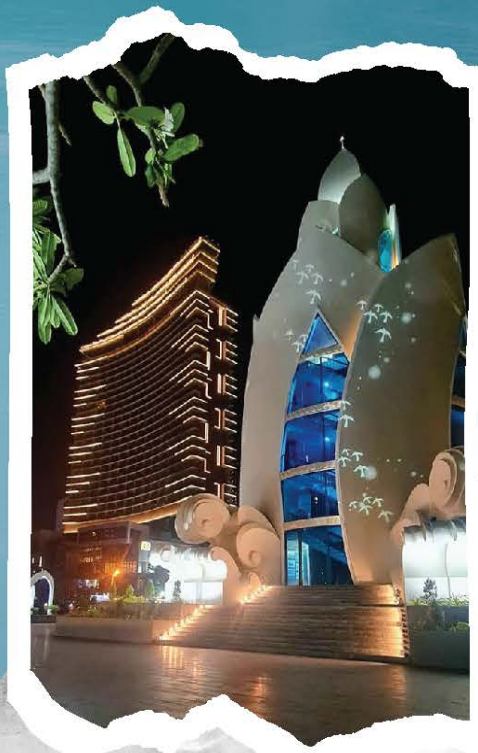
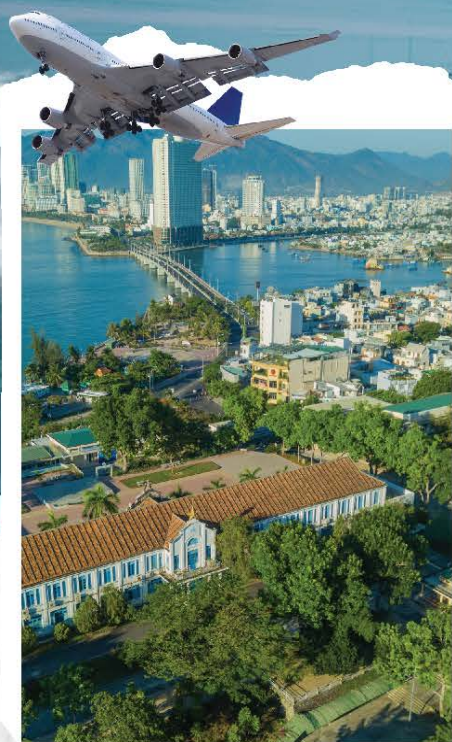


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# NHA TRANG



**MSDI**  
2023

**INTERNATIONAL CONFERENCE**  
on Marine Sustainable  
Development and Innovation

July 21-23, 2023, Nha Trang, Vietnam

ABSTRACT PROCEEDINGS

**INTERNATIONAL CONFERENCE ON  
MARINE SUSTAINABLE DEVELOPMENT AND INNOVATION**

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2023

## ABSTRACT PROCEEDINGS



21-23 JULY, 2023

NHA TRANG, VIET NAM

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## **ABSTRACT PROCEEDINGS**

# **The International Conference on Marine Sustainable Development and Innovation (MSDI 2023)**

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## WELCOME MESSAGE

Distinguished participants,

Ladies and Gentlemen,

On behalf of the International Organizing Committee, I am delighted to welcome all the participants to the International Conference on Marine Sustainable Development and Innovation (MSDI 2023), to be held from 21<sup>st</sup> July to 23<sup>rd</sup>, 2023 in Nha Trang, Vietnam.

Nha Trang University has grown up from the Faculty of Fisheries, Academy of Agriculture and Forestry in 1959. In 2022, we have recently celebrated our 63<sup>rd</sup> Anniversary of development. Initially being a university that specialized in fisheries only, NTU has become a prestigious multidisciplinary and multilevel educational institution with a strong foundation of fisheries, aquaculture and marine economy. We embrace the vision to become a leading university in training, research, and technology transfer in fishery sciences and some selected areas in the marine economy in Southeast Asia by 2030.

The aim of the MSDI 2023 conference is to provide a unique opportunity for international scholars, researchers and practitioners who are working in the fields of MSDI to get together and share their latest research findings and results. Special sessions of the UK - Vietnam workshop are arranged herein in which various multidisciplinary partners from both the UK and Viet Nam will explore and showcase themes of shared heritage.

We hope the participants will get the theoretical achievements, practical knowledge and personal contacts that will help you build up long-term, profitable and sustainable communication among experts in a wide range of scientific areas. Additionally, there will be 04 keynote speeches from 04

respected speakers in different fields and from different countries, including Korea, Japan, Norway, and Vietnam. We strongly believe their valuable speeches will enrich our understanding and knowledge about Marine Science and Sustainable Development in the context of Industrial Revolution 4.0.



**Assoc. Prof. Trang Si Trung**  
Rector

Nha Trang University, Vietnam

We would like to take this opportunity to express our sincere thanks to the authors for their contributions and the participants for their interests and valuable contributions in the discussion. We also thank the scientific committee members for their high-standard reviews of the submitted manuscripts and the steering committee for promoting and supporting the conference. Your high expertise, enthusiasm, valuable time and knowledge have enabled us to prepare this conference. To our keynote speakers, welcome and thank you for accepting our invitation and spending your valuable time attending and sharing your experience with us all. Furthermore, we would like to thank the sponsors and all persons who have been engaged in preparing and performing the conference. Finally, we wish all participants a fruitful, stimulating, and rewarding stay in Nha Trang City, one of the 29 most beautiful bays in the world.

Thank you.

## About MSDI

The Marine Sustainable Development and Innovation (MSDI) is a biennial international conference that aims to facilitate the international exchange of new knowledge and achievements in the fields of Marine Sciences and Innovations. It also facilitates the collaboration of leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Marine Sciences. Furthermore, MSDI provides a premier interdisciplinary platform for researchers to present and discuss the latest innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Marine Sciences. Participants from all countries are welcome to participate and submit papers to the conference.

Conference sessions, along with keynotes and workshops, are highly interactive to ensure maximum exchange of information and ideas related to the topics. Such activities provide valuable feedback for researchers, and serve as crucial inputs for policymakers. This event will feature renowned keynote speakers, oral presentations, posters, and technical sessions that related to the topics addressed in the program.

MSDI 2023 includes 6 topics:

- Marine Mechanical Engineering
- Marine Aquacultural Engineering and Technology
- Marine Product Technology
- Fisheries Science
- Marine Innovations
- Special Sessions on the UK-Vietnam Workshop

The MSDI 2023 Organizing Committee has received 303 papers from authors representing many countries, including Vietnam, the Philippines, South Korea, Japan, the United Kingdom, Taiwan, Indonesia, Norway, Iceland, China, and others. After a blind peer review process, the papers were accepted and presented at the MSDI 2023 conference will be published in the Journal of Fisheries Science and Technology - Special issue. Additionally, selected papers will be published in the Journal of Earth and Environmental Science (Scopus indexed, IOP Conference Series Publisher).

We would like to express our gratitude to the members of the Organizing Committee of the MSDI 2023 conference for their hard work and advice, which were instrumental in maintaining the high level of the event. We hope that all the papers will serve as valuable sources of information for academics, researchers, engineers, and students in their scientific work.

## KEYNOTE SPEECHES

### PLENARY SPEECH 1

#### Topic: **Aging Effects on Marine Structure**

##### Abstract

*Quantifying the aging effects on marine structures is indispensable to enhance the sustainability of marine structures. In order to achieve this goal, firstly, we need to investigate the aging effects on the mechanical properties of materials frequently used for marine structures. Secondly, we need to identify the categories of damages of marine structures. And finally, we need to predict the extents of damages and their residual strengths. Recently, we obtained marine structural steels from a naval vessel which was about to retire after more than 40 years service. Various kinds of tests were conducted to demonstrate the material properties of the aged marine steels, whose results will be introduced in this talk. Aged ships and offshore structures are suffered from mechanical damages including denting and fracture due to impact loadings, from fatigue damages due to cyclic loadings and from corrosion damages due to electrochemical reaction with marine environments. Prediction of extents of mechanical damages will be intensively covered herein. The residual strengths of damaged structures with mechanical damages or corrosion damages have been intensively investigated experimentally and theoretically by the research group of the speaker. Some of the research results are briefly introduced in the talk.*



##### Speaker

##### **Prof. Sang-Rai Cho**

Professor Emeritus of University of Ulsan, Republic of Korea

CEO of Ulsan Lab Inc

Email: [srcho@ulsan.ac.kr](mailto:srcho@ulsan.ac.kr)

Sang-Rai Cho is Professor Emeritus of the School of Naval Architecture and Ocean Engineering, University of Ulsan, Korea, and CEO of Ulsan Lab Inc. He obtained the degrees of Bachelor of Science (1975) and Master of Science (1977) in Naval Architecture from Seoul National University, Korea. He received his Ph.D. in Naval Architecture and Ocean Engineering from the University of Glasgow, UK (1987). He was Vice President of the University of Ulsan (2005 – 2009), President of the Society of Naval Architects of Korea (2012 – 2013). He was chairman of various research/technical committees including Impulsive Pressure Loading and Response Assessment Committee of International Ship and Offshore Structure Congress (2006- 2012), Technical Committee of Korean Register of Shipping (2013 – 2019) and Maritime Safety Committee of the Society of Naval Architects of Korea (2017 – 2019). His main research streams are concerning the ultimate and impact strengths of ships and offshore structures. He has conducted numerous ultimate strength and collision tests on various marine structures and has developed simplified design-oriented analysis methods. Many ultimate limit state design formulations have been derived based on experimental and theoretical/numerical investigation results, including those for submarine structures. He received Academic Life-time Achievement Award from the Society of Naval Architects of Korea (2014).



## PLENARY SPEECH 2

### **Topic: Regional Fatigue Crack Propagation Resistance in a Friction Stir Welded Ti-6Al-4V: Closely Relating to Microstructural Evolution**

#### **Abstract**

*There are growing interest and potential application of Friction Stir Welding (FSW) in fabricating titanium components in aerospace and space components. In the case of near alpha Ti-6Al-4V (Ti-6-4) alloy, a locally transformed area from HCP to beta structure is sometimes formed relating to the hot spot in temperature during the FSW process. The purposes of this research are to get basic knowledge on the role of microstructure evolved in a FSWed Ti-6Al-4V. Here special attention has been paid to the effect of the local beta-transformed microstructures. The experimental study demonstrated that the local fatigue crack propagation (FCP) rates in the stirred zone and near the interfacial zone were higher than those in the base metal by a few times. The local fatigue crack threshold level was also significantly affected. These behaviors are discussed based on the microstructural change, as well as on the residual stress by the FSW.*



#### **Speaker**

##### **Prof. Masakazu Okazaki**

Full Professor of Department of Mechanical Engineering,  
Niigata Institute of Technology, Japan

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Masakazu Okazaki is a professor in Department of Mechanical Engineering, Niigata Institute of Technology, Japan. He received PhD from Tokyo Institute of Technology in 1979. He was an Associate Professor in Nagaoka University of Technology from 1985 to 1999. He had taught as a Professor in the University of Tokyo from 1999 to 2005. He was a professor at Department of Mechanical Engineering at Nagaoka University of Technology (NUT) from 2005 to 2022, Japan. He does research in manufacturing engineering, mechanical engineering, and materials engineering. His research interests include thermo-mechanical fatigue of heat resisting alloys, thermal and environmental barrier coatings, high temperature strength of materials and structures, and advanced utilization of biomass resources. He is a fellow and editor in charge of the Japan Society of Mechanical Engineers (JSME) and heads its strength of materials division. He is also the editor in chief of the Japan Society of Material Science (JSMS) journal. He is a member of Japan Institute of Metals (JIM), The Gas Turbine Society of Japan (GTSJ), and The Iron and Steel Institute of Japan (ISIJ). He has received awards for his outstanding research from various academic societies including distinguished paper award from JSME (2015), best paper award from JSMS (2006), and JSMS award by high temperature materials committee of JSMS (1996).

## PLENARY SPEECH 3

### Topic: Nutritional and Digestive Physiology of Marine Fish Larvae

#### Abstract

*Food uptake follows rules defined by feeding behavior that determines the kind and quantity of food ingested by fish larvae as well as how live prey and food particles are detected, captured and ingested. Feeding success depends on the progressive development of anatomical characteristics and physiological functions and on the availability of suitable food items throughout larval development. The fish larval stages present eco-morpho-physiological features very different from adults and differ from one species to another. Ontogenetic changes in digestive function lead to limitations in the ability to process certain feedstuffs. There is still a lack of knowledge about the digestion and absorption of various nutrients and about the ontogeny of basic physiological mechanisms in fish larvae, including how they are affected by genetic, dietary and environmental factors. The neural and hormonal regulation of the digestive process and of appetite is critical for optimizing digestion. These processes are still poorly described in fish larvae and attempts to develop optimal feeding regimes are often still on a trial and error' basis. A holistic understanding of feeding ecology and digestive functions is important for designing diets for fish larvae and the adaptation of rearing conditions to meet requirements for the best presentation of prey and microdiets, and their optimal ingestion, digestion and absorption. More research that targets gaps in our knowledge should advance larval rearing.*



#### Speaker

**Prof. Ivar Rønnestad**

Full Professor of University of Bergen, Postbox 7803 N-5020 Bergen

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Ivar Rønnestad is a professor at Department of Biological Sciences at University of Bergen (UiB), Norway. He has been involved in studies of physiology of fish since 1988. His main research interest is nutritional and digestive physiology of fish, initially mainly the larval stages, but recently also on juveniles and adults. He is currently working on GI-tract physiology and the gut brain axis that links feed intake, digestion and growth. His prior work included studies in deep-sea diving physiology at NUTEC from 1982-87. Prior affiliations include Institute of Marine Research at Austevoll (1988-89) NIFES (1993-97) and from 1996 he has been at UiB. He has conducted research stays in Japan (Kyoto University and Kagoshima University), Israel (IOLR), Portugal (CCMAR and University of Algarve), USA (University of California, Los Angeles, UCLA), Copenhagen (KU) and has an extensive research collaboration at national, European and international level. His supervision includes 7 postdocs, 8 PhD (+18 finished) and 3 Master students (+31 finished) at UoB and abroad. He publishes regularly in peer reviewed journals (ISI core collection 192, H-index 45)

## PLENARY SPEECH 4

### **Topic: Trade-offs and Sustainability Challenges for Marine Biodiversity and Ecosystems in Vietnam**

#### **Abstract**

*Vietnam possesses remarkable marine biodiversity, characterized by diverse ecosystems, species, and genetic resources that are abundant and unique to the region. Marine biodiversity conservation can alter the ecosystems and ecosystem services that are vital for human well-being. Therefore, sustainable marine management must account for the potential trade-offs between biodiversity conservation, ecosystem services and sustainable development goals (SDGs). Here, we highlight development and sustainability challenges for Vietnam based on analyses of interactions and trade-offs between goals focusing on food, poverty eradication and marine biodiversity. By examining the information and practices within the marine economy sectors such as fisheries, aquaculture, and tourism, it becomes evident that Vietnam confronts significant challenges in meeting the objectives of food production, poverty eradication, and biodiversity conservation within a changing environment. To meet the future demand for sustainable marine development, it is crucial to enhance marine management and conservation efforts while maximizing the societal and environmental benefits derived from these actions.*



#### **Speaker**

#### **Assoc. Prof. Quach Thi Khanh Ngoc**

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Quach Thi Khanh Ngoc is an associate professor at the Faculty of Economics, Nha Trang University, Vietnam. She obtained her PhD from UiT-The Arctic University of Norway. Her fields of specialization are fisheries economics and the economics of ecosystem services, with a focus on the use and development of bioeconomic modelling for fisheries and marine protected areas, poverty and food security in fisheries, and environmental valuation of marine and coastal ecosystems. Her research has been published in journals such as Marine Resource Economics, Natural Resource Modelling, Ecological Economics, and Ecosystem Services. Dr. NGOC has served in the role of principal investigator and researcher for numerous national and international economic and environmental projects, including NAFOSTED (Vietnam National Foundation for Science and Technology Development), EfD (Environment for Development), EEPSEA (Economy and Environment Program for Southeast Asia), NORAD (The Norwegian Agency for Development Cooperation) and EU Horizon.

# Topic 1

## MARINE MECHANICAL ENGINEERING





PID 147

## Simulation the Instability of the Fishing Vessel Propeller Structure During Operation

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**Abstract:** The propeller of a fishing boat is an important part of a ship; It helps propel the ship in the water. However, because of the very complex operating conditions of the surrounding environment, it affects the structure of the propeller, resulting in the propeller becoming unstable and causing vibration. The precise determination of the frequencies that cause the vibration is highly dependent on determining the instability of the propeller at different frequencies. This paper studies the simulation instability of propeller structure to explain the cause of propeller vibration at low frequencies.

**Keywords:** propeller, fishing boat, instability, vibration

PID 183

## Studying Influence of the Mathematical Model Error on the Results of Calculating Freedom Torsional Vibration for Marine Diesel Propulsion System

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**Abstract:** The Freedom Torsional Vibrations (FTV) Calculation (FTVC) for the marine main propulsion plant (MPP) is used to determine the freedom frequencies and the FTV formations of the mechanical system. Normally, the MPP is dynamically modeled as a finite  $n$  concentrated masses with the parameters of: Mass moment of inertia  $J_k$  ( $\text{kgm}^2$ ,  $k = 1 \div n$ ) and the torsional stiffness  $C_{k,k+1}$  ( $\text{Nm/rad}$ ) between the  $k$  and  $k+1$  concentrated masses. This paper studies the influence of the number of concentrated masses  $n$  as well as the accuracy of determining  $J_p$  (Moment of inertia of the propeller) on the solution of the MPP's FTVC. The research verifies to the MMP on the Korean ship, using the MAN-B&W 6G70MEC.

**Keywords:** Freedom Torsional Vibration (FTV); Mathematic model of the FTV; Exactness of the FTV calculation.

PID 214

## Optimizing Power Consumption and Humidity of Sliced Avocado Using A Heat Pump Dryer

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**Abstract:** When using a heat pump dryer, drying butter to maintain humidity typically consumes much electrical energy. Therefore, this study aims to minimize power consumption and ensure the humidity of sliced butter by response surface method based on heat pump drying technology. Experiments were conducted to determine the ability to consume electrical energy when reaching the humidity of the sliced butter. The obtained data was also used to construct an objective

function describing the influence of the drying temperature and drying speed of the drying agent on the drying process. Optimal results were obtained the power consumption and humidity of the sliced butter were 4.8 kw and 6.2%, respectively, when drying at temperature and drying speed of 46.03°C and 1.15 m/s, respectively.

**Keywords:** Power consumption, the humidity of sliced butter, heat pump drying technology, Surface response method, analysis of variance.

**PID 242**

### **Researching the Force Absorption System for the Front of the Passenger Car to Secure the Driver**

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**Abstract:** Protecting the safety of drivers in the bus is very important and necessary in front collisions. This research on the system shock absorber and absorption of force bus head in front collisions. This design will protect bus heads not violations in safe spaces and protect drivers in front collisions. The finite element model and safety analysis simulation of the system shock absorber and absorption of force by LS – DYNA and MADYMO software. The study's results show shock absorber structure ensures durability. The head part index is down 35%. The neck part index is down 28%. Drivers are protected more safely. Injury values of driver satisfy safety ECE R94 standard in bus front collision.

**Keywords:** ECE R94 standard, MADYMO software, LS – DYNA software, collision, injury.

**PID 291**

### **Research of the Effect of Loading Acting on the Front Axle of the Truck 1.25 Tons by the Finite Element Method**

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**Abstract:** This paper describes the results of a study on the impact of different loads on a 1.25-ton light truck's guide girders. Using the finite element method, the study evaluated the truck's maximum traction, maximum horizontal force, maximum braking force, and maximum upward force modes. The research findings provided insights into the durability and load-bearing capacity of the guide girders under specific survey conditions. As a result, the paper offers recommendations to drivers on selecting the appropriate load to increase the guide girder's lifespan while driving on the road.

