risk of sea level rise.

Keywords: sea level rise, coastal community, impact, knowledge, perception

Assessing Spatial Variation on Microplastics Abundance in Kuantan River Water

M.D. Munirah[1], M.M. Fuad[2], and F. Fikriah[1]*

[1]*Department of Marine Science, Kulliyyah of Science, International Islamic University Malaysia, 25200 Kuantan, Pahang, Malaysia.*
[2]*Institute Oceanography and Maritime Studies, Kulliyyah of Science, International Islamic University Malaysia, 25200 Kuantan, Pahang, Malaysia.*

**Corresponding author: fikriahf@iium.edu.my*

Abstract: Microplastic contamination is largely acknowledged as a global concern that endangers natural ecosystems and human health. Since the mass production of plastics began in the 1940s, little attention was given to the role of rivers as debris pathways to the sea. This preliminary study is to investigate the microplastics abundance in Kuantan River water. Microplastics were extracted via floatation method, counted, and categorized by shape, color, and size under the stereomicroscope, while the polymer groups were identified using FTIR. Generally, microplastics were found in all water samples although no significant spatial variation on microplastic abundance was observed. The findings showed the shape of threadlike fibers predominates while black and blue are the most significant colors found in the water samples of Kuantan River. The size of microplastics found in the samples was mostly 1000 µm or below with polyethylene (PE) and polypropylene (PP) are the predominates polymer groups. The diverse findings along the selected sampling stations of Kuantan River reflect various sources such as fisheries activities, water treatment plants, and surface runoff. Thus, this study could provide a baseline data for further research in this area.

Keywords: microplastics, river water, polymer, marine debris

The Effect of Rock Armour Thickness on Wave Overtopping Performance at Coastal Revetments

N.A. Mohamad[1], M.S. Ab Razak[1*], B. Yusuf[1] and A.M. Amiruddin[2]

[1]*Department of Civil Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.*
[2]*Department of Environmental Management, Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.*

**Corresponding author: ar_shahrizal@upm.edu.my*

Abstract: Rock revetments are expected within the landscape of coastal areas. The structures are built for various purposes, such as beach erosion control and slope protection of coastal bunds or reclaimed land. The slopes are rough, porous and permeable; therefore, the wave energy is dissipated effectively. Rock revetments are designed to limit waves overtopping discharges. The armour layer is conventionally designed for two-unit diameters thick. Large overtopping discharges may hazard the structures and the areas defended. The growing trend and impact of climate change in the coastal zone demand a more advanced rock revetment design. An increase in the thickness of the armour layer is expected to reduce the wave energy further, increasing the overtopping performance. This study investigates the influence of an increase in rock armour thickness on mean wave overtopping discharge at rock revetment. Small scale two-dimensional physical model tests on a 1:3 rock revetment with a composition of armour layer (D_{n50a} = 45mm), underlayer (D_{n50u} = 10mm) and an impermeable core were performed in the wave flume of the Department of Civil Engineering at Universiti Putra Malaysia. The wave flume has a length of 20 m, a width of 1.5 m and a height of 1.2 m equipped with a piston-type wave paddle and active wave absorption system. An array of wave gauges was installed before the model structure to measure the wave parameters. The tests were first conducted for the conventional two-unit diameter thick armour layer ($2D_{n50a}$) at different crest freeboards and wave conditions. Each test consisted of approximately 1000 irregular waves based on the JONSWAP spectrum with a peak enhancement factor of 3.3. Then, the tests were repeated for the three-unit diameter thick armour layer ($3D_{n50a}$). The conventional two-unit diameter thick armour layer was taken as the reference case, which exhibited an overall good agreement with empirical predictions by EurOtop 2018. The measured mean overtopping discharges are within the scatter of the 90% confidence band of the EurOtop 2018 empirical predictions. Increasing the armour layer thickness from two to three-unit rock diameter appeared to increase the wave overtopping performance of the rock revetment.