**Keywords:** Light trucks, bridge girder, the front axle of the truck.

PID 313

## Analysis of the Internal-Design Factor to the Patrol Boat: A Study of Hull Resistance Using Savitsky and Holtrop Approaches

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**Abstract:** The issue with sea transportation is the high operational costs due to fuel consumption. Ship resistance generated by the shape of the ship hull is one factor that affects efficiency. Internal factors that affect the hull's resistance include the frontal area, appendage area, and appendage factor. In previous studies, research has been conducted on the effect of adding appendages to the hull and hull design variations on resistance. However, research on the influence of internal factors, e.g., rudder surface area and frontal area of the bow on hull resistance of monohull-type ships still need to be done. In this study, the effect of the type of internal factor is to be by considering the calculation of the hull resistance using the Savitsky method and Holtrop formula. Several hull designs with variations on adding the applied appendages are proposed to be the subjects of this study. The effect of the internal factors on the hull performance, i.e., resistance, is quantified to conclude the parameter which provides the highest effect.

**Keywords:** Resistance, monohull, internal-design factor, hull appendage.

PID 437

## LDV Measurements of Turbulent Boundary Layer Velocity Profiles on Flat Plates with Different Roughness

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**Abstract:** The forces exerted on bodies immersed in a fluid are largely determined by the thin boundary layer over their surface. We conducted experiments to study the effects of surface roughness elements on the turbulent boundary layer over a flat plate at various Reynolds numbers. For this study, we considered a total of ten flat plates with various surface roughness heights, denoted as  $k$ . We obtained the velocity profile in the wall-normal direction using LDV. The effect of an increase in the local Reynolds number,  $Re_x$ , on the non-dimensional velocity profiles,  $u^+ - y^+$ , is to produce a shift along the log-law line, resulting in an increase in both the  $u^+$  and  $y^+$  values. The drag force exerted on flat plates with various non-dimensional roughness heights,  $l/k$ , was determined based on the measured momentum thickness at various local Reynolds numbers. We observed an increase in the drag force in general with an increase in the height of the roughness element. Using the general linear least squares method, we obtained a power-law relation between the drag coefficient,  $c_f$ , and the non-dimensional parameters, Reynolds number,  $Re$ , and the non-dimensional roughness height,  $l/k$ .

**Keywords:** Boundary layer, friction drag, LDV, roughness.

**PID 458    Dynamic Balancing of Rigid Rotors by the Influence Coefficient Method**

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**Abstract:** Applied to rigid rotors, the influence coefficient method is the most adaptable method for rotor dynamic balancing because it uses only experimental information. The sole requirement for balancing rotors with this method is that there exists proportionality between mass unbalance located at correction planes and vibration measured at measuring planes. Hence, the rotors only need to be described by correction and measuring planes. The sensitivity of the measuring planes compared to the correction planes determines the response of the amount of unbalance for a specified rotation speed. The paper aims to describe in detail the experiment for dynamic balancing of rotors to verify the influence coefficient method. The direct calibration on two-plane rigid rotor using this method showed that a significant reduction of unbalances can be obtained.

**Keywords:** Rotor dynamic balancing, influence coefficient method, residual unbalances, Discrete Fourier Transform.

**PID 586**

**Numerical Design on the Intake Port of DI-Engine Type Vikyno RV165 by Using 3D-CAE Software**

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**Abstract:** The intake manifold profile in a diesel engine has an influence on engine intake performance, which in turn impacts the engine's power characteristics and exhaust gases. Improving the performance of the appropriate geometric design of the intake manifold in order to optimize the study time is a key basis. This research aims to build a parametric model for the 3D profile of the VIKYNO RV165-2 engine intake line. By changing the value of parameter variables in the model through SolidWorks software, it is able to design and change the 3D profile design of the intake manifold. The 3D model of the intake line will be parameterized based on the 2D design drawings of this part provided by VIKYNO. The parameter variables used are upper inclination, lower inclination, curvature, intake valve diameter, input cross-section. Many different 3D models of intakes will be created with respect to the values of parameter variables changed by using SolidWorks software. The results of the study provided a parametric model for the 3D profile of the intake tract, linking the parametric variables of the model with Solidwork software as a basis for speeding up this detailed 3D design process. The 3D design of the intake by the parametric model compared to the 3D design of the intake manifold by direct rendering from the 2D drawing has a difference of no more than 2% in volume. From the platform model, the change of input variables is displayed quickly on new designs, in accordance with the standard, and thereby the model is selected for the stage of researching the efficiency of air intake on the engine.

**Keywords:** CAE, Diesel engine, intake port geometry, numerical design.



PID 815

## Study of Thermal Stresses to Welding Process in Yacht Fabrication

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**Abstract:** Welding process plays an important role in ship and offshore fabrication. The effect of residual stress due to thermal always pays attention to weld professionals. Additionally, the deformation of welding joints is also assessed by finite element analysis and actual assembly, particularly in aluminum alloy material. This paper focuses on thermal stress and strain to assess quality of catamaran yacht made by aluminum alloy. Some details of welding structure are discussed in butt joint, lap joint and T joints as well as in chainplates, cross beam and mass sail rigging structures. The obtained results are based on study in stress concentration and fatigue strength assessment of ship structures.

**Keywords:** Welding process; residual stress; catamaran yacht; stress concentration; weld joint.

PID 970

## Multi-Criteria Decision-Making Models of DEX and EDAS: Selecting Machines in Ship Fabricating Factories

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**Abstract:** As a result of the proliferation of alternative machines and the general advancement in their technology, machine selection issues have been the subject of investigation by many researchers. This study presents a proposed Decision Expert (DEX) approach and Evaluation based on Distance from Average Solution (EDAS). The decision-making demand in firms' factories for machine selection in fabrication companies is discussed. This paper provides an overview of decision making, including the decision-making process and the factors that affect it. The report categorizes prevalent decision-making models based on their distinct characteristics, highlighting the importance of rationality in decision-making. Integrating with the EDAS technique, the proposed DEX approach selects welding machines in practical industries. The approach considers factors such as operating capacity, costs, welding speed, and precise thickness of the workpiece. Besides, this study will benefit leaders, engineers, or experts who can easily decide to invest and select what types of machines to develop and improve the quality of their products in practical manufacturing and industry. The proposed approach has several advantages, including a consistent weight derivation process, fewer pair-wise comparisons, ease of use, and lower computing expenses. In short, the study provides practical insights for managers in selecting machines and enhancing decision-making processes.

**Keywords:** ship manufacturing, fabricating workshop, uncertainty model, machine selection, MCDM, optimization design.

PID 1275

## Use Solar Energy for Turning Seawater into Freshwater Serving for Off-Shore Fishing

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**Abstract:** Renewable energy has been paid attention to in Vietnam in particular and worldwide in general. Besides wind energy, solar energy is one of the top priority energy sources. For offshore fishing vessels, freshwater source serving daily fishermen's activities is one of the most crucial and necessary factors. This study presents a solution for estimating, designing and manufacturing equipment which can turn seawater into freshwater. Especially, this equipment will use renewable energy (solar energy) to help fishing offshore vessels save capacity, load, and fishing cost and help fishermen be proactive about their water resources. The research results are the foundation for estimating the design of water purification systems in general, a system to filter seawater into fresh water in particular as well as the renewable energy systems and applying them in the field of fishing, offshore fishing, as well as actual manufacturing.

**Keywords:** Offshore fishing, seawater purification into fresh water, solar battery, water purification system.

PID 1299

## Research on Stability of Laminated Composite Plate under Nonlinear Aerodynamic Load

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**Abstract:** This paper presents the finite element approach to solve the stability of the layer composite plate under nonlinear aerodynamic load, taking into account the influence of thermal deformation, and nonlinear geometry. The nonlinear aerodynamic load is based on nonlinear piston theory. Calculate the definition of the critical pressure value and vibrational amplitude response of the plate. The obtained numerical results of the present method are compared with those of published works in the literature. The calculation results contribute to service design and repair of the body and wings of aircraft equipment.

**Keywords:** Composite plates, nonlinear aerodynamic load, aerodynamic load, finite element method.

PID 1331

## Ultimate Strength of Aged Ships under Hull Structure's Imperfections

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**Abstract:** Ship hull structures, especially aged ones, contain various imperfections, typically: initial deformations, residual stresses, and especially corrosion wastage. These factors have a significant impact on the hull girder strength. Therefore, understanding residual hull girder strength capacity is of great significance and role in ensuring the safety and reliability of the ship

in different operating conditions, especially extreme load conditions. The existing methods to determine the hull girder's ultimate bending moment either ignore imperfections or consider imperfections such as initial deformations or residual stresses but with the assumption of a fixed level. In the current study, the stress distribution method and incremental- iterative method are used; and solutions are proposed to cover factors such as initial deformations, residual stresses, and corrosion. A single skin bulk carrier, 56,000 DWT of deadweight, is employed as the demonstrative example. Eleven cases of imperfections are suggested, and the variations of ultimate bending moment for hogging and sagging conditions under the effect of uncertainties are analyzed and evaluated. The results of the current study are offered and discussed. Several concluding remarks are also presented.

**Keywords:** Ship structures, hull girder, method, imperfections, ultimate bending moment.

**PID 1401**

### **Study on the Impact Behavior of SUS 304 for LNG Tank Structures Under Cryogenic Temperature Conditions**

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**Abstract:** Austenitic stainless steel 304 is a special steel considered in cryogenic service applications. One of them is intended for LNG tank applications. During the transport voyage this storage tank is maintained at a temperature range of 160 at atmospheric pressure. This material is specific because it has advantages including high strength, excellent corrosion resistance, and excellent welding performance. This study presents an impact test to evaluate the toughness of 304 stainless steel under cryogenic temperatures. The test was carried out by testing Charpy V-notch specimens which were carried out at room and cryogenic temperatures. Prior to testing, the specimens were immersed in liquid nitrogen for at least 10 minutes. The absorbed energy is captured in the experiment and plotted against the high temperature. After testing, metallographic observations were made to observe crack patterns at normal temperature and cryogenic temperature. The results show that a clear transition toughness behavior from ductile to brittle transition cannot be identified for SUS 304 material.

**Keywords:** SUS 304, Cryogenic temperature, Impact energy.

**PID 1789**

### **Picometer displacement measurement using regular crystalline lattice and super-resolution interferometry**

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**Abstract:** In semiconductor manufacturing and X-ray optics manufacturing, processing uncertainty of 10 pm or less will be needed. This manufacturing will require displacement sensors or these calibration instruments with resolution of pm or less, and these devices must be obeyed by the meter definition. The author has developed pm-order displacement/length measurements using a) regular crystalline lattice spacing of highly oriented pyrolytic graphite (HOPG) with scanning tunneling microscope (STM), and b) super-resolution phasemeter for heterodyne interferometry. In this paper, both experimental results are given.

**Keywords:** Picometer, regular crystalline lattice spacing, scanning tunneling microscope (STM), interferometry, heterodyne

**PID 1835**

### **Development of the Optical Time-Of-Flight Based Ranging System Using Compressive Sensing**

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**Abstract:** A new type optical time-of-flight based ranging system constructed by an active light source and two low sampling rate photodetectors was introduced for measuring the distance. The intensity of the light encoded by the compressive sensing technique and a gigahertz range carrier wave generator was illuminated the object. The photodetectors with kilo-sampling rate range synchronized with the light source were used for sampling the encoded light wave reflected from object. The waveform of the carrier wave can be reconstructed with few samples by the compressive sensing technique. Resultantly, the distance from the object to the photodetectors was precisely extracted from the phase of the carrier waves in very short time.

**Keywords:** Compressive sensing, compressive sampling, time-of-flight, optical ranging, distance measurement.

**PID 1860**

### **Investigation of Wave Effects on Motion of Unmanned Surface Vehicle at Various Scales**

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**Abstract:** Motion characteristics of Unmanned Surface Vehicle are mainly affected by sea wave during its operation. This paper shows the numerical results of the catamaran Unmanned Surface Ship at various scales in irregular waves based on boundary element method. The effects of different sea states on each scaled model in a head sea, bow quartering sea and beam sea are analyzed to predict safety region of the ship motion. The significant amplitudes of ship motion are obtained from the ship motion responses in regular waves. Steady wave drift forces in the cases of bow oblique sea are calculated to find the impact of second order waves on the models. It is proved that motion of model C is remarkable in the narrow frequency domain from 0.2 to 1.4 rad/s but the ship responses of model A are considerable in the range of frequency of 0.2 to 2.5 rad/s. The significant amplitude of surge and pitch motion reach the peak values in head sea condition while the peak values of yaw motion are in oblique sea of 120 degrees. The left motion is maximum in head sea condition.

**Keywords:** Different sea state, irregular waves, motion characteristic, unmanned surface vehicle, various scales, wave drift force.



PID 1944

## Effect of Friction Stir Welding Parameters on Interfacial Bonding in Dissimilar T-Joint between AA6061 and Copper

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**Abstract:** The dissimilar T-joint of AA6061 and Cu1100 was fabricated by friction stir welding technology. The effect of welding speed on welding interface, mechanical properties was investigated. The results showed that joint interface was sensitive to welding speed. Increasing welding speed reduced bonding strength of interface. Fracture behavior of joint was also revealed to elucidate obtained results.

**Keywords:** Friction stir welding, welding interface, dissimilar T-joint, AA6061, copper, bonding strength.

PID 1982

## Interaction of Mixing Layer in Incompressible Conditions: Comparison of Numerical and Experimental Studies

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**Abstract:** Mixing layer occurs in nature as well as in practical applications. An example can be shown as the interaction of two flows with different velocities under the sea. In this study, the aerodynamic characteristics of the mixing layer were investigated for incompressible flow. A numerical scheme was used for analyzing the wake structure of the mixing region generated by two different flow velocities. The numerical results were validated by experimental data with the same flow condition. Our experimental results indicated that the numerical method provided highly accurate results for the mixing flow. The flow around the mixing layer can be divided into three regions, before the interaction, the high interaction part and the fully developed part, where self-similarity was observed. The aerodynamic mode of the flow was analyzed using Proper Orthogonal Decomposition (POD) method. Detailed flow characteristics as well as the dominated mode were analyzed.

**Keywords:** Mixing layer, interaction flow, POD, aerodynamic mode.

PID 2002

## Effect of Tool Offset on Interface Formation of Dissimilar FSWed T-Lap Joint between AA7075 and AA5083

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**Abstract:** The dissimilar T-lap joint of AA7075 to AA5083 was fabricated by friction stir welding. Changing microstructure, joint interface, and mechanical performances via tool offset toward advancing side (AS) was revealed. The results showed that increasing distance of tool offset

reduced kissing bond defects (KBs) on the AS but increased the KBs on retreating side (RS). The mechanical properties of the joint were evaluated through both hardness, tensile strength, and local strain. The fracture behavior of joint was also revealed.

**Keywords:** Friction stir welding, dissimilar T-lap joint, AA7075, AA5083, joint interface, mechanical performances.

**PID 2052**

### **Modeling and Simulating Axial Vibrations on the Crankshaft of the Large Two-Stroke Marine Diesel Engine**

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**Abstract:** The axial vibration is the strong vibrated phenomenon occurring on the main propulsion using a large two-stroke marine diesel engine. This article researches to build a mathematical model of the axial stiffness coefficient generated by the geometric configuration of the crank pin-crank web sets (CPCWS) and the combustion gas force. The stiffness coefficient of the crankshaft's axial vibration model for the one cylinder (one CPCWS) is calculated by statistical analysis from the input data obtained from the numerical simulation by finite element (FE) model, using ANSYS software, applied to the main engine MAN B&W 6G70ME. For the FE model of the CPCWS to study the axial vibration (deformation) we propose that the set composed of: ½-main crank pin (MCP) in the left; crank-web (CW) in the left; connecting rod pin (CRP); CW in the right; ½-MCP in the right is carried out the axial deformation along the engine shaft axis with the freedom ends. Using the 2-D technical draw of the CPCWS we develop the 3-D FE model and apply the commercial software ANSYS to calculate the axial deformations under combustion force transmitted from piston. By comparing the obtained values of axial stiffness according to the FE model and three other values calculated from the traditional formulas proposed by Dorey, Guliantmoti & Machot, and Skorchev, it is possible to investigate and determine the appropriate calculation method for the verified research object (CPCWS).

**Keywords:** Axial stiffness; crank pin-crank web set; diesel crankshaft; large two-stroke marine diesel engine; axial vibration simulation.

**PID 2299**

### **Analysis SUV Vehicle Structure in Frontal Impact with Differential Vehicles Model**

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**Abstract:** This article presents an analysis of the chassis structure of a sport utility vehicle (SUV) compared to sedans, pickup trucks, and SUVs and compares it with the Flat 150 hard wall to show the impact on the occupants in the vehicle during the collision. Tests at the Insurance Institute for Highway Safety (IIHS) showed that an SUV called the Toyota Rav4 was involved in a moderate

overlapping crash rated "Marginal," which is considered a crash passive. In a vehicle-to-vehicle collision, the undercarriage when colliding with different vehicles will create different degrees of deformation such as A-pillars, B-pillars, longitudinal beams, and bulkheads. Crash testing was performed using LS-DYNA software and Hypermesh, a finite element (FE) model of the SUV provided by the National Highway Traffic Safety Administration (NHTSA), simulating the crash collide two-vehicle collision, based on the standard crash test conducted by IIHS and NCAC, the moderate overlap crash test (40% deviation) at 55km/h is divided into 4 cases. When there is a collision result, it is possible to analyze the impact on the driver through IIHS performance evaluation standards and compare the vehicle's structural deformation between SUV models with different test models, for more accurate results on the safety structure of the vehicle's chassis points out large deformations that damage the safety space and points out areas for improvement to ensure the safety of passengers driving in the cabin.

**Keywords:** Analysis, SUV, vehicle structure, frontal impact, models.

**PID 2826**

### **Application of Smoothed Particle Hydrodynamics Method in Optimization of Tank Heel**

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**Abstract:** The smoothed particle hydrodynamics (SPH) is a meshless numerical method applied to the problems of fluid sloshing, gas flow, extreme deformation, and wave engineering. This method is used to perform LNG tank analysis to show the motion of liquid and to measure the filling head under operation conditions. Tank heel optimization is a critical concern in the design of LNG fuel tanks to keep the suction pump operation stable and prevent thermal shock during LNG bunkering. In this study, we introduce the design of the sump tank and numerical simulation to show that the model maintains the suction pump submergence at the minimum filling ratio during dynamic ship motion. The LNG tank structure and LNG liquid were modeled as rigid elements and hydrodynamically smoothed-particles, respectively. The simulation was performed to simulate roll and pitch motions and the instantaneous LNG level at the suction pump was also captured to evaluate the filling head. The captured results of the LNG level show that a filling ratio reduces to the minimum LNG tank heel by adapting the walled sump tank. The findings in this study contribute to the database for the method of the LNG tank design and optimization.

**Keywords:** LNG fuel tank, tank heel, suction pump submergence, smoothed particle hydrodynamic, filling ratio, ship motion.

**PID 2837**

### **Research for the Development of Crack in Bimetal Al/Cu Sheet**

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**Abstract:** At present, bonding two dissimilar metal materials is a major challenge for today's industries. Applying friction-stirring welding technology is also a feasibility study, but in order to evaluate the bond strength compared to the base material, it is necessary to survey, experiment,

evaluate to find out the advantages and disadvantages of this method. In this paper, we only focus on studying the crack development based on force application. In which, this study uses force to make cracks form and develop differently. Specifically, the research focuses on the following contents: surveying the microstructure of the Al/Cu junction, investigating the crack growth. Through this study, we can see how the crack develops, the material of the junction, in addition to the results of the strength of the weld, so that it can be applied effectively, most in practice. When this research experiment performs the crack at different positions according to the standard, applying force to the weld immediately shows that the crack is likely to develop along with the interface between the two materials with the highest ratio and not branched. Thus, this study found that the weld with the higher breaking energy, the higher the bonding strength of the two materials.

**Keywords:** Cracks in Al/Cu (Cu/Al) bimetal sheets, bimetal Al/Cu (Cu/Al) sheet bonding, grain structure in Al/Cu (Cu/Al) bimetal sheets, Friction stir welding, Aluminium alloy.

**PID 2846**

### **A Numerical Simulation and Multi-objective Optimization for the Plastic Injection Molding of the Centrifugal Pump Casing**

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**Abstract:** In the plastic injection molding process, the control parameters are essential to the success of plastic molding product fabrication. This study aims to optimize process parameters for the quality of centrifugal pump casing during plastic injection molding using a combination between response surface methodology (RSM) and the NSGA-II method. Firstly, the L27 orthogonal array design of the experiment method is used, which has four input variables, including plastic temperature, mold temperature, cooling time, and injection time. The output responses of the injection molding process to be evaluated are the warpage and shrinkage deformation of the molded product. After obtaining data, the RSM model is applied to describe the relationship between the input and output variables. Finally, multi-objective optimization uses the NSGA-II method for the best product quality. The results show that the optimized parameters for injection molding of the centrifugal pump casing are a plastic temperature of 200°C, mold temperature of 65°C, cooling time of 25s, and injection time of 10s with warpage of 0.868 mm, and shrinkage of 10.104mm.

**Keywords:** Warpage, shrinkage, plastic injection molding, multi-objective optimization, centrifugal pump casing.

**PID 2951**

### **Joining Technology by Welding in Thermoplastic Composite Laminate**

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**Abstract:** Composite laminates have been utilized in heavy industries such as aerospace, automotive, floating structures, etc., due to their lightweight, high specific strength, and modulus. As the primary structures, the joint is needed to connect them to each other. More currently, thermoplastic is emerging to step by step replace thermosetting composite laminate with the comparative mechanical properties and physical ability to adapt their applications in industry. Therefore, the joint of a thermoplastic composite laminate is interestingly studied. Based on the strong development of welding technology applied in metal, it is expected to achieve high quality



of the joint of thermoplastic composite laminate without using some conventional techniques as mechanical joint (using rivet). In fact, some welding techniques have been well introduced, such as ultrasonic welding, resistance welding, and induction welding. In this study, we briefly discuss the joint of thermoplastic composite, and the welding mechanism, especially the induction welding method. Furthermore, some research directions will also be discussed with the joint of thermoplastic composite laminate and induction welding method.

**Keywords:** Thermoplastic composite laminate, joint, welding, mechanical strength.

**PID 2959**

### **Application of Clear-V of Technique to Simulate Liquid Sloshing in 2D Containers**

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**Abstract:** Liquid sloshing inside partially filled 2D containers was investigated by using the CLEAR-VOF technique to track the free surface. The governing equations for the incompressible fluid flow are continuity and momentum conservation equations. The finite element method is used to solve these equations. The model is validated by a comparison between the computational and experimental results published.

**Keywords:** Sloshing, CLEAR-VOF, FEM

**PID 3079**

### **Analysis Sedan Vehicle Structure in Frontal Impact Using Computer Model**

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**Abstract:** This paper presents an overview of Sedan vehicle structure based on frontal impact. The analysis results include parameters on the degree of deformation, the collision absorption ability of the Sedan vehicle structural model in accidents. The purpose is based on the comparison results to simulate the Sedan vehicle structure model that collides with other car chassis models at different speed levels, based on that, compares the crash analysis simulations to find the textures the frame absorbs the maximum impact energy and minimizes the deformation so as not to affect intrusion into the safe space of the passengers compartment of the vehicle. The results of this paper show that the frame structures such as the A-Pillars and Horizontal brace between the engine compartment and the passenger compartment need to be improved to increase the safety for the passengers inside.

**Keywords:** Structural, analysis, Sedan, vehicle structure, frontal impact.

PID 3092

## Experimental Study on Vortex Flow Around A Hydro-Fin with A Delta Section

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**Abstract:** Vortex cavitation commonly occurs on marine lifting surfaces, such as hydrofoils, turbines, propellers, energy harvesting, and energy-saving devices when they are running at a high speed. The influence of the hydro-fin wedge angle on various cavitation regimes around three-dimensions hydro-fin is investigated using high-speed photography and synchronized force measurements. The experiments were conducted in a high-speed cavitation tunnel at Chungnam National University (CNU-CT), South Korea. The chord length of the fin is 41 mm, the range of cavitation number of 2.37–0.48, and the angle of attack of 0–15°. The cavitation that occurred around the control fin can be classified into tip vortex cavitation (TVC), sheet, and wake cavitation, and the angle of attack is the dominant factor in the cavitation pattern. As the aspect increase, the cloud cavity volume increases, and the diameter of the TVC increases, while the wedge angle has a small effect on wake cavitation and sheet cavitation and has a large effect on the size of the TVC. The drag coefficient is quantitatively different according to the wedge angle. The wedge angle does not affect the lift coefficient remarkably. According to the cavitation number, the hydrodynamic force coefficient can be divided into three regions with a constant value, value increasing, and value decreasing region.

**Keywords:** Vortex flow, cavitating flow, tip vortex cavitation, hydrodynamic force.

PID 3131

## Low Deadrise Chine Hull Application for Fast Current River Boat

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**Abstract:** River transportation in the upstream part of the river has very different characteristics from river transportation in the downstream part, where the main difference is in the means of river vessels and the condition of the shipping lanes. The shipping lanes in the upstream river have characteristics such as relatively narrow grooves, fast currents, and many rock obstacles, meanwhile in general the vessels have a relatively small size, speedboat/longboat type, and outboard engine. The hull design of speedboats that operated in this certain area is generally in the form of a planning hull deep V-shape single chain. This type of hull design is commonly used by speedboat manufacturers with consideration of the simple design and easy moulding process. Although this hull type has good directional stability in calm flow generally when passing through a shipping lane with very heavy currents, at the operational condition the boat tends to be difficult to control when passing through heavy currents from the side and the bow direction. The study was focused on the comparison of the existing deep V-shape and a low deadrise with a chine hull of a fast-current river vessel, where the parameters to be compared include lift force, drag force

lift coefficient, drag coefficient, and speed/power prediction. The research was conducted using qualitative methods, comparative studies, and numerical analysis. The samples of the existing hull design were obtained from the measurement results and the design approach of the existing hull, while the low deadrise hull design with a chine hull is a development design with the main size ratio approach from the existing. This study resulted in several factors that became the advantages and disadvantages of each type of hull in relation with the improvement of the design qualities and safety during operation.

**Keywords:** Low Deadrise, V-shape Hull, Fast Current River Boat.

**PID 3142**

### **An assessment of fatigue strength in jack-up platform**

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**Abstract:** Fatigue strength assessment of ship and offshore structures is a complex problem. Because the environment loads and the global climate change are big challenge of theories and experimental analysis. There are many rig oil platforms such as jack-up, wellhead, Floating Production Storage and Offloading (FPSO) and Floating Storage and Offloading (FSO) in Vietnam Southern continental shelf. The requirements of higher and higher operation to find new oil and gas resources, jack-up rig platform is overload and need to reassess the fatigue strength. In this working, analysts have to collect a big data of wind, wave, current, and detail of offshore structural serviceability. The stress concentration is also paid attention to analysis. This paper presents a tool to assess the fatigue strength of jack-up platform rapidly. The obtained results is a good manual of management and operation in oil and gas industry aspect as well as to improve the growth of Vietnam marine economy.

**Keywords:** Fatigue strength; Jack-up platform; Environment load; Stress concentration; Marine economy.

**PID 3363**

### **Molecular Dynamic Study on Deformation Behavior of Single-Crystalline Al<sub>0.3</sub>CoCrFeNi High-Entropy Alloys (HEA) During Tension Simulation**

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**Abstract:** The deformation behavior of single-crystalline Al<sub>0.3</sub>CoCrFeNi high entropy alloys (HEA) under tensile test examined via molecular dynamics (MD) simulation. The impacts of the temperature and strain rate on the tension toughness, Young's modulus, phase transformation, and dislocation are investigated. The results indicated that phase transformation and dislocation appear in all samples. Rising strain rates result in a growth in the maximum toughness and Young's modulus. In detail, increasing the strain rates from 108 to 1010 s<sup>-1</sup>, the maximum stress rises from 11.2 to 12.6 (GPa). Besides, the fraction of amorphous and HCP structures strongly rises

at higher strain rates resulting in the significant growth of the number of dislocations. On the contrary, the temperature increase result in the reduction of tension toughness and Young's modulus. The maximum stress decreases from 11.6 to 6.98 (GPa) with increasing temperature. Especially recorded amorphization process was due to a significantly increased amorphous structure, which is the reason for the decrease in the dislocation and strength in the single-crystalline Al<sub>0.3</sub>CoCrFeNi HEA samples.

**Keywords:** Tension, deformation mechanism, phase transformation, molecular dynamics simulation.

**PID 3378**

### **Using Matlab-Simulink Software to Study the Braking Efficiency of a Car**

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**Abstract:** In fact, when studying automotive dynamics, we have to conduct both simulation and experimental methods at the same time. This paper presents the results of using Matlab-Simulink software to study the braking efficiency of a car. The results show that, when a fully loaded car is running on a left roundabout with a radius of 100m, at a speed of 50km/h, the road has a friction coefficient is 0.8, and the car is braked with the maximum braking torque. If a car has an antilock braking system (ABS), the wheels are not locked, the braking force of the rear wheels increases by about 37%, the car's braking acceleration increases by about 16%, the braking efficiency is satisfactory according to the ECE-R13 standard [1]. If a car does not have ABS, the rear wheels will be locked and slip completely, the braking efficiency will be greatly reduced, and the vehicle will move unsafely.

**Keywords:** Matlab-Simulink, braking force, braking efficiency.

**PID 3394**

### **Numerical Investigation on the Motion of a High-Speed Planning Hull in Calm Water Condition using RANSE Method**

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**Abstract:** Planning hulls were commonly used in both civilian and military situations. The prediction of the motion of the planning hull was complicated due to the trim angle and sinkage oscillations caused by the lift variations and complex hydrodynamic interactions at high speeds. To evaluated the motion of the planning hull, it was essential to analyze the hydrodynamic performance of the planning hull at high speed. This paper presented a CFD method for calculating the hydrodynamics of a planning hull in calm water conditions at different Froude numbers. The numerical method was based on the Reynolds-averaged Navier-Stokes equation (RANSE). The volume of fluid (VOF) and two degrees of freedom equations were utilized. An efficient procedure was introduced to solve numerical divergence in numerical simulations. Resistances of the planning hull in numerical results were compared with experimental results to verified and validated the used RANSE method.

**Keywords:** RANSE, Planning hulls, CFD, VOF, Resistance.

PID 3412

## Research for Determination of the Limit the Dynamic Rollover Threshold of a Three-Axle Vehicle

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**Abstract:** The three-axle vehicle is a popular vehicle widely used in today's road transport network. Complex volumes and textures often move at high speeds making three-axle vehicles often happen in dangerous types of accidents, the most dangerous of which is the phenomenon of the vehicle's horizontal overturning. These accidents not only affect the vehicle and the driver but also the surrounding traffic. The rollover instability is often influenced by a number of factors such as road surface conditions, lateral forces, driver's reflections, etc. Overturning instability is usually caused by the truck moving at high speed when changing lanes or turning around, causing the wheels to not stick to the road surface (separating wheels), making it difficult for the driver to handle. In this paper, the author uses the method of many-body systems and sets up a system of differential equations according to Newton-Euler. Use MatLab/Simulink software to conduct dynamic simulations. From there, as a basis for determining the limit of lateral instability of the three-axle vehicle.

**Keywords:** Horizontal overturning, lateral forces, Simulink, three-axle vehicle, separating wheel.

PID 3962

## A study on the Influence of Speed on Bus Vibrations on the Road Surface Profiles According to ISO 8608:2016

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**Abstract:** To evaluate the smooth movement and the dynamic safety of a bus, the paper presents the results of a study on the vibration of a Hyundai County bus when running on different road surfaces according to ISO 8608:2016. The results show that, when a fully loaded Hyundai County bus moves on class B road according to ISO 8608:2016, the maximum speed is 100km/h, on class C road the maximum speed is 90km/h, on class D road the maximum speed is 75km/h and above class E road have a maximum speed of 60km/h, then the Hyundai County bus will ensure the smooth movement and dynamic safety according to the national standard TCVN 6964:2008 (ISO 2631:2003) and Germany standard VDI 2057:2017.

**Keywords:** Vibration, smooth movement, dynamic safety.

PID 3667

## Ultrasonic Vibration Measurement Using Heterodyne Interferometry and SDR Phase Meter

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**Abstract:** Advanced digital signal processing algorithms improve mechanical displacement measurements using high-speed and pm-level interferometers in real time. In recent years,



developing digital algorithms and employing low-cost software-defined radio (SDR) software applied to communication systems and other general-purpose systems with flexible solutions and low cost are essential in modern industrial applications, which can be consistent with real-time phase-change measurements of MHz-frequency interference signals for a heterodyne interferometer. This paper combines a heterodyne interferometer and a real-time SDR phase meter, demonstrating an ultrasonic vibration instrument's high-speed vibrating measurement capabilities. A double-pass interferometer is implemented to produce interference signals modulated with a sine waveform phase change associated with a tool's ultrasonic vibrating displacement, calculated by the phase meter's quadrature demodulation algorithm. The measurement results show that the system detects the sine-wave vibration trajectory generated by the vibrator at a frequency of 20 kHz and an amplitude of ~460 nm. The principle of the measurement system, instrumentations, experiments, and results are discussed in the paper.

**Keywords:** High-speed vibration measurement, heterodyne interferometry, quadrature demodulation, software-defined radio.

**PID 4025**

### **A Numerical Study on Thickness of Rear Under-ride Protection Device in Case Pick-Up to Semi-Trailer Full Rear Impact**

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**Abstract:** Today, in the global supply chain, large trucks, tractors, and semitrailers are essential as the final step in this complex network. However, they have many potential dangers because the gaps from the semi-trailer's floor to the road surface are high, so small cars easily get underride. To solve this issue, some regulations have required the installation of additional protection devices on the front, sides, and rear where these gaps exist, for example, FMVSS 223, 224 of the US, or UNECE R58 of Europe. Using LS-DYNA software and trailer and pick-up models from proven sources to set up a collision simulation, then proceed to change the thickness of the rear underride protection device to assess the effect. The collision was designed with 55.8 km/h of pick-up and a stationary trailer. The effect of change thickness on axial displacement and energy changes is presented.

**Keywords:** Rear under-ride, protection device, design, truck, semi-trailer.

**PID 4209**

### **Estimation of the Required Power of Bow Thruster Based on Numerical Simulation**

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**Abstract:** The paper presents the results of hydrodynamic characteristics of bow thruster (thrust coefficient  $K_T$ , torque coefficient  $K_Q$ ) in various pitch angles using RANSE method and compared to the experiment data provided by Maritime Advanced Research Centre (CTO S.A.), Gdansk,

Poland. The required power of the bow thruster is estimated based on those numerical simulations. To get a better energy efficiency, the thrust-to-power ratio with pitch angle can be compared. The simulation of a rotating propeller is done using the sliding mesh approach. The k-epsilon turbulence model is utilized with commercial code ANSYS CFX when analyzing bow thruster performance. The results show that the difference between numerical and experiment results is quite high. Moreover, the power and the thrust-to-power ratio increase with the pitch angles and the bow thruster performs the best efficiency at the pitch angle of around 190.

**Keywords:** Bow thruster, hydrodynamic characteristics, numerical simulation, RANSE.

**PID 4140**

### **Developing and Solving the Mathematical Model of Transient Heat and Mass Transfer in Freeze-Drying of Cordyceps Militaries**

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**Abstract:** In this study, a mathematical model of the transient mass and heat transfer of cordyceps militaris during lyophilization was developed. This mathematical model was solved using a program coded in MATLAB to simulate the relationship between product temperature and sublimation rate over time. The parameters of drying mode were set in the simulation as follows: heating plate temperature from 273.2 to 303.2 K, drying chamber pressure from 30 to 60 Pa. The fruiting body of cordyceps analysed in the study is considered as cylindrical shape with the radius of 1.5 mm, length of 60 mm, which was arranged in 1 layer on a tray with dimensions of 200x300x20 mm. Research results show that, when the heating plate temperature is increased, the sublimation rate tends to increase, when the sublimation chamber pressure decreases, the sublimation speed increases rapidly. This result can also be used to build software to set the technological mode for the cordyceps drying process by sublimation method.

**Keywords:** Heat and mass transfer, freeze-drying, sublimation, cordyceps militaris.

**PID 4143**

### **Energy Absorption Capacity Under Tensile and Compressive Loads of Auxetic Metamaterial Structures**

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**Abstract:** An auxetic metamaterial is a mechanical metamaterial with a negative Poisson's ratio. When compressed or stretched in one direction, it contracts or expands in a perpendicular direction. This review paper focuses on the energy absorption of auxetic metamaterial structures and their applications. Starting with the original structure proposed by D. Han et al., another structural model with heuristically enhanced ribs is proposed to suit the structure's anisotropy, reduce mass, and increase energy absorption. An extension to this is the newly designed MH-1 model, which is lightweight compared to commonly reported auxetic forms. Numerical results

show that MH-1 has the best specific energy absorption and exhibits an obvious auxetic effect under tension, with symmetrical and stable deformation modes.

**Keywords:** Metamaterials, Poisson's ratio, specific energy absorption – SEA.

**PID 4226**

### **Numerical Investigation of Ventilated Supercavitating Flow Around Cavitators with Varying Angles of Attack**

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**Abstract:** This study employs computational fluid dynamics to qualitatively and quantitatively examine the characteristics of the ventilated supercavitating flow behind a 45° cone-shaped cavitator at various angles of attack (-15°, -10°, -5°, 0°, 5°, 10°, 15°). Specifically, we investigate the geometry of the supercavity, the mechanism of gas leakage, and the deformation of the supercavity under different flow conditions. Our findings indicate that, under a fixed Froude number, the length of the supercavity (LS) decreases as the angle of attack of the 45° cone cavitator varies from -15° to 15°. In contrast, the maximum diameter ( $D_{\max}$ ) of the supercavity appears to be independent of the angle of attack. The gas leakage mechanism of the ventilated supercavity is consistent with twin-vortex tubes, and the distance between them is affected by the angle of attack. Finally, we quantitatively examine the deformation of the supercavity due to gravity as the angle of attack of the cavitator varies. As the cavitator angle of attack increases from -15° to 15°, the centerline of the supercavity tends to move upward from the baseline (i.e., the centerline of the test model).

**Keywords:** Supercavitation, ventilation, supercavity formation, angle of attack.

**PID 4352**

### **Material Design for Manufacturing Stab-Proof Life Jacket**

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**Abstract:** In contemporary times, professionals working in aquatic environments like fishermen, fishery inspectors, customs officers, etc. necessitate a device that provides protection against puncture and drowning. Consequently, a multi-layer composite material comprising woven fabric (para-aramid 200de), coated plate (Dyneema® SB31), and foam was assessed to create a life jacket that is both stab-proof and anti-drowning (stabproof life jacket). The research aimed to determine the ideal number of layers and arrangement of multi-layer composite materials that would offer NIJ standard level 1 protection against puncture. The study outcomes revealed that using both types of woven fabric and coated plates resulted in the most favorable puncture resistance, considering the thickness and weight of the composite materials. The efficacy of using only woven fabric ranked second, while only coated plates produced the least desirable results. Placing the puncture-resistant material above the foam layer was more effective than putting it beneath the foam layer in all three cases. The findings serve as the groundwork for design and development of stab-proof life jackets suited for professionals in specific aquatic industries.

**Keywords:** Puncture-resistant life vest, Puncture-resistant, multi-layer composite, Aramid, UHMWPE.

PID 4482

## Exploring the Impact of Industry 4.0 on Marine Mechanical Engineering in the Philippines: Opportunities and Challenges in the 21st Century

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**Abstract:** Industry 4.0 is revolutionizing the way we do business and operate our industries today. The marine mechanical engineering industry in the Philippines is not exempt from this digital transformation. The advancement of technology has paved the way for the development of smart ships and the implementation of automated systems in the maritime industry. This review paper explores the impact of Industry 4.0 on marine mechanical engineering in the Philippines, the opportunities it presents, and the challenges it brings. The paper starts with a brief introduction to Industry 4.0 and its various components that are relevant to the marine mechanical engineering industry. It then delves into the current state of the industry in the Philippines, including its strengths and weaknesses. The review paper discusses the opportunities that Industry 4.0 presents in terms of improving efficiency, reducing costs, and increasing safety in the maritime industry. It also highlights the challenges that come with implementing new technologies, such as cybersecurity threats and the need for upskilling the workforce. The paper concludes by emphasizing the need for the marine mechanical engineering industry in the Philippines to embrace Industry 4.0 to stay competitive and relevant in the 21st century. The authors suggest that stakeholders must work together to develop a clear roadmap for the adoption of new technologies and address any barriers to implementation. The review paper provides valuable insights for policymakers, industry players, and researchers in the field of marine mechanical engineering in the Philippines.