Keywords: physical model; rubble mound; coastal protection

Assessing the impact of sea level rise to the island communities on Perhentian Islands and Redang Island Malaysia

Nazli Aziz[1, 3], Amri Md Shah[2], Lee Hin Lee[2], Wan Izatul Asma Wan Talaat[1], Nur Azura Sanusi[3], Nor Hafzan Abd Rasid*[1] & Naieman Muhammad[4]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

[2] *Coastal Management and Oceanography Research Centre, National Water Research Institute of Malaysia (NAHRIM)*

[3] *Faculty of Business, Eonomic and Social Development, 21030, Kuala Nerus, Terengganu, Malaysia* [4]*Lembaga Sumber Air Terengganu (LAUT), 20200 Kuala Terengganu, Terengganu Darul Iman *Corresponding author: hafzan.abd@umt.edu.my*

Abstract: Ocean is a "carbon sink" that absorbs a large amount of carbon dioxide that prevents the release of this gas directly into the upper layer of the atmosphere. Climate change to some extent has disturbed this function. Climate change has caused sea level increased and has impacted the ocean ecosystems. Center for Coastal and Oceanographic Studies, National Water Research Institute of Malaysia (NAHRIM) predicts a rise of sea level up to 1,064m in 2100 The prediction will impact and increase the vulnerability of island and costal community socioeconomics directly. Hence, this study aims to analyze the knowledge and awareness among the island communities related to the impact of sea level rise on Perhentian Islands and Redang Island. This study found that Perhentian Islands' community is more vulnerable and has high awareness of the sea level rise impact toward community's socioeconomics. The findings of the study show that the majority of respondents on Redang Island (55.0%: 55 people) and Perhentian Islands (68.0%: 68 people) are aware of the sea level rise phenomenon in their surroundings. A total of 50.4 percent of respondents stated that the rise in sea level on these two islands is noticeable and can be seen clearly through naked eye observation. This study also indicates the differences of the community's awareness and concern towards sea level rise based their settlement location. It is hoped that the results of this study will useful to provide vital information to the various authorities in the management and planning in implementing mitigation and adaptation approaches to reduce the impact of sea level rise to the vulnerable island community.

Keywords: sea level rise, community, sosioeconomics, impact, awareness, knowledge

Evaluating the Attitude and Behaviour of Redang Island's Community Towards Sustainable Waste Management

N. F. A. Razak[1], A. R. A. Latip[1], N. H. A. Rasid[2], N. Aziz[1,2], C. D. M. Safuan[2], Maizah M. Abdullah[3], Sabiqah Tuan Anuar[3], W. I. A. Talaat[2*]

[1]*Faculty of Business, Economics and Social Development, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[3]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: wia@umt.edu.my*

Abstract: Waste generation is one of the most urgent environmental issues that demands widespread attention. Accumulation of solid waste in the environment and disintegration of most of its components has been identified as the primary drivers of the rising tide of marine debris, notably long-lasting plastic trash that inevitably results in marine pollution. The Solid Waste and Public Cleansing Management Corporation (SWCorp) estimates that in 2021, the country's daily production of solid waste might exceed 38,318 tonnes, with an average person producing 1.17 kilogramme of solid waste. Therefore, the purpose of this research is to assess the community in Redang Island's attitudes and behaviours towards sustainable waste management, which is defined as a system that maximises resource conservation through waste prevention and reduce, reuse, and recycle (3Rs) initiatives so as to preserve social, economic, and environmental balance for the benefit of the current and future generations. Sustainable waste management generally involves the collection, transportation, valorisation, and disposal of different kinds of waste in a way that doesn't endanger the environment, human health, or future generations. From production through final treatment, it comprises all operations associated to the management of waste. The data was gathered by a survey based on a questionnaire provided to the respondents. The poll included 202 Redang Island locals. The results showed that 91.6 percent of respondents (185 respondents), by far the majority, are aware of recycling behaviours and the significance of recycling activities. However, just 29.2 percent (59 respondents) recycled their garbage at home, while 61.4 percent were not participating in any recycling efforts. This is as a result of their unfavourable attitude and lack of knowledge on environmental literacy (42.1%). Additionally, they claimed they weren't doing it since Redang Island lacked the facility for rubbish collection (34.9%). It is surmised that to improve both the land and marine environment, it is crucial to promote ocean literacy of the local communities in islands and coastal areas by increasing their awareness and to build their capacity in sustainable waste management practices.