**Keywords:** Industry 4.0, Marine Mechanical Engineering, Philippines, Opportunities, Challenges.

PID 4496

## Design Optimization of a Marine Refrigeration System with Waste Heat Recovery Channel

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**Abstract:** This paper presents the design of an optimized marine refrigeration system to be used as a preservation facility for fishermen on boats. This aims to help preserve and maintain the high quality of the catch during fishing operations. This is to replace the manual ice box method. The system is tested in an actual environment offshore. The lowest temperature reached inside the refrigeration when full load is -1.7°C with a maximum time of 6 hours, while the temperature of the fish inside the refrigeration is 2.5°C. These results show the capability of the enhanced marine refrigeration system to achieve the desired temperature for the catch to maintain its good quality. In addition, the usability and user experience survey results indicated that the target beneficiaries agreed that the following aspects of the marine refrigeration system include usefulness and functionality, ease of use, design capacity, dimension, aesthetics, and kerosene as the resources used are excellent.

**Keywords:** Absorption, Kerosene, Marine Refrigeration.

PID 4549

## Numerical Simulation Flow Around The 4600DWT Cargo Ship in Calm Water Condition Using RANSE Method

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**Abstract:** Information about the flow field around the ship may enable the designers to improve ship hull form concerning ship hydrodynamics. The flow around the ship can be obtained through model tests in towing tank and simulations. However, the experimental method provides the most reliable data about flow around the ship, but this method is too expensive and time-consuming. Currently, the RANSE (Reynolds – averaged Navier – Stokes equation) method has been widely employed in predicting the ship resistance and flow around the ship in the ship design process due to it provides relatively accurate results, savings in time and money compared to the experimental method. Therefore, this paper deals with the numerical results of the study flow around the 4600DWT cargo ship, which operate on Vietnam's river-sea routes in calm water condition at different ship speeds using the RANSE method. The effect of ship speed on ship resistance components, wave pattern, wave profile along the ship, distribution of dynamic pressure, and wall shear stress on the ship's hull surface and nominal wake field are presented and analyzed in the paper.

**Keywords:** RANSE, ship resistance, flow.

PID 4620

## Study on Expedient Modelling of Ball Screw Feed Drive System Using Vibration Analysis

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**Abstract:** A ball screw feed drive system (BFDS) is a commonly used transmission mechanism because it responds flexibly to CNC milling machines' operating conditions. This paper focuses on surveying, describing, and classifying the vibration modes of ball screws by using the dynamic modelling method. Two main vibration modes, axial and rotational modes, are affected by the physical geometry (size, length, pitch) of the ball screw and the working table position. Ball screw vibration is also determined by the preload value, which directly affects the axial and torsional stiffness of the ball screw. Therefore, this study presents a pooled modelling method that uses the dynamic parameters of the ball screws to predict vibration frequencies in two main vibration modes. This paper also presents the experimental vibration model of the BFDS to analyze the vibration signal. The calculated and measured results of vibration frequency are compared and commented on to interpret the vibration modes of the BFDS, especially that of the ball screw.

**Keywords:** Ball screw feed drive system (BFDS), Modeling Method, Vibration Frequency, Natural frequency, Axial Mode, Rotational Mode.



PID 4629

## Optimization of Cutting Parameters for Milling Inconel-800 Superalloy Under Nanofluid MQL Conditions Using Experimental and Metamodel Methods

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**Abstract:** Many experts throughout the world are interested in the machining of Inconel-800, a superalloy material that is difficult to cut. This work employs the sophisticated and industry-accepted lubrication approach of minimal quantity lubrication (MQL), which improves the machinability of Inconel-800 superalloy material while reducing the quantity of standard cutting fluids. The RBF metamodel was utilized to explain the link between cutting velocity, feed per tooth, depth of cut, and corner radius to two quality variables, cutting force and specific cutting force. To identify optimum global solutions for the multi-objective optimization issue, a combination of the RBF approximation model and the Nondominated Sorting Genetic Technique II (NSGA-II) algorithm was used. The results show that this study plays a part in supporting scientists and engineers to understand machining difficult-to-cut materials better and minimize waste to the environment towards sustainable and environmentally friendly machining.

**Keywords:** Superalloy material, Nanofluid MQL, Approximation, Optimization, Environment Friendly Machining.

PID 4910

## Level Ice Breaking Simulations Using A Fully Coupled Fluidstructure Interaction Code HydroQus

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**Abstract:** Icebreakers going through level ice zone in the Arctic Sea routes are subjected to level ice-breaking loads and broken ice floe and pack ice-induced loads simultaneously; hence, it is important to estimate the ice loads on the icebreaker. This paper aims to estimate ice resistance of a model icebreaker which is towed through an ice sheet zone in a Korean arctic basin. In this study, a new approach using HydroQus, hydrodynamic subroutine for Abaqus, without Eulerian domain was introduced. The icebreaker model ship was modeled as a rigid body. HydroQus supplied non-linear hydrostatic force and hydrodynamic force in real time to the ice sheet and the broken ice separated from the level ice after the ship's ice breaking. Hydrodynamic form-induced drag forces were exerted on the level ice and the broken ice. Ice material was modeled with four-node tetrahedron elements. Drucker-Prager yield function was applied to the level ice. Continuum damage mechanics model was introduced to involve ice breaking. The level ice breaking pattern was similar to that in the model ship towing tests. The level icebreaking was very well simulated showing realistic breaking pattern. The broken pack ice separated from the level ice due to icebreaking has interacted with hull bottom.

**Keywords:** Drag force, friction coefficient, icebreaker, ice resistance, level ice.

PID 5578

## Design and Simulation of Structural Durability of Passenger Car Front in Collision

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**Abstract:** In this paper, design and calculate a damping system with HYPERMESH software. Research using LS-DYNA software to analyze finite element model and structural strength of passenger car front and violate the safe space on impact. Simulation results with a speed of 50 km/h according to ECE R66 standards show a reduction of 27%. Meet the requirements on the condition of the car head structure. The safe space is not violated according to ECE R66 standards in a head-on collision.

**Keywords:** ECE R66 standard, HYPERMESH software, LS-SYNA software, collision, passenger car, damping system.

PID 5683

## Effect of Cyclic Loading Rate on Fracture Behavior of Friction Joint of Dissimilar Superalloys at Elevated Temperature

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**Abstract:** The dissimilar nickel-based superalloys, a forged Inconel 718 and a casted Mar-M247 superalloy, were joined via the friction welding. The effect of the cyclic loading rates at 650oC on the joint life was investigated. The fracture behavior of the joint was sensitive to the loading strain rate. Three typical modes of fracture were found, the joint fractured: (1) on Mar-M247 side (far from the interface), (1) adjacent to the interface on Mar-M247 side, and (3) adjacent to the interface on the Inconel 718 side. The dissimilar fatigue and creep resistance of the base superalloys and the triaxiality stress/strain state induced by the mismatch properties between the base superalloys were found to be the main factor attributed to the fracture behavior of the joint.

**Keywords:** Dissimilar joint, cyclic loading rate; elevated temperature; fracture behavior.

PID 5718

## Biaxial Fracture Mechanism and Thermal Transport in Nanoporous Graphene-like BC<sub>6</sub>N

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**Abstract:** This work analyzes the thermal transport (TT) and mechanical characteristics (MC) of graphene-like BC<sub>6</sub>N monolayer utilizing non-equilibrium molecular dynamics (NEMD) and molecular dynamic (MD) simulations. Herein, the TT and MC of BC<sub>6</sub>N with a circle pore defect are systematically reviewed and numerically examined under biaxial tensile processes. The results

show that the BC<sub>6</sub>N sheet has a balance on mechanical properties in two directions under biaxial tension as changing pore size from D = 2.0 to D = 7.0 nm. Young's modulus, toughness, failure stress, and failure strain of BC<sub>6</sub>N monolayer with a circle pore decrease when the pore size increases. The trending laws are also shown to predict the mechanical parameters of the porous BC<sub>6</sub>N sheet. Besides, the thermal conductivity (TC) of the monolayer BC<sub>6</sub>N with a smaller pore size is much higher than those of the sample with a bigger pore size due to higher energy loss. Changing pore size can adjust the TC and 2D temperature dispersion around the circlepore. Furthermore, the pristine BC<sub>6</sub>N TC is incredibly higher than the defective ones. The study results confirm 2D-BC<sub>6</sub>N's outstanding optical, electronic, thermal, and mechanical characteristics, particularly inspiring for further experimental and theoretical works.

**Keywords:** 2D-BC<sub>6</sub>N, mechanical characteristics, thermal conductivity, molecular dynamics.

**PID 5733**

### **Ultimate Strength Assessment of Collision Damage Caused by Dropped Objects on Container Ship**

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**Abstract:** This study aims to present numerical investigations on container ships' residual longitudinal ultimate strength subjected to dropped container collisions. First, the commercial software ABAQUS was applied. The accuracy and reliability of the proposed numerical analyses were established by comparing the numerical results with the experimental results. Next, parametric studies were carried out on actual container ships to assess the degree of loss of the ship's longitudinal strength in two dangerous situations a ship sagging and hogging. The effects of parameters such as impact velocities, impact masses, impact locations, and impact angles on the ultimate longitudinal strength of the ship have been investigated. The results present in this study can be applied to predict the residual longitudinal ultimate strength of dropped container collisions on a container ship. It is also useful for the initial design stage of ship structures in case of collision incidents.

**Keywords:** Dropped object, container ship, ultimate longitudinal strength, numerical simulation.

**PID 5837**

### **Temperature Distribution in the Weld Zone of Friction Stir Welding on Alloy Aluminum Tubes**

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**Abstract:** Friction stir welding (FSW) is solid-state welding, the temperature during welding is lower than the melting point of the material. During friction-stirring welding, temperature, stress, and strain change depending on the technological parameters, and understanding that relationship will help determine the optimal parameters of the welding process. This paper analyzes the heat distribution of the welding zone and the influence of the technological parameters of the frictional stirring welding of aluminum alloy tubes by the finite element method. The finite element model is built based on the commercial software Abaqus/Standard. Numerical simulation was established to analyze the heat transfer process in the welded parts, the distribution of stress, and strain as a basis for determining the optimal parameters of the welding process.

**Keywords:** Friction stir welding; Pipe welding; Abaqus/standard; Numerical simulation.

PID 5909

## Experimental Study on Maneuverability of The Cruise on the Han River with High-Lift Rudder with Wedge Tail

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**Abstract:** The high-lift rudder is essential to improve the maneuvering performance of the ship. In the previous studies, the high-lift rudder with a wedge tail is proposed, the lift force increases significantly at a large rudder angle, while the drag increases slightly at a small rudder angle. In this study, the free running model test is carried out on the open water pool. The model of the cruise on the Han River with a 1.5m length is tested on the turning circle test with the three different types of rudders namely the flat plate, NACA0015 conventional, and NACA 0015 with a wedge tail. The turning circle test is performed and test results are obtained in terms of including advances, and tactical diameter. The comparison results show the cruise with NACA 0015 with wedge tail gives better maneuvering performance by reducing advance and tactical diameter for the turning port and starboard, respectively.

**Keywords:** Free-running model test (FRMT), high-lift rudder, lift force, NACA0015 conventional, wedge tail.

PID 6018

## Optimization of Cutting Parameters Using Grey – Taguchi Method in Hard Milling of Skd-61 Steel

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**Abstract:** SKD-61 steel is widely applied in various industries, including the marine industry. The Grey-Taguchi approach is used in this study to optimize surface roughness (Ra), cutting force (Fc), and material removal rate (MRR) while hard- milling SKD-61 steel in pure minimum quantity lubrication (MQL) and nanofluid MQL environments. The orthogonal array method generated a set of studies for four input parameters: cutting speed, depth of cut, feed per tooth, and cutting condition. The results of the ANOVA study show that cutting condition, feed per tooth, and cutting velocity are essential factors influencing response parameters. A strategy for enhancing multi-objective answers in machining that combines Grey relational analysis (GRA) with the Taguchi method. The optimized findings show that the lowest surface roughness, cutting force, and highest material removal rates are achieved when the cutting condition, cutting velocity, depth of cut, and feed per tooth are set to nanofluid MQL, 80 m/min, 0.2 mm, and 0.01 mm/tooth, respectively.

**Keywords:** Hard milling, nanofluid MQL, optimization machining parameters; Grey relational analysis; Taguchi.

PID 6131

## Interaction of Mixing Layer in Incompressible Conditions: Comparison of Numerical and Experimental Studies

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**Abstract:** Mixing layer occurs in nature as well as in practical applications. An example can be shown as the interaction of two flows with different velocities under the sea. In this study, the aerodynamic characteristics of the mixing layer were investigated for incompressible flow. A numerical scheme was used for analyzing the wake structure of the mixing region generated by two different flow velocities. The numerical results were validated by experimental data with the same flow condition. Our experimental results indicated that the numerical method provided highly accurate results for the mixing flow. The flow around the mixing layer can be divided into three regions, before the interaction, the high interaction part, and the fully developed part, where self-similarity was observed. The aerodynamic mode of the flow was analyzed using Proper Orthogonal Decomposition (POD) method. Detailed flow characteristics as well as the dominated mode were analyzed.

**Keywords:** Mixing layer, interaction flow, POD, aerodynamic mode.

PID 6165

## A Numerical Investigation into the Effect of Different Piston Bowl Geometry and Optimizing Fuel Injection Parameters On the Performance and Exhaust Emissions of A Marine Diesel Engine Fuelled with Biodiesel Blend

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**Abstract:** For diesel engines, the fuel injection parameters and piston bowl geometry (PBG) have a great influence on the working process and exhaust emissions. This paper presents the research results on effects of the fuel injection parameters such as the diameter of the spray nozzles, injection pressure, the start of injection, and diameter of fuel particles injected into the cylinder in combination with optimizing PBG on the performance and exhaust emissions of the marine diesel engine Yanmar S185L-ST fuelled with biodiesel blend. The study procedure was conducted using specialized simulation software Diesel-RK. The study results showed that the optimization of parameters above and in combination with the proposed PBG allows a significant reduce fuel consumption, NO<sub>x</sub>, and soot emissions.

**Keywords:** Biodiesel blend, Diesel-RK software, exhaust emissions, fuel injection parameters, piston bowl geometry.

PID 6248

## Residual Ultimate Strength of Corroded Stiffened Plates

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**Abstract:** This paper investigates the structure behaviors of corroded steel stiffened plates subjected to axial compression and evaluates the effects of pitting- and grooving-corrosion damages on the residual strengths of corroded stiffened plates. To achieve this purpose, compression tests were performed on seven stiffened plates having artificially corrosion damages by machining. Pitting- and grooving-corrosions were considered in the fabrication of the test models. Prior to these tests, the initial shape imperfections of the stiffened plate models were measured using a 3-D scanning machine. Test results including load-displacement relationship and the ultimate strength under axial compressive loads are reported in this paper. Numerical simulations were also performed for the compression tests. The results confirmed that grooving corrosion may significantly reduce the compressive strength.

**Keywords:** Corrosion damage, grooving-corrosion, pitting-corrosion, residual strength, stiffened plate.

PID 6361

### A Programming Approach for Ship Pipe Route Design: Network Flow Coupled with Parametric Modeling

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**Abstract:** Pipeline routing on ships consumes time and high cost in the ship design process; experts now do most pipeline routing work with the support of CAD software. Most of the research focuses on solving complicated routing problems in a preliminary design of a ship's engine room. In this study, we have proposed a parameterized pipeline-aided design to assist engineers in the preliminary stage based on the network approach. Simulation results show the efficient and rapid modeling of pipeline routing tasks in the ship engine room.

**Keywords:** Automatic pipeline routing, Parametric pipeline design, Dijkstra's Algorithm, Routing network.

PID 6497

### Numerical and Experimental Investigation on Temperature Distribution of AA6061-T6 Friction Stir Welded by Different Tool Pin Profiles

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**Abstract:** This study presents an investigation of temperature distribution of AA6061-T6 aluminum alloy friction stir welds with various tool pin profiles. Research efforts are being made to gain a better understanding of Friction Stir Welding (FSW) process, to explore different tool configurations, and their influence on the heat generation. The numerical model was created and analyzed in Abaqus software. This numerical model uses coupled Eulerian Lagrangian method, Johnson-Cook material model and mass scaling technique. Model is validated with experimentally

observed temperature value in Stir zone (SZ) and Heat-affected zone (HAZ). The numerical results show the high correlation with the experimental study, with the deviation around 10%. It is shown that tool pin profiles with the combination of thread and flat features generated the highest temperature.

**Keywords:** Friction stir welding, Pin profile, AA6061.

PID 6474

### The Effect of Bio-Waste Rice Husk Powder and Short Basalt Fiber as A Supportive System for Long Flax Fibers Reinforced Polypropylene Hybrid Composites on the Mechanical, Thermal, and Flammability Properties

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**Abstract:** The hybrid composites by the combination of natural fiber - flax fiber (FF), Basalt fiber (BF), and redundant biowaste resource - Rice husk powders (RHP) reinforced thermoplastic in this research has excellent mechanical, thermal, and flame retardants performance due to their intrinsic and expected mechanism structure. New processing to manufacture various lengths for long fiber reinforced thermoplastic composites was initially proposed to overcome short flax fiber by their aspect ratio. Polypropylene (PP) was used as a matrix for long unidirectional Flax fibers (LFF) strips (from 5 to 20 mm in length), and the BF and RHP can use twin extruder machines to manufacture pellets for making hybrid composites. The supportive (BF/RHP/PP) pellets linked with LFF were finally hot-pressed into plates. The compounding process was cut into strips by a mini cutting machine and scissors manual, then used an injection molding machine to get the final achieved specimens. The optimal LFF plies and length in the composites strip were obtained when the LFF was two plies (~16%LFF) and 10mm in length. Finally, LFF2/30%BF/PP-6%RHP composite achieved improved tensile and flexural (strength and modulus) properties by 36.64%, 40.31%, and 37.51%, 56.49%, respectively, compared to the LFF reinforced composites. Moreover, hybrid composites have high char residual with 19.18%. (higher than 83.26% comparison with LFF/PP). Flammability properties by using cone calorimeter test showed high pHRR and THR with 36.41% and 11.73% increase, respectively. The results indicated that hybrid thermoplastic composites are a promising approach that provides potential applications of LFF in the automobile application field.

**Keywords:** Flame-retardants, long flax fiber bundles, mechanical properties, rice husk powders, short basalt fibers.

PID 6617

### Effects of Impact Location on the Dynamic Response of Repeatedly Impacted Aluminum Alloy Plates

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**Abstract:** This paper presents a numerical investigation of the effects of impact location on the dynamic response of aluminum alloy plates to repeated mass impacts. A numerical model was developed and validated against relevant test data. In the simulation, the strain hardening was adopted using existing published equations. A parametric study was performed by considering

different impact locations while keeping impact energy (mass and velocity) identically for each impact. The results showed that the plate was deformed progressively, the impact forces get increased, while its duration time decreased when the plate was impacted repeatedly. While changing in impact location after each impact remarkably affected the response of impacted plates, i.e., less damage was observed.

**Keywords:** Numerical simulation, aluminum alloy plate, repeated impacts, residual deformation.

**PID 6816**

### **Effect of Nanopores on Mechanical Properties of InSe Membrane**

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**Abstract:** The mechanical characteristics and atomistic deformation mechanisms of nanoporous InSe membranes under uniaxial tensile were investigated via molecular dynamics (MD) simulation. The effects of nanopores size on the ultimate strength, Young's modulus, and deformation mechanisms were investigated. With the perfect InSe membrane, the ultimate stress in the zigzag and armchair directions is 7.87 N/m and 8.25 N/m at a temperature of 300 K, respectively. Young's modulus values when tensing in the zigzag direction are quite close to those when tensing in the armchair direction. With the nanopores membranes, the crack spreads in the perpendicular with tension direction. However, for the zigzag tensing, the crack tends to propagate along the zigzag edge after the crack propagates in the direction perpendicular to the tensile direction. The findings show that when the nanopore is present, the stress is localized in the area surrounding the void, making destruction easier. As a result, nanoporous InSe membranes have significantly reduced mechanical characteristics. As the porosity increased, the ultimate strength and Young's modulus of monolayer InSe decreased. Moreover, the results point out that with defective InSe membranes, brittle-type failure was observed. Besides studying the effects of nanopores on the mechanical properties of InSe sheets, this study also studies the impact of tensile strain rate on the mechanical features of InSe sheets. The results indicated that at greater strain rates, the destructive fracture is retarded, and the failure strength is increased. The impact of porosity is substantially greater than the impact of strain rate on the tensile characteristics of the InSe membrane.

**Keywords:** Tension, deformation mechanism, InSe, membrane, molecular dynamics simulation.

**PID 6830**

### **Tensile Behavior of the Dissimilar Friction Stir Welding between Pure Copper and Aluminum 1050**

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**Abstract:** The copper-and-aluminum hybrid connectors are critical components in electric vehicles. Friction stir welding is used to manufacture a joint between pure copper 1100 and aluminum 1050 plates with a thickness of 5 mm in this study. A significant amount of copper was

dispersed into the aluminum side to establish the bonding. The bonding strength was investigated using the tensile test. The macrostructure and fracture paths of the joints were monitored using an optical microscope. The copper/aluminum interface could be a preferred location for crack propagation. The tensile strength of the joints was increased with the increase of the tool rotation. The stress in the joint was simulated for discussion.

**Keywords:** Dissimilar Cu/Al joint, friction stir welding, tensile failure, interface stress.

**PID 6890**

### **Investigation of Environment Factors on the Resistance Characteristic: Study Case of the Designed Patrol Boat Hull**

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**Abstract:** The increase in world oil prices has led to high operational costs in the maritime sector. In this regard, it is necessary to increase efficiency in the use of fuel in the maritime transportation security sector. Resistance on the ship's hull affects efficiency and fuel consumption. In previous studies, there have been analyses on internal factors of the ship's hull, such as appendages, which can affect the resistance value of the ship's hull. However, examination of the external factors, e.g., the condition of the waters during operations of patrol boats, is still scant. This study conducts a series of analyses of the influence of environmental factors on the hull resistance values, such as water density and wind speed with 5 different conditions. The results of this study are expected to be a reliable reference in predicting hull performance under different environments, especially in an attempt to reduce fuel consumption due to resistance.

**Keywords:** Patrol boat, planning hull, savitsky method, resistance pattern, required power.

**PID 7158**

### **Optimizing the Processes of Spinning of Vt1-0 Material Titanium**

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**Abstract:** The paper presents optimization of the spinning technological processes of cylindrical blanks of VT1-0 material titanium. This process is computed using the finite element method (QForm VX) and conducted experimentally on the PNC-111 machine to test the accuracy of the proposed method. In this study, the titanium material model VT1- 0 is used to build models for computation and experiment. The results of the study help researchers to effectively implement the technological process of spinning titanium materials.

**Keywords:** Titan VT1-0; spinning; simulation processes for spinning; Qform VX.

**PID 7478      Microstructure Evolution in the Cu/Al Dissimilar Friction Stir Welding**

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**Abstract:** The hybrid Cu/Al connections have been used widely in electrical vehicles. In this work, the pure copper 1100 and aluminum alloy 6061 were joined by the friction stir welding. The microstructure evolution in the welded zone under different weld regimes was investigated. The welded cross-sections were polished and etched for the investigation. The attention was put on the material flow, the mixture between the copper and aluminum, the grain microstructure.

**Keywords:** Copper 1100, aluminum alloy 6061, welded microstructure.

**PID 7612**

**Structural and Inverse Kinematic Analysis of 6 DOF Robot Manipulators in the Welding Process**

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**Abstract:** The article presents the structural analysis results using Ansys® software. Additionally, the general solution proposed by Raghavan and Roth for the inverse kinematics of a 6-DOF robotic manipulator is performed in Matlab®. The geometric model of the robot manipulator based on the workspace requirements is designed. The behaviour of the structure for the manipulator is performed under two different load conditions corresponding to the two types of welding trajectory (circle and zigzag welding). The analysis results show that the manipulator ensures durable conditions.

**Keywords:** Ansys, Matlab, kinematics, welding, manipulator.

**PID 7680**

**Numerical Studies on Effects of Blade Number Variations on Performance of Sludge Pumps**

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**Abstract:** The sedimentation of sludge in pangasius catfish ponds presents a significant challenge for the economic development of farmers in Vietnam. Sludge results from a combination of



uneaten food, waste, and algae, which undergo decomposition, releasing toxic gases such as H<sub>2</sub>S, NH<sub>3</sub>, and NO<sub>2</sub>. These gases, in turn, reduce the oxygen levels in the ponds and negatively impact the growth of catfish. The removal of sludge is necessary every two months during the catfish raising process. A sludge pump capable of performing well in the Vietnamese environment is needed to address this issue. This paper aims to investigate the impact of blade number on the performance of a sludge pump. Since pangasius ponds range in depth from 2 to 4 meters, the study focuses on the pump's performance at a head height between 2 and 4 meters. The research employs the CFD method to analyze the flow of sludge pumps with impeller blades of 7, 8, 9, and 10, modeled with a semiopen impeller centrifugal pump type at 2200 rpm, using the k-ε turbulence model and the time-average Navier-Stokes equation.

**Keywords:** Sludge pump, blade number, geometrical Blade, CFD, two phase.

**PID 7697**

### **Effects of Material Strain Rate, Impulse Profile on Damage Evolution of Steel Plates Subjected to Repeated Pressures**

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**Abstract:** Ships and offshore structures can be damaged due to repeated pressures arising from slamming events during their service. In this study, the prediction of the damage extent of steel plates used in marine structures subjected to repeated slamming pressures was presented. The numerical analysis model was developed using the finite element software ABAQUS/Explicit and validated through a comparison with test data. Subsequently, the validated model was extended to investigate strain rate and impulse profile effects on the damage of plates having actual scantlings. In the simulation, the plate model was fully clamped while adopting the strain hardening model; the impulsive pressures were applied uniformly over the plate. Different strain rate models were used. Besides, several types of impulse profiles which can be used to simplify the actual slamming pressure were also adopted. The effects of strain rate and impulse profile on the damage of the repeatedly implosive pressure plates are found to be remarkable. The results can be applied to the design of marine structures against slamming.

**Keywords:** Numerical simulation, Damage evolution, Repeated pressures, Steel plate, Strain rate.

**PID 7709**

### **Multi-Objective Optimization of Machining Performance in Hard Milling of Skd61 Steel**

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**Abstract:** Cutting condition is one of the main factors affecting the machining performance and quality of the final product in hard milling. This study attempts multi-objective optimization of surface roughness (Ra) and material removal rate (MMR) in hard milling of SKD-61 steel. First, the L27 orthogonal array design of the experiment method is used, which has four input variables, including cutting speed, feed rate, depth of cut, and material hardness. After obtaining the experimental data, the response surface model (RSM) describes the relationship between input and output parameters. Finally, multi-objective optimization is implemented using the NSGA-II method to obtain the best surface quality and highest productivity. The results show that the optimized cutting parameters for Ra and MMR are a cutting speed of 44.97 m/min, a feed rate of 0.029 mm/tooth, and a depth of cut of 0.39 mm. This leads to a predicted Ra of 0.59 μm and an MRR of 674.96 mm<sup>3</sup>/min.

**Keywords:** Hard milling, cutting conditions, optimization, surface roughness, the material removal rate.

PID 7962

## Effect of Pin Length on Mechanical Properties of Dissimilar FSWed Lap-Joint between AA6061 and 316 Stainless Steel

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**Abstract:** The dissimilar lap-joint of the AA6061 to 316 stainless steel was produced by friction stir welding. Changing microstructure, joint interface, and mechanical performances via pin length was revealed. A wave interface pattern was found at long pin length. The interface became flat at lower pin length with the oxide film formation. The highest joint strength was obtained at the pin length of 2.8 mm but strongly reduced at the pin length of 2.6 mm. The strength was dramatically correlated with the bonding area and interface morphology.

**Keywords:** Friction stir welding, dissimilar lap-joint, joint interface, mechanical performances.

PID 7911

## Life Estimation for a Welded Joint for the Gas Turbine Disk Applications

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**Abstract:** The dissimilar friction weld (denoted DFW) of superalloys Inconel 718 (denoted IN718) and MarM247 (denoted M247) was investigated under various test types, from fatigue dominant to creep dominant condition. The friction joint of dissimilar superalloys IN718 and M247 is considered such a success case under fatigue dominant conditions such as under low cycle fatigue fast-fast test and thermal mechanical fatigue in-phase and out-phase in which the lives of the DFW is estimated to be comparable to these of base metal M247. However, under creep dominant test conditions, the fracture occurred in the heated affected zone (HAZ) in IN718 portion and relative low lives compared to these of base metals. The severely recrystallized microstructure in the HAZ, especially the dissolution of  $\gamma'$ , during weld processing is responsible for the reduction of HAZ creep resistance in this DFW. The elastic follow-up mechanism and the high concentration of hydrostatic stress in this zone is also recognized to be main factors contributed to life reduction of the DFW joint. In this work, the lives of the DFW are predicted by covering all factors mentioned above. The fatigue and creep properties of HAZ in DFW are carried out by fabricating the friction stir welding of IN718 in the same condition. The stress-strain distribution in the DFW joint was investigated by the finite element method (FEM). A combination of FE model included M247-HAZ-IN718 is applied. It was found that the observed crack initiation site, crack growth path, and fracture modes in HAZ are well coincided with FE simulation. The FE results showed the reduction of creep resistance in HAZ is primary contribution in the short lives of DFW, the elastic follow-up mechanism and the triaxiality stress parameter are factors enhancing the creep damage in this zone. The lives of DFW estimated were good agreement with experimental data.

**Keywords:** Dissimilar friction welding superalloys, creep-fatigue, damage, life prediction, HAZ, FEM.

PID 8034

## Study on Building the Relationship between Fuel Injection Parameters and Exhaust Emission Content of Fishing Vessels' Diesel Engines to Diagnose the Technical State

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**Abstract:** For diesel engines, fuel injection parameters are essential. It directly affects the process of forming the combustion mixture, fuel combustion, and emission formation. There, it is worth noting the injection pressure and the pressure at the end of the compression stroke in the engine cylinder at the time of fuel injection. If the above parameters are reduced compared to the technical requirements, the combustion process is incomplete, and soot emissions increase. On that basis, the article studies the relationship between fuel injection parameters and exhaust emissions by simulation and experimental methods, through which it is possible to recognize emission results for diagnosis technical status of the fuel injection system and the group that encloses the combustion in a chamber of the engine. Research results on the 6CHE Yanmar diesel engines of the fishing vessels at no-load conditions show that. When soot emissions increase by more than 20%, the fuel injection pressure is reduced compared with technical requirements. The fuel injection system and the group that encloses the combustion chamber need to be maintained on time to prevent damage incidents that may occur and to ensure the safety of people and fishing vessels when operating at sea for a long time.

**Keywords:** Fuel injection pressure, injector, fuel injection system, pressure at the end of the compression stroke, diesel engine of the fishing vessel.

PID 8266

## Double Illuminations Inline Digital Holography for Nano-Particles Tracking

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**Abstract:** We propose a new low-coherence (LC-) digital in-line holographic microscope (DIHM) system to accurately obtain the three-dimensional (3D) position of the nano-particle. The two LC digital in-line holograms (DIH) of the nano-particle are recorded with two respective illumination angles of the light source. The reconstruction process is carried out with two holograms at different distance to calculate the diffraction images. The 3D position of the nano-particle can be determined by the diffraction distance where two diffraction images of the nano- particle form the smallest overlap area. The method can be employed to accurately track the position of the nano-particles without pre-preparation nano-particle pattern and also not depending on the structure of the nano-particle.

**Keywords:** Digital in-line holography, nano-particle tracking, digital holographic microscope.

PID 8317

## Dynamic Analysis of Planar Mechanism in Numerical Methods

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**Abstract:** When kinematic synthesis and analysis of planar mechanism the designer must define a geometry and set of motions for a design task. Then it is logical to determine the forces or torques in order to create such motion in the system that means to find out a convenient approach to solve for the forces and torques that result from our kinematic system in such a way as to provide the designed accelerations. This task is called dynamic force analysis (or kinetic analysis). Many numerical methods to determine the position, velocity, and acceleration of planar mechanism are introduced and applied successfully, for example, using the transformation matrix. Solving fully kinetic problems for a planar mechanism it is necessary to establish a simple and easy procedure that determines the forces or torques maintaining the motion in the system with the help of a computer. This paper will focus on how to determine the forces or torques acting on the planar mechanism by numerical method when acceleration and dynamic properties of the linkage are known. One chosen example shown out here aims to demonstrate detailly the numerical solution for dynamic force analysis.

**Keywords:** Numerical methods, dynamic force analysis, kinetic analysis.

**PID 8330**

### **Estimating the Impact Strength of Sandwich Structure in Canoe by Dropped Experiment**

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**Abstract:** This paper estimates the impact strength of the canoe structure by the dropped experiments. The canoe was built by the sandwich structures, it was consist of two facesheets (skins) which made by stainless steel SUS316L and 0.6 milimeter thickness, a core structure was a foam polyurethane PU. The drop test was conducted by the striker, which 42 kilogram weight, fall down at the 2.0 meter height on to that sandwich structure. The result shows the sandwich structure which SUS-PU-SUS have a impact strength better than the stainless steel structure without foam PU.

**Keywords:** Drop test, polyurethane, sandwich structure, stainless steel, striker.

**PID 8357**

### **Optimization of Swimming Gaits for Elongated Undulating Fin Using Computational Fluid Dynamics (CFD)**

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**Abstract:** There is currently a rising interest in researching bio-inspired robot fish due to the valuable insights they can provide into the theory and application of underwater vehicles. It has been observed that the propulsive efficiency and maneuverability of a natural fish are significantly by coordinating the movement of their components such as body, fins, and tail. To accurately predict the thrust acting on fish robot, it requires conducting a hydrodynamic analysis of the surrounding fluid using computational fluid dynamics (CFD). This paper presents a 2D and 3D CFD simulation of an elongated undulating fin made up of sixteen joints and a layer attached to direct support structure. The movement of the robot fish is defined using Fluent and user-defined function (UDF), while Dynamic Mesh is utilized to replicate the swimming motion of the fish in water. Hydro-dynamic analysis is performed under varying parameters, including amplitude,

frequency, and wavelength. This studying aims to offer insights into the flow of fluid around the underwater vehicles and the distribution of pressure that is useful for optimizing and improving the design and manufacture of the biomimetic robotic fish. Additionally, the study will give more intricate information of fluid flow served for the development of artificial fish utilized in varying external environments.

**Keywords:** Computational fluid dynamic, dynamic mesh, robotic fish, undulating fin.

**PID 8365**

## **Wave Dissipation by Vegetation for Coastal Defense in the Western Mekong Delta under Climate Change**

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**Abstract:** The combination of the Mekong Delta dyke-mangrove system effectively protects the hinterland against flooding and erosion in extreme conditions for decades since they could dissipate waves and currents efficiently. However, literature and satellite data indicate that severe erosion happens along the Western sea-dykes of the Ca Mau coast caused by increased intensity of storms due to climate change. State-of-the-art wave transformation models are used to predict the influences of wave propagation and wave overtopping discharge over sea dykes and/or associated with mangrove ecosystems under extreme typhoons, which cooperates with both high – frequencies (HF) and low – frequencies (LF) waves. Results confirm that the HF wave quickly dissipates in shallow water, whereas the LF wave is dominant and penetrate over a longer distance. At dyke toe, the wave height through vegetation is substantially diminished, approximately ten times less than that in the sea-dyke solely. However, the modelling wave overtopping discharge seems to be overestimated compared with the standard-based formula.

**Keywords:** Ca Mau coast, climate change, LF waves, overtopping discharge, mangroves.

**PID 8375**

## **Evaluating the Insulation Efficiency of the Engine Room's Bulkhead of a Steel Hull Cargo Ship**

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**Abstract:** The ship engine room is an area that requires very strict insulation and fire protection. Types of bulkheads in the engine room are designed with different types of insulation and fire protection structures. According to regulations, when the engine room discharges gas burns at 950oC for 60 minutes, and the outside surface of the bulkhead does not exceed 140oC. However, when a fire occurs, it is impossible to accurately determine the internal and external temperatures for each type of bulkhead. Therefore, this study will evaluate the heat transfer capacity through the multi-layer structure of the bulkhead when a fire occurs in the engine room. This result is used to assess the bulkhead's insulation and fire protection effectiveness. This study uses all three methods simultaneously: calculation by the theory of stable heat transfer through multi-layer bulkheads, experiment on bulkhead models, and using ABAQUS software to simulate heat transfer through multi-layer bulkheads. The research results show that the temperature transmission temperature chart through the layers of bulkhead types A and C is almost linear. In contrast, bulkhead type B is nonlinear when passing through the air layer inside the bulkhead structure. When maintaining a temperature of 950oC for 60 minutes on the inside surface, the outside temperature is 140oC lower for type A and B samples and 140oC higher for type C samples. This



indicates that the type C bulkhead does not meet the specified requirements. Therefore, through this assessment, it is necessary to study solutions to increase the insulation and fire protection effectiveness of the ship's engine room bulkheads.

**Keywords:** Engine room wall, multi-layer structure, insulation, fire protection, heat transfer.

**PID 8542**

### **Mechanical and thermal Characteristics of Nanoporous Gallium Telluride Monolayer**

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**Abstract:** A nanoporous gallium telluride monolayer (NGTM) consists of ordered arrays of nanopores separated by gallium telluride nanoribbons. In this work, we used molecular dynamics (MD) and non-equilibrium molecular dynamics (NEMD) simulations to study the mechanical response and thermal conductivity of NGTM. The NGTM exhibited lower mechanical properties (MP) and thermal conductivity (TC) than the pristine sheet. Furthermore, despite showing high YM and failure strength, NGTM has expressed lower TC three to six times than the pristine one. This work emphasizes the special physicals of NPGT as a novel porous two-dimensional material, which can be a bright candidate for designing advanced nano-spintronic, nanoelectronics, energy conversion systems, and optoelectronic applications.

**Keywords:** Nanoporous gallium telluride, 2D materials, mechanical, thermal conductivity, molecular dynamics.

**PID 8578**

### **Dissimilar Cu/Al Friction Stir Welding: Sensitivity of the Tool Offset**

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**Abstract:** Copper 1100 and aluminum 1050 plates with a thickness of 5.0 mm are butt-joint using friction stir welding. The tool offset is linearly varied along the welding path. Two welding regimes, using the same linear tool offset but opposite directions, are applied for fabricating two Cu/Al plates. The material flow is dominated by both tool offset and offset history. The intermetallic compounds layer and interface morphology in each welded plate are formed in a different manner. As a result, the bonding strength and fracture behavior between two welded plates are significantly distinct.

**Keywords:** Cu/Al dissimilar welding, offset history, interface morphology, intermetallic compounds, strength and fracture.

**PID 8634**

### **Effect of Contact Blast Loading on the Plastic Deformation Forming Ability of Large Steel Pipes**

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**Abstract:** Plastic deformation forming with metal pipe blanks by contact blast loading inside pipes is an interesting moldless forming technique, also a complex and error-prone process. Some advantages are very characteristic of this forming technique such as no cost of mold, tooling and energy consumption, no complicated control equipment compared to other forming techniques. Up to now, the calculation and design of this forming technique mainly use some existing reference empirical formulas, so the experimental results are only suitable in the range of small pipe diameters, and still there are significant deviations for larger pipe diameters. In order to increase the accuracy of forming process by contact blast loading inside large pipes, this paper presents a study on the influence of the mass of highly explosive material - TNT to the forming ability of large steel pipes from API-5LX-42 mild steel materials by modern 3D numerical simulation. Four output criteria are used to evaluate the efficiency of this process, including Maximum diameter of the blast zone ( $D_{max}$ ), Von Mises stress ( $S_{max}$ ), Hoop plastic strain component ( $PE22_{max}$ ), and Pipe wall thinning rate ( $\varepsilon_{max}$  %). The research results can be used for the next experimental step to evaluate the difference between simulation and experiment, as well as use this data in the calculation and design of pipe products to save both time and money of trial and error before application in actual manufacturing.