Keywords: *waste management, ocean literacy, attitude, behaviour, community, solid waste*

Seasonal variation of specific activity Glutathione S-transferase in Gonad of *Diadema setosum*

A.A. Hanif [1*], S.N. Ja'afar[2], N. Yusoff[2] and Z Bachok[1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2,3]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: hanifakbar1401@gmail.com*

Abstract: Marine pollution causes a significant effect towards marine organisms. Bisphenol-A is one of the pollutants that can affect the physiology of animal particularly marine organisms. In this study, the specific activities of Glutathione S-transferase (GST) from gonad of *Diadema setosum* (sea urchin) were studied as potential indicators of coastal environmental pollution. GST is a class of phase II detoxification enzymes that defend against chemical damage on cellular level. Sea urchins was chosen as animal model because it is essential test species in ecotoxicology and early-stage development research. Sea urchin can be considered as valid test organisms because of their significant phylogenetic position as a deuterostome, which means they are closely related to vertebrates. The sea urchin was sampled at Pantai Tok Jembal in November 2021, February 2022, May 2022, and August 2022 and dissected to get the gonad. Protein concentration was determined by using Bradford Assay method. GST Assay method was done to determine the response of the enzyme and seasonal variations of GST activity. GST activities shows a significant difference between the seasons $p<0.01$. The results also shows that the mean GST activity in gonad increased sharply from November 2021 to February 2022, then increased gradually to May and August 2022 which may happen due to different salinity pre northeast monsoon and post northeast monsoon effect. Antioxidants such as GST in sea urchin can be valuable for monitoring the effect of pollutant in marine organism.

Keywords: Sea urchin, Oxidative stress, Marine pollution, Enzymatic Assay;

ASSESSING GOVERNANCE FEASIBILITY TO ADOPT MARINE SPATIAL PLANNING TOWARDS SUSTAINABLE OCEAN ECONOMY IN TERENGGANU, MALAYSIA.

H.A. Md Salimun*

Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia

**Corresponding author: Professor Dr. Wan Izatul Asma binti Wan Talaat (wia@umt.edu.my); Profesor Ts. Dr. Mohd Fadzil Bin Mohd Akhir (mfadzil@umt.edu.my); Profesor Gs. Ts Dr. Aidy @ Mohamed Shawal Bin M Muslim (aidy@umt.edu.my); Dr. Nazli Bin Aziz (nazli_aziz@umt.edu.my).*

ABSTRACT

Marine Spatial Planning (MSP) is a process that brings together multiple users of the ocean to make informed and coordinated decisions about how to sustainably use marine resources. An exploratory approach into understanding MSP concept and its feasibility to adopt the application in Malaysian ocean governance perspective is conducted towards achieving sustainable ocean economy and Sustainable Development Goals (SDGs). Based on literatures, multiple hindrances identified to comprehensive MSP exist, namely as institutional barriers, environmental considerations, economic limitations, users' conflict and social constraints. These hindrances collectively are caused by, or counter lead to, poor governance framework in managing coastal and marine resources and space especially in multi-jurisdictional arenas. This paper embarks to investigate the existing governance in Malaysia, conducting juxtaposed comparative study by benchmarking with other countries and finally propose recommendations for the best and effective governance solution to initiate the application of MSP in Terengganu Malaysia. The study focuses into international and domestic policies and legislations related to coastal and marine environmental management, as well the national physical development plans mainly the National Physical Plans and the 2nd National Coastal Zones Physical Plans.