**Keywords:** Contact blast loading, 3D numerical simulation, moldless forming technique, large steel pipes.

PID 8738

### A Study on the Dynamic Load of Tractor Semi-Trailer on the Class B Road According to ISO 8608:2016

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**Abstract:** The dynamic load affects the smoothness of movement, dynamic safety, and durability of the vehicle and the road. This paper presents the research results on the dynamic load of a tractor semi-trailer on the class B road according to ISO 8608:2016 standard. The results showed that, if the tractor semi-trailer is moving straight on the class B road according to ISO 8608:2016 at a speed range from 30km/h to 85km/h with an interval of 5 km/h, then braked with braking torque  $MB = 80\% MB_{max}$ , the wheel load on the front wheels is increased by about 88.9% and the wheel load on the rear wheels is decreased by about 20.1%; the dynamic load factor of front wheels is increased from (1.0÷1.81) and the dynamic load factor of rear wheels is decreased from (1.0÷0.8); the tractor semi-trailer ensures durability, smooth movement, and dynamic safety.

**Keywords:** Wheel load, dynamic load factor, tractor semi-trailer.

PID 9090

### Numerical Investigation on the Dynamic Response of Steel Plates under Repeated Slamming Loads

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**Abstract:** During their service, marine structures are exposed to repeated impulsive pressure loads induced by slamming. The structures can be damaged under such loadings. This paper presents numerical investigations of the dynamic response of steel plates having actual scantlings used in marine structures subjected to repeated slamming pressures. A numerical model to simulate structural response components under repeated impulsive loads was proposed using a commercial finite element software package validated against relevant experimental results. In

the simulation, the recorded slamming pressure time history was used as a simplified triangular impulse profile. Subsequently, based on the validated model, the dynamic response of actual steel plates was numerically studied. The effect of design parameters on the structural response of the plates under repeated impact pressure loadings was investigated. The pseudo-shakedown phenomenon of the plates was examined accordingly.

**Keywords:** Numerical simulation, Pseudo-shakedown, Repeated slamming pressures, Steel plate.

**PID 8824**

### **Fabrication of Activated Carbon from Acacia Crasscarpa Bark by Carbothermal Functionalization for Adsorptive Removal the Dyes in Aqueous Solution**

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**Abstract:** Carbon is an essential element for life and is the basis of millions of organic chemical compounds. Activated carbon is a form of carbon that has been treated to give it a very porous structure, thus having a very large surface area. Activated carbon adsorbent from Acacia Crasscarpa bark has been used to eliminate hazardous dyes, specifically the anionic dye methyl orange (MO) and the cationic dye methylene blue (MB) in the present study. Different temperature ranges and heating rates were applied to transform an amorphous carbon to the crystalline carbon, which is known as the carbonization process. In the first step, the collected and washed bark. Acacia Crasscarpa bark was calcined anaerobically to obtain amorphous carbon. The carbonization process was carried out at a temperature of 1050°C in a resistance furnace in the Argon atmosphere. After that, the activated process was performed by chemical activation with NaOH. It was found that the adsorption capacity of activated carbon synthesized from Acacia Crasscarpa bark is much higher than activated carbons made from some other raw materials. They have maximum equilibrium adsorption capacities of 156.25 mg/g and 144.09 mg/g for MO and MB, respectively. A high BET surface area of 711.05 m<sup>2</sup>/g. XRD pattern showed that the high content of crystalline carbon was obtained and carbon content was achieved approximately 83%. Also, SEM images illustrated the average size of carbon is 2.58 µm and surface structure of activated carbon appeared the pores inside the particle. The results of this study will be useful for future scale-up production of low-cost adsorbents using Acacia Crasscarpa bark for the removal of waste products in industrial wastewater

**Keywords:** Acacia crasscarpa bark, activated carbon, dyes, NaOH, carbonization.

**PID 9157**

### **Numerical Investigation on the Influence of Ship Hull Form Modification on Resistance of the 4600DWT Cargo Ship Using RANSE Method**

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**Abstract:** Optimization of ship hull form in the ship design process aims to reduce ship resistance, which is crucial for economic efficiency and meets the International Maritime Organization (IMO) requirement for emission reduction and energy saving. This paper investigates the impact of the longitudinal centre of buoyancy (LCB) position on the resistance of a cargo ship 4600DWT using

the RANSE (Reynolds – averaged Navier – Stokes equation) method. The ship hull form was modified using the Lackenby method. The obtained numerical results indicate that the LCB position significantly affects ship resistance. The physical phenomenon of the change in ship resistance is also explained through the analysis of the differences in the flow field around the ship's hull form with modified LCB positions.

**Keywords:** RANSE, Resistance, Hull-form, LCB.

**PID 9214**

**Effect of Pin Speed on Mechanical Properties of Dissimilar Friction Stir Welded T-lap Joint between Aluminum Alloy AA6061 and Stainless Steel SUS304**

**Minh-Quan Nguyen<sup>1</sup>, Huy Huu Ho<sup>1</sup>, Thuyen Van Phi<sup>1</sup>, Hao Dinh Duong<sup>2\*</sup>, Tra Hung Tran<sup>2\*</sup>**

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**Abstract:** The paper present about dissimilar friction stir welding T-lap joint between aluminum alloy AA6061 and atainless steel SUS304. The effect of FSW tool rotational speed on mechanical properties such as ultimate tensile strength, surface hardness and micro-structure has been investigated. The result showed that the tensile strength was was sensitive to pin rotation speed.

**Keywords:** Friction stir welding, dissimilar T-lap joint, joint interface, welding rate, mechanical performances.

**PID 9246**

**Effect of Rotational Speed on Mechanical Properties of Dissimilar Friction Stir Welded Lap-joints AA6061/316 Stainless Steel**

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**Abstract:** The paper present about dissimilar friction stir welding T-lap joint between aluminum alloy AA6061 and stainless steel SUS304. The effect of FSW tool rotational speed on mechanical properties such as ultimate tensile strength, surface hardness and micro-structure has been investigated. The result showed that the tensile strength was sensitive to pin rotation speed.

**Keywords:** Friction stir welding, dissimilar T-lap joint, joint interface, welding rate, mechanical performances.

PID 9305

## Mechanical Properties of Fabric-Reinforced Geocomposites in accomdation with Novel Size-independent Flexure-Test Technique

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**Abstract:** In this paper, two silica-based geopolymer matrix systems reinforced composites containing approximately 40 and 48 wt.% of Carbon HTA twill (TohoTenax) and advanced S-glass twill (Saint-Gobain, Vetrotex) respectively were synthesized and fabricated at optimal conditions. The flexural properties of the resulting composites which are high toughness: the shear stress plays here a greater role in compared with other ceramic matrix composites were determined on a universal testing machine under three-point bending mode in accordance with novel size-independent technique which based on testing specimens at different scale of sample height (H) to span length (L) ratio; Microstructure of composites were analyzed by means of scanning electron microscope (SEM) to determine the adhesion between the fiber and geopolymer matrix and micro-cracks as inborn defects of inorganic matrix composites as well.

**Keywords:** Geocomposite, fabric fiber, elevated temperature, mechanical properties and microstructure.

PID 9450

## Failure Modes of Bio - Composite Sandwich Beams

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**Abstract:** A thorough investigation of failure behavior of bio - composite sandwich beams under three point bending was undertaken. The beams were made of E-glass fabric M450/QX868 2-layers surrounding the balsa wood core. The both dry and wet biocomposite sandwich specimens were submitted to fire. The constituent materials were fully characterized and in the case of the balsa wood core, failure envelopes were developed for general two-dimensional states of stress. Various failure modes including facing wrinkling, indentation failure and core failure were observed and compared with analytical predictions. The initiation, propagation and interaction of failure modes depend on the type of loading, constituent material properties and geometrical dimensions.

**Keywords:** Sandwich beams, failure modes, E glass/polyester facings Balsa core, wrinkling.

PID 9506

## Estimating the Strength of Floating Fish Cage After Collision Impact with Small Boat by Simulation Method

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**Abstract:** The floating fish cage using in aquaculture become more popular along the coast in middle of Viet Nam, the traditional cage was built by wooden combine with floating plastic tank and net frame under sea water. In this study, the new type of floating fish cage is built by composite



material, exactly is fiber glass reinforced plastics FRP. On the operation, the small boat come and leave to the floating cage system which connecting a lot of each independent cages to each other by the connection devices. This paper will estimate the impact strength of the outer floating cages when the impact with boat follow the collision direction occur. The mass and velocity of collision impact will change some cases according to the scenario situations. The research using the commercial Abaqus software for simulation.

**Keywords:** Floating fish cage, strength, collision impact, FRP material.

**PID 9536**

### **Fabrication of 1 kW High Power Fiber Laser for Industrial Cutting Machine**

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**Abstract:** High-power fiber laser is widely used in metal processing industries. This paper presents a research and development of a fiber laser source with a wavelength of  $1080 \pm 10$  nm with high power  $\geq 1$  kW that can operate in continuous mode (CW) and modulated pulse mode (QCW). We have developed a 1 kW high power laser source by combining diode laser pumps transmitted through a fiber amplification medium and a beam collimator to form a high-power laser source. The Yb3+ doped fiber is used as a lasing media because of its broad absorption spectrum from 850 nm to 1080 nm, which allows the use of multiple pump source or multi-wavelength pump source schemes, thus facilitating power upscaling to  $\geq 1$  k suitable for cutting metal materials such as steel  $\leq 4$  mm, stainless steel  $\leq 3$  mm, aluminum  $\leq 3$  mm. In this research, we have given the results of measuring and evaluating the main parameters of the laser source such as power, frequency and stability. In addition, the coupling methods between the diode laser pump and the resonator chamber, the fabrication of the diode laser pump source control system, the cooling system, and the sensing system are also presented.

**Keywords:** High-power fiber laser, laser cutting, laser diode, Yb doped fiber, laser engine.

**PID 9613**

### **Research and Development of Highly Sensitive Vibration Measurement Using High-Speed Laser Interferometer**

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**Abstract:** A vibration monitoring system based on a laser interferometer is presented in this research. A high bandwidth optical sensor is used to extract vibration frequencies from laser interference fringes in real time, a camera is used to correct the position to be measured and monitor the quality of the light interference fringes. The laser source has a long coherence length, so it is easy to obtain interference fringes. The interference fringes between reflected lasers from a vibrated object to be measured and from a reference mirror will be sampled by the optical sensor. The detected signal is filtered and processed by a high-speed camera to analyze and to obtain information of the vibration or the displacement of the object. The sensitivity of the vibration measurement could be in sub-micrometer order. The detector's bandwidth of  $\sim 16$  kHz region which can cover wide range of vibration frequencies generated by industrial machines.

**Keywords:** Laser interferometer, vibration, interference fringe, high-speed camera, FFT transform.

PID 9943

## Effect of Welding Speed on the Mechanical Properties of Friction Stir Welded Aluminum Alloy 5083

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**Abstract:** The influence of welding speed on the properties of friction stir welded aluminium alloy 5083 was explored. The effects of various welding regimes on the defect formation, hardness distribution, tensile strength, and bending strength of the joint were experimentally investigated. Kissing bond defects were prevalent in the joint, however, this kissing bond was eliminated at high welding rates. The welded zone was softened significantly; all the tensile specimens were fractured in the welding zone with shear mode. The tensile strength of the joint reached 85% of the base aluminium alloy 5083 while the bending ductility of the joint was higher than that of base aluminium alloy 5083.

**Keywords:** Aluminium alloy 5083, friction stir welding, defects, mechanical properties.

PID 9874

## Analysis Occupant Compartment of SUV Vehicle Structure in Frontal Impact in Case Car to Car

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**Abstract:** This article presents the analysis of the chassis structure of a sport utility vehicle (SUV) according to the standards of the Insurance Institute for Highway Safety (IIHS) on small, moderate and overlapping crash tests. Frontal collision to check the safety of the vehicle and analyze the SUV chassis structure in the event of a collision. The crash simulation process according to IIHS criteria will be further extended at speeds of 40 km/h, 55 km/h, and 80 km/h between vehicle and vehicle, to analyze weak positions on the vehicle in the event of a collision. According to IIHS, increasing the collision speed will change the amount of energy generated by the collision exponentially. The computerized test method uses LS-DYNA and HYPERWORKS software to simulate crash cases. The finite element (FE) model of the SUV was provided by the National Highway Traffic Safety Administration (NHTSA). The results obtained are based on the IIHS safety performance assessment to assess the impact on the passenger compartment based on 5 points set up under the floor of the vehicle, 2 points located in the Firewall, and 1 point on the door side. The analysis also shows the structure of security if the collision penetrates into the A- pillar, B- pillar, and Firewall sections. These analytical data can be used as a data source to make improvements to the chassis structure to reduce risks to passengers.

**Keywords:** Analysis; occupant; SUV, vehicle structure; fontal impact.

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**Abstract:** The most common types of defects that can lead to irradiation-induced hardening in reactor pressure vessel (RPV) materials are point defects and dislocation loops (DLs). However, their respective contributions to the overall hardening of RPV materials have not been clearly determined. To address this issue, this study was conducted using iron alloys with equivalent Mn and Ni content to those used in nuclear RPV in Japan. The study employed transmission electron microscopy (TEM), atom probe tomography (APT), and nanoindentation to assess the roles of SCs and DLs in contributing to the hardening behavior of RPV materials. The results indicated that both solute clusters (SCs), which are formed by the aggregation of point defects, and DLs play equally important roles in the hardening behavior of RPV materials. However, an in-depth analysis of three-dimensional images using the APT method revealed that there may have been errors in evaluating SCs and DLs, leading to double counting when assessing the impact of irradiation-induced defects on the hardening behavior of RPV materials. These findings highlight the need for improved accuracy in evaluating these defects to better understand the behavior of RPV materials under irradiation.

**Keywords:** RPV, Iron Alloys, Hardening Assessment, Dislocation Loops, Solute Clusters.

# Topic 2

## MARINE AQUACULTURAL ENGINEERING AND TECHNOLOGY





PID 484

## Effects of Microalgae and Stocking Density on Growth and Survival Rate of Giant Clam (*Tridacna Squamosa* Lamarck 1819) Larvae

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**Abstract:** In order to improve techniques for production of giant clam, *Tridacna squamosa*, in the hatchery, the present experiment aimed to evaluate the impact of microalgae mixture and stocking density on growth and survival rate of the clam at veliger stage. In the first experiment, giant clam larvae of the D-stage were reared in the conical fiberglass tanks and fed with combinations of microalgae, including *Chaetoceros muellerii* and *Isochrysis galbana* (1:1) and *Nannochloropsis oculata*, *Isochrysis galbana* and *Chaetoceros muellerii* (1:1:1). One group of giant clam larvae without feeding was used as a control. The experiment was lasted for 7 days until the Pediveliger stage with six replicate tanks. In the second experiment, the larvae (2 days post hatched, DPH) were reared at densities of 3, 5, 7 and 9 larvae mL<sup>-1</sup> (so-called D3, D5, D7 and D9, respectively) for a period of 7 days. Each density was randomly assigned to triplicate tanks. The larvae were fed twice a day with a combination of *Isochrysis galbana* and *Chaetoceros muellerii* (5,000 cells/ml each type of algae). At 4DPH, extracted zooxanthellae was seeded into the giant clam larvae.

The results showed that larvae fed *Nannochloropsis oculata*, *Isochrysis galbana* and *Chaetoceros muellerii* (1:1:1) obtained the largest length ( $217.5 \pm 3.1 \mu\text{m}$ ), specific growth rate (SGR)  $7.18 \pm 0.34$  (mean $\pm$ SD) and the survival rate ( $31.5\% \pm 1.6\%$ ) ( $P < 0.05$ ). In addition, rearing densities significantly affected growth in shell length, SGR and survival rate in giant clam larvae ( $P < 0.05$ ). Of which, the larvae at D3 gained the highest shell length, SGR and survival rate. Meanwhile, the larvae D9 had the lowest shell length, SGR and survival rate. No significant differences in survival was observed between D3 and D5. Therefore, in order to improve productivity of the larvae clam for massive seed production, a stocking density of 5 larvae mL<sup>-1</sup> is recommended.

**Keywords:** Giant clam, microalgae, *Tridacna squamosa*, growth rate, survival rate.

PID 913

## Estimating the Strength of Connector between FRP Floating Fish Cages by Simulation Method

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**Abstract:** In the floating fish cage was built by fiber glass reinforced plastics FRP material, the connector between each cage is very important. The connector will be kept the nominal distance for each cage and rotated around the longitudinal of cage edge axis. This research finds out the material satisfied with that conditions, which was combined the rubber outside and steel wire rope inside. The connector was connected with FRP fish cage by the stainless steel bolts and nuts. This paper estimates the strength of connector by simulation method using the commercial Abaqus software.

**Keywords:** Connector, floating fish cage, FRP material, strength.



PID 4818

## VTG is Essential for Vitellogenesis in *Fenneropenaeus Penicillatus*

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**Abstract:** Aquaculture is a fast-growing industry for food production, while reproduction control is critically significant for the sustainability improvement of crustacean stocks. The red tail prawn, *Fenneropenaeus penicillatus*, is one of the economically important marine shrimp species in China. Vitellogenesis is a critical process affects the fecundity, eggs quality, hatching, and larval survival rates during animal breeding. Vitellogenin (Vtg) play a key role in regulating vitellogenesis and ovarian development in animals. The purpose of this study is to investigate the molecular regulatory mechanism of Vtg in *F. penicillatus* vitellogenesis. Researchers used various methods, such as cloning Vtg through RACE; analyzing the expression pattern of Vtg using RT-qPCR; locating Vtg in ovary and hepatopancreas using FISH; and examining its functional properties during vitellogenesis using siRNA. These findings offer new insights into the regulatory mechanism of vitellogenesis and provide a theoretical basis for the artificial breeding of *F. penicillatus*.

**Keywords:** *Fenneropenaeus penicillatus*, VTG, vitellogenesis, regulatory mechanism, aquaculture.

PID 5455

## Investigating Technical Inefficiency and Production Risk in Aquaculture: The Case of White-Leg Shrimp Farming in Vietnam

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**Abstract:** The paper employs the stochastic frontier analysis with heteroscedasticity to investigate the technical inefficiency and production risk for the intensive white-leg shrimp aquaculture in Ninh Thuan, Vietnam. The result shows that that feed is found to be a risk-increasing input, whilst chemicals/drugs and electricity are revealed to be risk-reducing inputs. It means that an average risk-averse shrimp producer is expected to use less feed and more chemicals/drug and electricity compared to a risk-neutral producer. It is, however, revealed that the use more feed and chemicals/drug; and less electricity, farm size and labor significantly decreases the technical inefficiency of shrimp farmers. Furthermore, the elasticity of feed is highest among the inputs in the frontier mean function while there is an evidence of excessive use of chemicals/drugs in this aquaculture. Policies on management of chemicals/drugs and assurance for aquaculture may be important for this intensive white-leg shrimp farming.

**Keywords:** Stochastic frontier analysis, white-leg shrimp aquaculture, production risk, technical efficiency, Vietnam.

PID 5741

## Developing an Aquaculture Water Treatment System using Combined Plasma and Nano Bubble

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**Abstract:** Aquaculture is a fast-growing industry for food production, while reproduction control is critically significant for the sustainability improvement of crustacean stocks. The red tail prawn, *Fenneropenaeus penicillatus*, is one of the economically important marine shrimp species in China. Vitellogenesis is a critical process affects the fecundity, eggs quality, hatching, and larval survival rates during animal breeding. Vitellogenin (Vtg) play a key role in regulating vitellogenesis and ovarian development in animals. The purpose of this study is to investigate the molecular regulatory mechanism of Vtg in *F. penicillatus* vitellogenesis. Researchers used various methods, such as cloning Vtg through RACE; analyzing the expression pattern of Vtg using RT-qPCR; locating Vtg in ovary and hepatopancreas using FISH; and examining its functional properties during vitellogenesis using siRNA. These findings offer new insights into the regulatory mechanism of vitellogenesis and provide a theoretical basis for the artificial breeding of *F. penicillatus*.