KEYWORD
Ocean governance, sustainable ocean economy, Marine Spatial Planning (MSP), marine resources, Sustainable Development Goals (SDGs), users' conflict

Sustainable Natural Architectural Design for Sand Dunes Restoration by Sand Trapping in Terengganu Coast

E.H. Ariffin[1,2], A. Ismailuddin[1], and S.N.H. Zainuddin[1]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: effihelmy@umt.edu.my*

Abstract: Much of the global coastlines experience coastal erosion ensuing shortage of surface area especially in developed and highly populous regions. Owing to this growing concern, the standard construction of coastal defence systems is a favoured choice to mitigate coastal erosion around the world, including the Malaysian state of Terengganu. Here, one of the major factors influencing seasonal coastal erosion is the northeast monsoon storm and the extensive of anthropogenic activities. The main idea of our study is using the sustainable natural architectural design on sand dune restoration with trap the sediment from swash zone to beach dune area. The highlight of the design would be the sediment trap within the structure design which will strengthen the beach slope during stormy season. The results of beach slope also supported with beach volume using the analysis of Profiler-XL 3.2 and reveal the maintain of sediment lose to swash zone during stormy season. While, during calm seasons the aeolian sediment will be recovery using wind-driven process. Furthermore, the comparison on sediment transport modeling between and without sand trapping can presenting by XBeach modeling the successfully of this study. In addition, the study will hope to aid the authority in developing cheaper erosion alleviation plan for coastal erosion in Malaysia.

Keywords: coastal erosion; coastal defence; beach recovery; significant wave height; monsoon

Telling Ocean Literacy Stories to Communicate Science: For Children by Children

Azza Jauhar Ahmad Tajuddin, Tengku Fara Kamilia Tengku Mohd Kamil, Nor Salina and Nor Abu Bakar

Abstract

Listening to story stimulates children to understand concepts and vocabulary, while developing their background knowledge. Promoting ocean literacy (OL) provide opportunities to students to improve their knowledge regarding the ocean, and how to protect it. Particularly, marine ecosystems have been subject to increasing pressures, highlighting the importance of taking ocean literacy to the classroom. Drawing attention to more relatable environments, like a local marine creatures, by tailoring OL activities to local contexts and community interests, might be an efficient strategy to raise awareness of ocean problems. A children's book, written by Universiti Malaysia Terengganu researchers was used as a springboard for an outreach project during World Oceans Week, developed with pre-school students in mind. The project aimed to assess the impact of using a children's book as a tool to promote environmental awareness, focusing on ocean ecological issues. Pre-recorded reading sessions of 'Loligo the Squid' storybook by 23 pre-school children aged 5-6 years old were shown to 99 female and 93 male pre-school students (ages between 5-7). The target audience were students from two public and two private pre-schools from coastal communities of Terengganu, aiming to assess if the reading session impacted students differently according to their background. A sequential explanatory mixed methodology was applied, using a pretest-posttest design, combined with focus group interviews in the last phase, to measure change in students' knowledge, before and after the reading. Results demonstrated that there was an overall improvement in students' knowledge regarding ocean literacy and the marine ecosystem.

Enhancing Ocean Literacy Through Art Activities

N.S. Ismail[1*], NM Abu Bakar, AJA Tajuddin, TFTA Kamil and WIAW Talaat

Pusat Pendidikan Asas dan Lanjutan, Universiti Malaysia Terengganu, 21300, Kuala Nerus, Terengganu, Malaysia

Faculty of Business and Management, Universiti Sultan Zainal Abidin, 21300, Kuala Nerus, Terengganu

Malaysia

Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia

Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia

**Corresponding author: nursalina@unisza.edu.my (p5141@pps.umt.edu.my)*

Keywords: ocean literacy; ocean literacy learning, arts; arts integration

Ocean literacy learning is commonly integrated in general subjects such as Science, Technology, and Geography. Other than that, the emphasis on ocean literacy learning is done through education investigation activities in enhancing students' scientific knowledge and skills. Arts integration has been positively linked to student engagement, motivation, and persistence. Hence, this study aims to explore the use of art in promoting ocean literacy among primary school students in Kuala Nerus, Terengganu via online involving 50 primary school students aged 7 – 12 years old. Observation on the assigned tasks about ocean animal and create that animal out of recycled items at their own house was carried out. At the end, they were interviewed on the effectiveness of using art in enhancing their ocean knowledge and recycling habit. The results indicated that most students were able to autonomously search for the information about the marine animal and creatively produce the animal using recycled item. Besides they indicated that learning about ocean and marine life is fun using art as they were able to present their creative product confidently. Engaging in art provides children with expression, creativity, and innovation. Favoured approaches to facilitate ocean literacy learning can include the use of art forms and playful activities for a stimulating classroom environment.

Investigation of beach morphological changes trend in the east and west coast of Peninsular Malaysia

S. H. Toh[1*], S. D. Wan[2], M. H. M. Shukri[2] and E.H. Ariffin[1,2]

[1]*Institute of Oceanography and Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*
[2]*Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia*

**Corresponding author: shtoh98@gmail.com*

Abstract: Beach morphology indicated the shape of the beach is influenced by the distribution of deposited material, and external forces such as wind, waves, tides or storms. Hence, the beach morphology changes represented how did the beach experience through environmental factors. In particular, Peninsular Malaysia is constituted by the east and west coast where both coasts face different sea conditions. Interestingly to identify, the west coast is located facing the Straits of Malacca which was sheltered by Sumatera while the east coast is located facing directly exposed to the South China Sea. However, the coastline of both sides is experiencing significant morphology changes regarding their position which east coast presenting more dynamic for environmental factors. This study gained insight into the beach morphology seasonal changes between the east coast, Terengganu and the west coast, Johor West are compared. The constructive wave and tidal influences on both sites will be discussed. The beach profile of the study site is interpolated by Profiler 3.2XL and MIKE21 are numerical modeling to simulate the behavior of environmental conditions that alter the beach morphology. By understanding the beach morphology of the coast, this study's findings could be references for coastal management or coastal construction before any implications in future action.

Keywords: beach morphology; beach changes; beach profile;

The Challenges in Marine Ecosystem

I.C. Ismila[1], M.A. Aminuddin[2], Z. Md Redzuan[3],
R. Mohd Fairoz[4], I. Ahmad Syahrul Nizam[5], and S. Hayatul Safrah[6]