**Keywords:** Aquaculture water treatment, plasma technology, advanced oxidation process nano bubble.

PID 6742

### The Generation Pathways of $\cdot\text{OH}$ and $\text{H}_2\text{O}_2$ By Plasma liquid Interaction

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**Abstract:** The strong oxidative properties of the reactive oxygen and nitrogen species (RONS) such as  $\text{O}^{\cdot}$ ,  $\cdot\text{OH}$ ,  $\text{O}_3$ ,  $\text{H}_2\text{O}_2$ ,  $\text{HNO}_2$ , and  $\text{HNO}_3$  are excellent utilization for bacterial killing, water treatment, and other applications. The chemical reactions of conventional methods are complicated. In this study, the physical method by using plasma-liquid interactions (PLIs) to make RONS was investigated. Moreover, two generation pathways of  $\cdot\text{OH}$  radicals and  $\text{H}_2\text{O}_2$  inside the bulk liquid also were presented. The results shown that, in the first pathways, the  $\text{H}_2\text{O}_2$  is quickly recombined by generated radicals  $\cdot\text{OH}$  which are mainly produced via the dissociation of water molecules by free electrons in the plasma. These species have high Henry constants that easily absorb and disperse into the bulk liquid. In other hand,  $\cdot\text{OH}$  radicals and  $\text{H}_2\text{O}_2$  are generated at the same time by the reaction of  $\text{O}_3$  with  $\text{H}_2\text{O}$  molecules, where  $\text{O}_3$  comes from plasma and then absorbed into bulk liquid. Moreover,  $\text{O}_3$  in liquid will react with  $\text{H}_2\text{O}$  molecules to generate  $\text{H}_2\text{O}_2$  and continuously react with generated  $\text{H}_2\text{O}_2$  to produce  $\cdot\text{OH}$  radicals.

**Keywords:**  $\text{H}_2\text{O}_2$ ,  $\text{O}_3$ ,  $\cdot\text{OH}$  radical, plasma-liquid interactions, reactive oxygen species.

PID 8356

### Spider Cone: A Novel Behavior of Cobweb-like Excretions of *Conus Geographus*

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**Abstract:** *Conus geographus* is a specialized nocturnal cone snail, aside from its evolved ability to engulf several target fish at once, a newly discovered behavior wherein it releases cobweblike excretions were observed. This study focuses on characterizing this behavior from visual media as well as to identify the factors triggering the behavior that distinguishes it from the known behavior of the species. Data from observations were then analyzed together with previously published data on the species and data from arachnids to determine similarities and their relationship from adaptation and evolution. Comparisons revealed that the first factor would be for mobilization, which is the descending ability of the *C. geographus* using the cobweb-like excretions that may be similar to the abseiling spiders of Theridiidae and Araneidae. Next is defense mechanism wherein the species has its siphon and was compared to spiders that have trichobothria which are both used for mechanoreception. The last considered factor is an additional feeding strategy, wherein in the observed visual media the *C. geographus* wrapped an aerator with its excretions in comparison to the entangling mechanism for feeding of specific species of spiders. Gathered information revealed that the cobweb-like excretions were used for mobility, defense mechanism, and feeding strategy as *C. geographus* is highly susceptible to adaptation due to its cognitive intelligence. The compared data showed similarities between geography cone snail and spiders suggesting a strong linkage between the two phyla that shows close convergent evolutionary relationship.

**Keywords:** Adaptation, cobweb-like excretions, conus geographus, evolution, molluscs.

PID 9736

**Marine Sustainable Development and Innovation in the Philippines: Government Context and Experience to Support Invention Development and Commercialization in the Countryside**

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**Abstract:** The Philippines is possibly one of the potential country models that provides significant government support to explore, develop and commercialize home-grown inventions. However, despite decades of substantial public spending to marine-related technology development and innovation it seems there is a need to determine if the efforts are gaining traction or if there is still some work to do. This Paper will provide background laws and regulations that affect marine sustainable development and innovation in the Philippines, public funding opportunities and technical assistance that were made available to the locals, and what has been achieved so far in terms of their patenting performance, technology transfer milestones, and actual commercialization. Using patent data and local commercialization efforts, three publicly-funded research products as sample cases were mapped and analyzed to determine if impacts can be felt from what can be considered as national public sector innovation drivers.

**Keywords:** Invention, technology transfer, commercialization, Philippines.

PID 9763

**The Importance of Technology and Cold Chain Logistics in Vietnam's Preservation of Harvested Seafood**

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**Abstract:** Vietnam has a long coastline and a well-developed fishing industry. However, the loss is substantial, and the quality of seafood products has not been recognized due to the restricted post-harvest preservation stage of seafood goods. With the development of cold chain logistics and technology, it has become simpler to preserve seafood. The application of cold chain logistics and technology to the preservation of seafood products after extraction in Vietnam is still limited due to a number of factors, including cost, technology availability, awareness, and credentials. In this article, the author will examine the current state of fisheries in Vietnam, the status of technology applications in the preservation of post-harvest seafood products, the current state of cold chain logistics, new and effective technologies in the field of aquaculture, the preservation of seafood products, and proposals to assist in the development of cold chain logistics and the application of technology to seafood preservation in Vietnam.

**Keywords:** Technology, cold chain logistics, Vietnam, preservation, harvested seafood.

**PID 9967**

**Growth Productivity of Whiteleg Shrimp (*Litopenaeus Vannamei*)  
by Providing Complex Feed Additives Based on Protein Isolate,  
Acidifier, Formulations**

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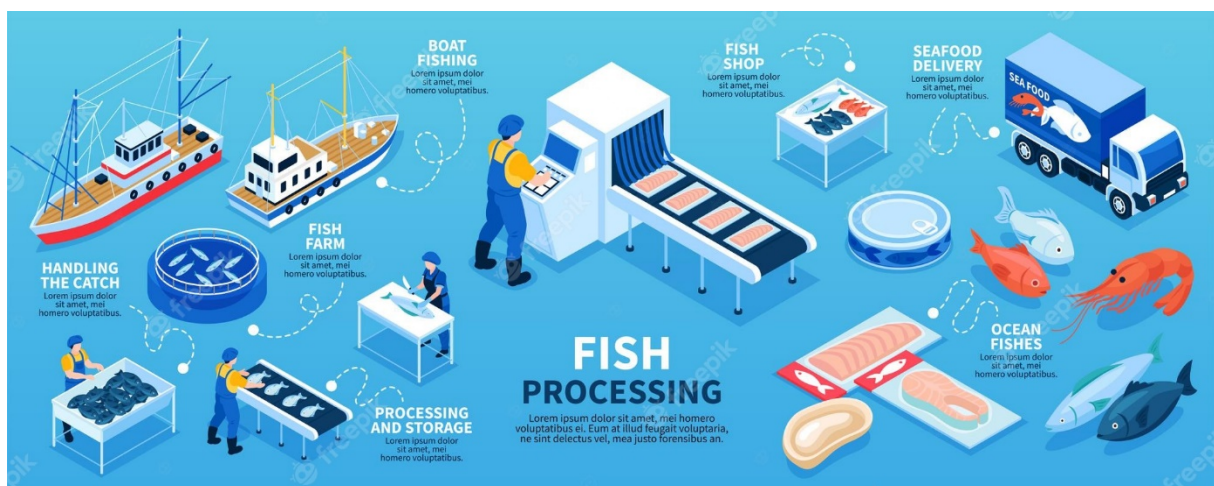
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**Abstract:** Whiteleg shrimp (*Litopenaeus vannamei*) nowadays is getting difficult to enforce its growth rate due to many stressor factors, such as carrying capacity loss and threat of disease. The alternative way to increase the growth performance of whiteleg shrimp is using feed additives. This study was aimed to evaluate the effectiveness of protein isolates, attractants, acidifiers, and enzyme mixes, as additives formulation through commercial feed to improve the growth performance of whiteleg shrimp. This study consisted of three treatments, the control pond as shrimp culture without additive treatment (K); additive treatment without reducing commercial feed (P1); and additive treatment with a reduction of 20% commercial feed (P2). The observation locations were conducted in two different location, in Sumenep, East Java, Indonesia and in Tasikmalaya, West Java, Indonesia. The early stage of post larvae 8 of shrimp was used at the beginning of the cultivation, reared at a density of 120 shrimp/m<sup>3</sup>, and with a pond size of 1000 m<sup>3</sup>. The results of this study indicated an excellent performance of shrimp growth with an additive treatment, where the growth rate of P1 Sumenep was  $0.376 \pm 0.112$  g/day; P2 Sumenep was  $0.379 \pm 0.056$  g/day and P1 Tasikmalaya was  $0.419 \pm 0.062$  g/day; P2 Tasikmalaya was  $0.322 \pm 0.109$  g/day. Meanwhile, the feed conversion ratio (FCR) of P1 Sumenep was  $0.85 \pm 0.17$ ; P2 Sumenep was  $0.71 \pm 0.03$  and P1 Tasikmalaya was  $0.36 \pm 0.08$ ; P2 Tasikmalaya was  $0.39 \pm 0.08$ .

**Keywords:** Feed additive, growth rate, whiteleg shrimp.

# Topic 3

## MARINE PRODUCT TECHNOLOGY





PID 1758

## Extraction and Characterization of Distilled Water from By-Product of Salt Refinery Processing

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**Abstract:** Salt-making is a flourishing agro-industry in the coastal municipalities and cities of Pangasinan. The vapour with corrosive properties is a by-product from salt refinery. This vapour is not harmful rather useful and helpful to the economy and environment of agro-industry community. Hence, these studies are being conducted to develop a salt water distiller to be able to collect the vapour turned distilled water to be used as coolant for radiator and car lead acid battery. A salt making machine with built-in distiller was fabricated and salt was refined efficiently. Distilled water was collected during the salt refinery and subjected to laboratory analysis. Results shows that the collected water from the salt refinery process have the presence of magnesium, potassium, sodium, calcium, chlorides and bicarbonates. The distilled water collected may be used in other purposes but not yet on automotive.

**Keywords:** Salt farming, mineral water, saltwater distillation.

PID 2535

## Investigation Applicability of Protein Isolate Extracted from Tuna Dark Muscle

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**Abstract:** Protein isolate (FPI) is extracted from the dark muscle of tuna by a pH adjustment method. It can be using as an additive or main material for food processing. For FPI powder, it is soluble at highly acidic/basic environments which are not favorable for food applications. FPI was dissolved at pH 12 then it was neutralized to be close to food pH, isoelectric point (pI) or acidic medium. At pH higher than 11 or below 2, the protein content in the supernatant was above 80% but it dropped to about 10% at pH close to pI. Confocal laser scanning microscopy images showed that the FPI solution was homogeneous at pH above neutral or below pI and became heterogeneous at pH close to pI. For fresh FPI, physico-chemical properties of FPI gel depend on co-gelling agents such as modified starch (MS) and soy protein concentrate (SPC). The results showed that when adding ingredients (MS, SPC) at a ratio of 4-6%, the state of the FPI gel was improved, the rate of weight loss of protein gels after heating decreased about 6 times. Penetration force, shear strength and the rate of weight loss of protein gels did not increase much after 7 days of storage at  $(4^{\circ}\text{C} \pm 1)$ . TBARS and TVB-N (gel adding MS) indexes did not increase significantly during the storage time of less than 5 days. But TVB-N index increased significantly after 3 days on storage for gels adding SPC.

**Keywords:** Dark muscle, fish protein isolate, gel, physico-chemical property, tuna.

PID 3915

## Study of the Efficiency of Radio Frequency Assisted Heat Pump Drying of Shrimp

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**Abstract:** The study focused on the efficiency of radio frequency (RF) assisted heat pump (HP) drying of shrimp. The experimental drying was conducted with input drying parameters as the drying-air temperature of 45°C, the drying-air velocity of 2.0 m/s, and RF power of 0, 0.5 and 1.0 kW, in which, HP only drying was corresponding to RF power of 0 kW. In the study, the effect of RF power on drying rate, color change, and protein content of dried shrimp were considered. When RF power increased, the drying rate and protein retention of dried shrimp increased significantly. At RF power of 1.0 kW, the drying time was 260 minutes, that reduced about 19% and 38% as compared to RF power of 0.5 and 0 kW. The protein content of shrimp after drying was 62.06%, 66.02% and 69.87% corresponding to the drying modes at RF power of 0, 0.5 and 1.0 kW. Besides, in RF assisted HP drying, the shrimp samples after drying got better color, appearance, and taste than those of HP only drying. At RF power of 1.0 kW, the dried shrimp got the best redness and lightness color, followed by the drying modes at RF power of 0.5 and 0 kW. In both RF assisted HP drying and HP only drying, the dried shrimp surface was not cracked, and the dried products obtained the good taste and the level of redness and lightness required.

**Keywords:** Color change, drying rate, protein content, RF power, shrimp.

PID 4272

## Development of Squid Jerky Snack Moringa Flavor

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**Abstract:** Squid is abundant in Agno, Pangasinan, Philippines. Moringa was identified as a superfood. During the pandemic, several squids were rotten because the community does not have the technology to process the squid. With this, the researchers came up with the idea to process the squid by creating a squid jerky snack flavored with moringa. The jerky snack shall be nutritious with its moringa flavor. The Squid Jerky Snack flavored with Moringa is a dried, seasoned, and ready-to-eat seafood product, made from squid. The researchers developed Squid Jerky Snack flavored with moringa which serves as an alternative or innovation to usual beef jerky. Unlike beef jerky, Squid Jerky is healthier, more nutritious, and inexpensive compared to beef, to be able to create a livelihood for the people of Pangasinan. This study covers the essential aspects of developing Squid Jerky Snack flavored with moringa in terms of the product description, ingredients, procedure, and tools and equipment needed in its preparation. Also, this study investigated the acceptability of the sensory quality of Squid Jerky Snack flavored with moringa in terms of taste, aroma, texture, and overall acceptability. The study was conducted on selected tourists and residents of Agno, Pangasinan, and the faculty and staff of Pangasinan State University – Asingan Campus. As whole, sanitation and hygiene is very important and the process requires some labor but it was fun doing them. The taste, aroma and texture is high acceptable as

well as the suggested retail price. The product is recommended for patenting and commercialization.

**Keywords:** Squid jerky, squid jerky flavored with moringa, squid, jerky.

PID 4746

### Development of Kinetics Models for the Growth of Specific Spoilage Organisms in Nile Tilapia (*Oreochromis Niloticus*) Fillets at the Final Stage of the Cold Supply Chain

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**Abstract:** This study aimed to develop kinetics models for the growth of total viable counts (TVC) and *Pseudomonas* spp. in Nile Tilapia (*Oreochromis niloticus*) fillets during logistics at low temperatures and possible abuse at ambient environments. The modelling process was to determine the parameters of primary models of Baranyi & Roberts, as well as those of a secondary model of Ratkowsky, the so-called square root model. The growth rate ( $\mu_{\max}$ ) of the TVC at  $1 \pm 1^\circ\text{C}$  was 0.02 (1/hour) which climbed to 0.46 (1/hour) at ambient temperatures of 30-33.5°C. The duration of lag phase ( $\lambda$ ) decreased from  $67.05 \pm 43.45$  hours at  $1 \pm 1^\circ\text{C}$  to  $1.4 \pm 1.38$  hours at 30-33.5°C. The growth rate of *Pseudomonas* spp. rose as storage temperatures increased. *Pseudomonas* spp. reached 0.06 (1/hour) at  $1 \pm 1^\circ\text{C}$ , and went up to 0.63 (1/hour) at 30-33.5°C. The duration of lag phase dropped from  $143.79 \pm 20.57$  hours at  $1 \pm 1^\circ\text{C}$  to only  $1.13 \pm 1.61$  hours at 30-33.5°C. The secondary model showed that parameters obtained from the growth model of TVC had the minimum temperature for bacterial growth ( $T_{\min}$ ) of  $0.23 \pm 0.05^\circ\text{C}$ , while those of *Pseudomonas* spp. possessed a  $T_{\min}$  of  $6.48 \pm 19.92^\circ\text{C}$ . The coefficients of determination ( $R^2$ ) of the models were relatively high, indicating the feasible application of the models in estimating the TVC and *Pseudomonas* spp. counts, as well as the product shelf life based on the cold chain temperature history.

**Keywords:** Kinetics model, temperature, cold chain, *pseudomonas* spp., total viable counts.

PID 5541

### Dietary $\kappa$ -carrageenan Downregulates Synapse Associated Genes in The Black Tiger Shrimp *Penaeus Monodon* Postlarve

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**Abstract:** Cannibalism is one of the characteristics of crustaceans that is highly pronounced in the black tiger shrimp *P. monodon* that affects its aquaculture production. Inclusion of algal based as feed additive in the diet that alleviates aggressiveness in shrimp might be one of the solutions. Thus, the present study examined the transcriptomic response of the black tiger shrimp postlarvae to a dietary  $\kappa$ -carrageenan with an emphasis on synapse related gene regulation. Black tiger shrimp postlarvae were fed with  $\kappa$ -carrageenan and no carrageenan treated diet for 30 days. RNA was extracted using Trizol™ plus reagent kit (Invitrogen, USA) that involves lysis, homogenization, phase separation, binding, washing, and elution of whole-body shrimp samples. Total RNA yield was confirmed using Nano spectrophotometry (Jenway, UK), gel electrophoresis, and Rad Molecular Imager Gel Doc™ XR+ System with Image Lab™ Software (Biorad, CA, USA). The

target quality, quantity, and integrity tRNA samples with a ratio of ~2.0 were desiccated in RNAsable® (Biomatrix, San Diego, CA) before sending to Novogene™ for library construction, sequencing, and bioinformatics analysis. Results showed that dietary  $\kappa$ -carrageenan upregulated 834 and downregulated 1317 differentially expressed genes (DEGs) in the black tiger shrimps. Among downregulated KEGG pathways are synapse related genes such as glutamatergic synapse, retrograde endocannabinoid signaling, serotonergic synapse, GABAergic synapse, and cholinergic synapse. The results suggest that dietary  $\kappa$ -carrageenan has antiaggressive behavior effects on shrimp thus, cannibalism minimize and may maximize growth performance in shrimps. Overall, it implies that inclusion of  $\kappa$ -carrageenan in feed may reduce mortality brought by cannibalism and reduce excitement in shrimp that maximize growth performance of the *P. monodon* postlarvae during culture.

**Keywords:** Cannibalism, KEGG pathway, inclusion, transcriptome, RNA analysis.

PID 5932

### Ultrasound-assisted Treatment Improves the Preservation Performance of Chitosan-Graft-Chlorogenic Acid on Refrigerated Seabass (*Lateolabrax Japonicus*) Fillets

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**Abstract:** This study evaluated the preservation performance of ultrasound-assisted chitosan-graft-chlorogenic acid (GUA) coatings on refrigerated sea bass fillets. The results showed that GUA treatment effectively inhibited the growth of microorganisms in sea bass fillets. Meanwhile, the changes of total volatile basal nitrogen (TVB-N), thiobarbituric acid reactive substances (TBA) and pH values were all slowed down under GUA treatment, indicating that protein degradation and lipid oxidation in sea bass were inhibited. LF-NMR and MRI results indicated that the GUA retarded the conversion of mobile water to free water. In addition, GUA treatment maintained the flavor quality of fish fillets, inhibited the reduction of Inosine 38 monophosphate (IMP) and the production of bitter substances (Inosine (HxR) and hypoxanthine 39 (Hx)), suppressed muscle tissue degeneration, and maintained better sensory scores. Overall, GUA treatment can extend the shelf-life of sea bass fillets for another 9 days.

**Keywords:** Chitosan-graft-chlorogenic acid, ultrasound, quality, preservation, sea bass.

PID 6133

### Development of Sea Salt Bath Bombs

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**Abstract:** As the salt capital city of Philippines, Pangasinan utilizes the full potential of sea salt by producing variety of products made and preserved from sea salt. Dried fish, fish sauce, and even cosmetic products are made from salt. Salt farming has also given local folks the means to earn. It became their livelihood in certain parts of Pangasinan. Since the province provided tons of salt, the thought of developing a product out of it was inevitable. Hence, this study aimed to develop bath bombs using sea salt. Aside from it becoming locally made, it would also be originally from natural salt which would make it more appealing to customers. This study also focused in finding

the best formula for the salt bath bomb. It sought the opinion of the participants of the study about the salt bath bomb's effectivity on their skin, the therapeutic claim if there is any, and their perception on the innovativeness of the product. The method used on the study was experimental method comprising three trials. Five participants joined the conduct of the study. They were given salt bath bombs from each trial to be tested at home. The result showed that out of the three trials, the third trial was more effective and was better compared to the two. The participants showed positive impression and stated that the developed salt bath bombs were therapeutic and innovative. They rated each trial as excellent in terms of quality.