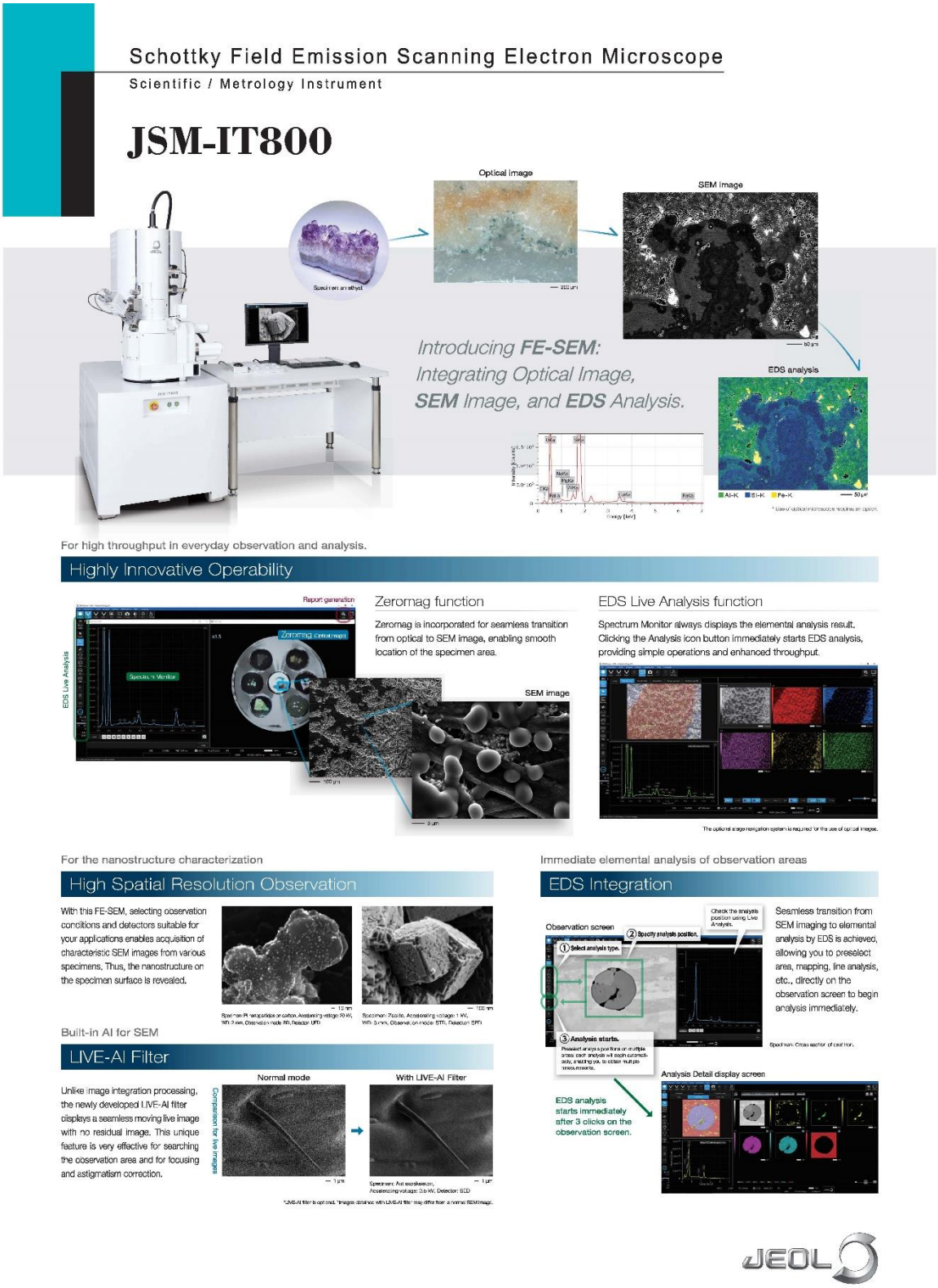
[1,2]Maritime Management Section, Universiti Kuala Lumpur Malaysian Institute of Marine Engineering Technology, 32200 Lumut, Perak, Malaysia
[3]Research and Innovation Section, Universiti Kuala Lumpur Malaysian Institute of Marine Engineering Technology, 32200 Lumut, Perak, Malaysia
[4] Atase Maritim, High Commission of Malaysia, 45-46 Belgrave Square, London SW1X8QT
[5]Department of Management and Humanities, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, 32610 Perak, Malaysia
[6] School of Maritime Business and Management, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia

**Corresponding author: ismila@unikl.edu.my*

Abstract: Marine pollution is an increasing challenge in today's world. This is due to various significant elements such as the effect of climate changes, ocean warming, acidification and oxygen loss, contamination from crude oil, and chemical discharge. The pollutants are dumped into our oceans regularly. It is believed that once an oil spill incident occurs, it may well cause severe effects on the environment, society, economics, marine ecosystems, and coastal communities. This study focuses on the challenge of the marine ecosystem that concentrates on marine oil spill pollution. The aim of this study focuses on the current effectiveness of the collaboration efforts among eleven response-related organizations regarding the oil spill incidents in Malaysia. This study has involved Delphi Survey Method amongst purposive expert respondents and has been analyzed using Statistical Package for the Social Science (SPSS) analysis tools such as Mean Analysis, Standard Deviation, Cronbach's Alpha, and Frequency based on 59 expert responses. 81.82% of the Malaysian organizations from DOE, Marine Department, Malaysian Maritime Enforcement Agency (MMEA), Fishery Department, Meteorology Department, PIMMAG, PETRONAS, Fire, and Rescue Department, and other organizations have agreed with the effectiveness of the current collaboration in oil spill efforts among the response team members.

Keywords: Marine Pollution, Oil Spill Response, Collaboration Efforts, Response Team Members, Oil Spill Incidents

Advertisements



We Are The Main Supplier for :

a) Industrial Gases

b) Entertainment Gases

c) Food Industry Gases

d) Refrigerant Product

e) Lab Gases

Sponsors

ORBITING SCIENTIFIC
& TECHNOLOGY SDN BHD
SCIENTISTS SERVING SCIENTISTS

Agilent
Authorized
Distributor

IKA
designed for scientists

JEOL
Solutions for Innovation

MCY
Excellent in Services

GEOHYDROCEAN SERVICES SDN BHD
GHOS

DZS
MARINE SDN BHD
(1223417-V)

hidrokinetik
technologies
a hidrokinetik group company

Partners

MARE
IMPACT
Our ambition is, to become more competitive and serve the national agenda of green growth, to incorporate into its operations a broader sustainability agenda. Classroom equipment, e-learning and facilities for the development and deployment of distant learning materials need a major upgrade as well that will subsequently upgrade our lecturer teaching impact and the students learning experience
"We want to create a unique and impactful contribution to our marine science curriculum and students learning experience under this new challenging era."
OUR PARTNERS
Universität Bremen
Eesti Maaülikool
UTP
UMT
UTM

UMT INES
INSTITUTE OF OCEANOGRAPHY AND ENVIRONMENT
MARINE COASTAL AND DELTA SUSTAINABILITY FOR SOUTHEAST ASIA
OUR FOCUS
TEACHING
Collaboratively develop teaching portfolio that fully appreciate the engineering and management sides of marine andcoastal environmental issues. And exposure students to cutting edge science and policy developments. All this requires smooth and institutionalised relationsto the world of profession, easy access to international knowledge base, and to the databases of case studies in the region.
FACILITY
Provide adequate ICT solutions. Students need more structured guidance in policy- and internationally relevant research, integrated solutions for blended learning, individual & group learning portfolio, e-learning multimedia modules, e-science module for undergraduate and postgraduate courses
CONTENT
Improve educational content, research and practical materials related to the subject areaproject updates and deliverables, discussion area, survey facility and access to the eMARE e-learning platform

Partners

INOCEM was established in 2003 with the objective to support and promote high quality research, training and outreach in oceanography, marine and maritime studies and related management programs through postgraduate education, education, research and effective programs that address marine issues in Malaysia. INOCEM is expected to become a center of excellence in IIUM specializing in research, development and commercialization of ocean and coastal resources with particularly emphasis in marine biotechnology and oceanography.

INOCEM has emerged as a venue pursuing excellence in demand-driven education, research and synthesis and dissemination of knowledge across a wide range of these subjects in regional, national and international contexts. INOCEM provide vibrant learning environment that is so conducive to scholarly achievements.

The establishment of this institute leads to the training and creating pool of experts who are well-versed in sustainability. Comprehensive sustainability management demands the development of science and applications towards sustainable development. Cooperation in research and joint facilitation of programmes were prominent in INOCEM.

Apart from research, INOCEM also plays a role in establishing network with the local community. English camp and beach plogging were conducted to educate the local community about the importance of sustainable marine resources. Currently, INOCEM adopts two local schools and collaborates with the community with regards to knowledge transfer.