**Keywords:** Sea salt, cosmetics, value-adding, bath bomb.

**PID 6961**

### **Effects of Varying Decellularizing Agent, Concentration and Temperature in the Development of Decellularized Extracellular Matrix from Tilapia (*Oreochromis niloticus*) Skin**

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**Abstract:** Fish processing industries result in an ample number of protein by-products that can be as high as 50–80% of the original raw material. Skin and bone with high collagen content comprise approximately 30% of the waste. The recovery of the value-added components of the fish discards will potentially improve waste utilization and contribute to a cleaner ecosystem. As pollution generation is associated with inefficient resource utilization, the current study describes the development of an extracellular matrix from Tilapia fish skin. Extracellular matrix (ECM) is a promising biomaterial for wound healing applications. Although ECM from bovine and porcine tissues have proven effective, religious restrictions and risks of disease transmission remain barriers to their clinical use. Extracellular matrix from fish skin given its similarity to human skin structure is seen as an alternative. In this study, the decellularized extracellular matrix from fish skin was developed using different concentrations (0.1%, 0.5%, and 1.0%) of the decellularizing agents (Triton X-100 and SDS) and temperature (4 °C, room temperature) using tilapia skin. The percent ECM obtained decreases as the concentration increases for both decellularizing agents (TX-100 and SDS). The physical evaluation showed that the effect of temperature is more noticeable with 0.5% and 1% SDS. On the other hand, at room temperature, skin tissue samples dissolved completely in the detergent solution. Furthermore, decellularization protocols using SDS adequately remove cellular components, especially at higher concentrations and 4°C temperature while TX-100 protocols produce a better dermal architecture of skin. The thermal properties of decellularized skin treated with TX-100 reveal that concentration and temperature have no effect; however, the denaturation temperature decreases with increasing SDS concentration in samples treated with SDS. The physicochemical parameters of decellularized ECM were altered by temperature and concentration (ATR–FTIR Spectroscopy, SDS- PAGE, Tensile strength, Water Contact Angle, and Water absorption test).

**Keywords:** Decellularized skin, extracellular matrix, fish byproducts, Tilapia skin, wound healing.



PID 6992

## Comparative Histopathology in Whole Blood Smear Time Series of Indo-Pacific Cubozoan: Sea Wasp (*Alatina Alata*)

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**Abstract:** Cubozoan (box jellyfish) envenomations pose a medical challenge in the Indo-Pacific region with a broad range of sting associated pathological effects, from local tissue damage to Irukandji syndrome or acute cardiopulmonary collapse and death. A better understanding of box jellyfish venom pathophysiology can be gained by examining its histopathological effects on blood components, particularly red blood cells (RBC), white blood cells (WBC), and platelets. This study compared time-dependent changes in whole blood smears prepared from blood drawn of anesthetized piglets exposed to purified venom from a medically relevant tropical Cubozoan – *Alatina alata*. The researchers (1) calculated the RBC count and WBC count; (2) performed a Manual Differential Leukocyte count to (a) quantified the types of WBCs, including neutrophils, and lymphocytes; and (b) assessed abnormal morphology of WBCs and platelets based on literature. In a 12-minute time series, in vivo piglet blood showed crenulated cells; plasma K<sup>+</sup> quantitation revealed transient life-threatening hyperkalemia within 1 minute. In a different experimental approach, ex vivo human whole blood exposed to *A. alata* venom showed a decrease in RBC count and WBC count. Manual Differential Leukocyte Count over the time-course of venom exposure showed a decline in normal neutrophils and lymphocytes with a shift to abnormal, vacuolated neutrophils and swollen lymphocytes. Abnormal morphologies such as basket cells, eosinophil degranulation, vacuolated neutrophils, foam cells, large swollen platelets, and platelet aggregations were present. These time-dependent cytopathological markers coincide with the clinical onset of Irukandji syndrome and thus suggest utility as potential diagnostic markers. These data further illustrate the potential use of histopathologic markers in tracking envenomation sequelae.

**Keywords:** *Alatina alata*, cubozoans, hemolytic activity, histopathology, venom.

PID 7071

## Optimisation of Hydrolysis Conditions for Yellowfin Tuna (*Thunnus Albacares*) Viscera Using Alcalase Enzyme

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**Abstract:** Fish protein hydrolysates contained small peptides and amino acids have many applications in food industry. The objective of the present study was to optimise the hydrolysis conditions (i.e., enzyme to substrate level, temperature and time) for preparing protein hydrolysates from yellowfin tuna viscera using a complete composite design (CCD) of response surface methodology (RSM). The model equation was proposed with regard to the effects of enzyme to substrate level, temperature and time on the degree of hydrolysis (DH) and protein solubility (PS). The results indicated that all the hydrolysis conditions had a significant effect ( $P <$

0.05) on both the DH and PS. An enzyme to substrate level of 0.88% (v/w), temperature of 53.4 °C and hydrolysing time of 6.7 h were found to be the optimum conditions to obtain the highest DH (66.0%) and PS (71.0%) using alcalase. The regression coefficients observed during both experimental and validation runs for DH and PS were 0.9731 and 0.9451, respectively, showing the validity of prediction models.

**Keywords:** Hydrolysis, optimisation, protein hydrolysate, yellowfin tuna.

**PID 7192**

### **Optimisation of Hydrolysis Conditions for Yellowfin Tuna (*Thunnus Albacares*) Viscera Using Alcalase Enzyme**

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**Abstract:** Tilapia is widely cultivated in tropical and subtropical regions, including the Philippines. However, the considerable growth of the aquaculture industry has led to increased waste generation, which can lead to environmental degradation when not disposed of properly. Consequently, there is also a growing interest in converting this aquaculture waste, particularly fish bones, into valuable products. Fish bones are excellent extracellular matrix (ECM) source, which is valued in tissue engineering due to its various biomedical and nutraceutical applications. One of the crucial steps in the extraction of ECM is demineralization. This study investigated the efficiency of the demineralization of tilapia bone using 0.5N HCl at different time durations. The efficiency was assessed by determining the residual calcium and its kinetics, protein content, and collagen integrity of the demineralized tilapia bone matrix (tDBM) through histology, composition, and thermal analysis. The residual calcium content was measured using X-ray fluorescence (XRF) and found to be less than 2% after one hour of demineralization. This is consistent with the results of the thermal gravimetric analysis (TGA) and indicates a second-order kinetic reaction. Histological analysis of the samples using Hematoxylin and Eosin (H&E) staining revealed the gradual disappearance of the basophilic components and the emergence of lacunae, which are discernable after six hours of demineralization. These observations can be attributed to the decellularization and the removal of the mineral content, respectively. The removal of the minerals leaves behind organic components of the bone samples, such as collagen. The attenuated total reflectance Fourier transform infrared (ATR-FTIR) revealed the preservation of the collagen markers, including amide I, II, III, amide A and B, and the symmetric and antisymmetric CH<sub>2</sub> bands in all demineralized bone samples.

**Keywords:** Bone, demineralization, extracellular matrix, kinetics, tilapia.

**PID 7684**

### **Exploring Heterogeneity in Environmentally Responsible Engagement: Evidence from Marine Litter Curbing in Vietnamese Fisheries**

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**Abstract:** This study applies Value-Belief-Norm (VBN) theory to investigate fishers' environmentally responsible engagement in curbing marine litter and the heterogeneity in their engagement. The concept of environmentally responsible engagement includes both pro-environmental behavior and policy support. While pro-environmental behavior is often associated with personal environmental actions at the household level, policy support represents their support for government action at the political level. Therefore, we examine whether fishers are willing to engage in both these actions. Data from 369 Vietnamese fishers are analyzed using structural equation modeling with FIMIX-PLS and POS-PLS. The results show that the sequence of values, beliefs, and personal norms can explain the fishers' pro-environmental behaviors toward marine litter and their support for policies against marine litter. Latent class techniques detect two segments of the fishers from the sample with different perspectives of engagement. Fishers in segment 1 placed great emphasis on the consequences of marine litter on fishing activities as a motivator for their responsible actions. Meanwhile, fishers in segment 2 behaved out of concern about responsibility and moral obligation. A binary logistic regression indicates that the risks of marine litter on fishing activity can provide the explanations for the differences between them. Our findings highlight both fishers' pro-environmental behavior and policy support as important strategies for dealing with marine litter in fisheries. If implemented simultaneously, they hold promise to alleviate the environmental and economic impact of marine litter in Vietnam.

**Keywords:** Marine litter, heterogeneity, environmentally responsible engagement, proenvironmental behavior, Vietnam fisheries.

PID 8295

### Applying 10 MeV e-Beam Irradiation to Improve the Microbiological Quality of Dried Anchovy Products

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**Abstract:** This study evaluates the efficacy of e-beam irradiation in anchovy drying from an initial moisture content of  $78 \pm 1\%$  wb to  $20 \pm 1\%$  wb. The anchovy was irradiated with a 10 MeV energy level and doses ranging from 3 to 7 kGy, with air temperatures of around 30°C. Microbial quality was assessed at the Intertek laboratory before and after irradiation. Results showed that parameters such as *Clostridium perfringens*, Coliforms, *E. coli*, *Salmonella* spp., *Staphylococcus aureus*, *Vibrio parahaemolyticus* Bacteria, Yeasts and Moulds, and TPC (30°C) met the expected results at a dose of 7 kGy, demonstrating the quality of anchovy products for export. This study highlights the potential of e-beam irradiation in the inactivation of pathogenic microorganisms without compromising food quality in anchovy products.

**Keywords:** E-beam, irradiation food, dried anchovy, microbiological qualities, TPC.

PID 8574

### Effect of the Addition of Fish Protein Isolate on Biscuits' Physicochemical and Sensory Properties

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**Abstract:** Biscuits are among the most popular baked goods. However, traditional biscuits are frequently poor in protein and low in the content of the essential amino acids. Meanwhile, fish protein isolate (FPI) is proven to contain all the essential amino acids. The addition of FPI to biscuits can improve their nutritional value but may change their physicochemical and sensory properties. The present study was, therefore, conducted to investigate the effect of the addition of different levels of FPI prepared from trimmings of yellowfin tuna on the physicochemical properties and sensory acceptability of biscuits. The results showed that the moisture and water activity of biscuits with 1.6–5.4% FPI added significantly decreased compared with the control biscuits without FPI. The hardness of the biscuits with FPI added compared to the control biscuits, however, was not significantly different. The results of the sensory evaluation also showed that the appearance, texture, color, flavor, taste, crunchiness, and overall acceptability of the biscuits with FPI added and the control biscuits did not differ significantly, except for the color and flavor of the biscuits with 3.8–5.4% FPI added. The addition of 2.7% FPI to biscuits was found to have no negative impact on the biscuits' quality. These findings suggest that FPI prepared from the trimmings of yellowfin tuna is a potential protein source that can be used to improve the nutritional value of biscuits.

**Keywords:** Biscuits, fish protein isolate, value-added products.

PID 8644

### Optimization of Microwave-Assisted Heat Pump Drying Parameters of Vietnamese Black Tiger Shrimp Using Response Surface Methodology

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**Abstract:** This article uses response surface methodology (RSM) to optimize the microwave-assisted heat-pump (HP-MW) drying process of black tiger shrimp to ensure shortened drying time with better quality production. We aim to assess the multi-objective function founded on the technological factors' influence, such as drying time, rehydration ratio, and specific energy consumption. Optimization parameters were air temperature ( $20 \div 40$ )°C, air velocity ( $1 \div 2$ ) m/s, and microwave power ( $100 \div 500$ ) W. The research results show that the optimal drying conditions for the best quality of dried black tiger shrimp and the highest drying productivity are a drying temperature  $t$  of 34.74°C, a drying airspeed  $V$  of 1.87 m/sec, a microwave power  $MW$  of 135.78 W and a humidity  $RH$  of ( $15 \div 17$ )% with characterized by maximum desirability function (0.993). Furthermore, the experimental results demonstrate the completed product values with the time drying of 13.7 minutes, the rehydration ratio of 2.33, and the specific energy consumption of 3.23. This study would contribute to developing technical capabilities for designing microwave-assisted heat pump dryers applicable to such high-valued foodstuffs

**Keywords:** Atlantic mackerel (*Scomber scombrus*), color, liquid smoked flavouring.

PID 8703

### The Effect of Liquid Smoked Flavourings and Wood Smoke on the Quality of Smoked Mackerel Fillets During Chilled Storage

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**Abstract:** This study was undertaken to evaluate the effects of liquid smoked flavourings and wood smoke on the sensory, color, texture, and lipid stability of smoked mackerel fillets for four weeks chilled storage. Fish fillets were smoked by two methods: (1) immersed in brine (1:1) containing 100 g/L NaCl at 0-5°C for 3 hours, allowed to drain at room temperature (~20°C) for 2 hours and smoked directly with wood smoke in a smoking chamber at 25°C for 3 hours; (2) immersed in brine (1:1) containing 5 mL/L commercial liquid smoke flavourings and 60 g/L NaCl for 16 hours at 0-5°C then dried at 25°C for 2 hours in an oven. Smoked samples were then vacuum packed and stored chilled at -1°C for one week, followed by 4±1°C for three weeks. The quality changes in sensory, color, texture, and lipid stability were observed after 0, 1, 2, 3 and 4 weeks of storage. The results showed that, smoked mackerel using commercial liquid smoked flavourings was higher in rancid flavour, lightness, redness, and yellowness but had less bitter odour and was softer than the wood smoked mackerel. The lipid oxidation was higher after the wood smoke process but was however rather stable during the chilled storage. In contrast, lipid oxidation in the liquid smoked products increased significantly during chilled storage.

**Keywords:** Atlantic mackerel (*Scomber scombrus*), color, liquid smoked flavouring.

PID 8876

### Influence of Season and Location on the Lipid Classes and Fatty Acid Composition of Pacific Oyster (*Crassostrea Gigas*) Cultured in Khanh Hoa Coast

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**Abstract:** The lipid profile of *Crassostrea gigas* cultured in Thuy Trieu lagoon - Cam Lam, Nha Phu lagoon - Ninh Hoa and Mon lagoon - Van Ninh was evaluated based on seasonal changes in total lipid and lipid categories, phospholipid (PL) content, free fatty acid (FFA) content, fatty acid (FA) composition, thrombogenicity index (TI), and antioxidant activity of the neutral and polar lipid fraction. The results indicated that the total lipid recovered in oysters from Ninh Hoa was higher compared to that from Cam Lam and Van Ninh with lower levels of FFAs, TI, and n-6/n-3 ratio. In all the three farming areas, total lipid was the lowest during the two spawning seasons (May and September). There was little variation in the phospholipid content from the three regions throughout the farming season. Lipids from *Crassostrea gigas* were separated into neutral and polar lipid fractions using column chromatography (CC) coupled with thin layer chromatography (TLC). Neutral lipids recovered from the oyster muscle were significantly higher than the polar lipids ( $p < 0.05$ ). The FA composition showed that *Crassostrea gigas* was abundant in saturated fatty acid (SFA 30.89%-39.16% of total lipids), followed by polyunsaturated fatty acid (PUFA, 28.13%-35.88% of total lipids), and monounsaturated fatty acid (MUFA, 19.32%-23.75% of total lipids). The dominant PUFA from the three farming areas were eicosapentaenoic acid (EPA 9.09%-13.77% of total lipids) and docosahexaenoic acid (DHA 6.71%-16.47% of total lipids). Both neutral and polar lipid fractions exhibited DPPH radical scavenging abilities with polar lipids having lower IC50 values (0.13 - 0.95 g/L) than neutral lipids (0.19-7.70 g/L).

**Keywords:** Column chromatography, fatty acid composition, lipid classes, Pacific oyster, thin layer chromatography.



# Topic 4

## FISHERIES SCIENCE



PID 1737

## Situation and Solutions for Post-Harvest Preservation on Vietnamese Fishing Vessels

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**Abstract:** The purpose of this study is to examine the impact of Maritime bank's corporate culture on its product innovation in Vietnam. The empirical results from analysis of data collected from 268 respondents point out that corporate culture has significant effects on Vietnam Maritime bank's product innovation through two factors which are innovative culture and leadership. The study's results are expected to help Maritime bank managers use direct efforts and resources in the most effective and efficient way to encourage bank's product innovation to improve their business in the long run.

**Keywords:** Fishing, post-harvest preservation, fishing boats.

PID 2217

## Examining Morphological Measurement Relationships to Differentiate Between Sexes in Slender Mudskipper *Periophthalmus gracilis* (Eggert, 1935)

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**Abstract:** This study developed a new method for determining the sex of *Periophthalmus gracilis* (Eggert, 1935) fish using morphological measurements. This alternative method could potentially overcome the limitations of traditional methods, such as dissection, which is time consuming, invasive, and can only be performed on dead or mature fish. The researchers collected 1,288 fish samples over 12 months from different coastal regions in the Vietnamese Mekong Delta. The fish were sexed based on their gonads and measured for various morphological aspects, including total length, standard length, body height, eye distance, eye diameter, mouth width, and head length. The researchers found that the relationship between total length and eye distance was the most effective in distinguishing between male and female fish. Males significantly increased eye distance than females, making it a vital measurement for sex determination. The combination of eye distance, body height, and mouth width could also be used to determine the sample collection time, whether during the wet or dry season. The study highlights the importance of using non-invasive and suitable ways to determine fish sex. The alternative method can potentially help reduce the number of fish used in traditional ways, ultimately aiding in conserving fish populations. Additionally, this study provides essential information for fishery management, as it can help estimate population sizes and sex ratios.

**Keywords:** Mekong Delta, morphometrics, mudskipper, *Periophthalmus gracilis*, sex differentiation.

PID 2455

## Thermophysical Properties of Cordyceps Militaris Change During Freezing Process

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**Abstract:** This study focuses on determining the thermophysical parameters of Cordyceps militaris in the freezing stage of the freeze-drying process. When the temperature of cordyceps changed from ambient temperature 25°C to freezing temperature -45°C, the thermophysical parameters of Cordyceps militaris changed much. The study determined the initial freezing point temperature of Cordyceps militaris to be -0.6°C. At temperatures above the initial freezing point, the density ( $\rho$ ) and specific heat ( $c$ ) increase slightly as the temperature decreases. In contrast, thermal conductivity ( $k$ ), thermal diffusivity ( $a$ ), and enthalpy ( $h$ ) decrease. However, at temperatures below the initial freezing point, as the temperature decreases, the density, specific heat, and enthalpy decrease while the coefficient of thermal conductivity and thermal diffusion increase. The results obtained from this study can be applied in calculating the heat and mass transfer during the freezing phase in the freeze-drying process of Cordyceps militaris.

**Keywords:** Freezing process, Cordyceps militaris, thermophysical properties.

PID 2812

## Stock Assessment of Traditionally Fished Aquatic Species in Non-wadeable Rivers in Samar Island Natural Park

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**Abstract:** The study surveyed diminutive freshwater fishes in 3 major rivers in the Samar Island Natural Park (SINP) to identify traditionally fished species and fishing practices, determine the impact of traditional fishing practices on biodiversity, and formulate policy recommendations for conservation. Each river system was divided into three stations and various fishing gears was deployed. The study identified six species of the dominant indigenous fish, as well as the endangered "Ludong" (*Cestraeus* sp.). Traditional fishing practices and water pollution were found to be contributing to declining fish populations, and lack of fishing paraphernalia and boats among the local community of fisherfolks was a major weakness. Urgent actions are needed to protect and conserve the indigenous aquatic species in the SINP rivers.

**Keywords:** SINP (Samar Island Natural Park), Non-wadeable river, Assessment.

PID 3113

## Effectiveness of Vessel Monitoring Systems in Managing and Monitoring Fishing Vessels in Ca Mau Province, Vietnam

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**Abstract:** Since October 2017, Vietnam's fisheries have made efforts to address the European Commission (EC)'s yellow card warning. One key factor in the removal of the yellow card warning was the implementation of a fishing vessel monitoring system (VMS) to manage and monitor fishing vessels at sea and prevent them from violating foreign waters. However, there has been limited research evaluating the effectiveness of VMS in Vietnam. To address this gap, this study focused on evaluating the use of VMS in Ca Mau province, one of the country's dominant fisheries. The study collected primary and secondary data from 94 surveyed fishermen who were captains and owners of Ca Mau fishing vessels equipped with VMS between December 2021 and April 2022. The findings showed that 99.5% of fishing vessels were equipped with VMS, with the ZuniVN-01 equipment being the most commonly selected (39.7%), followed by Viettel S-tracking (24.2%), and BA-SAT-01 (23.5%). However, these VMS failures occurred frequently, with the most significant being disconnection for more than ten days between the VMS onboard and the local control center. Despite these failures, 96.8% of respondents believed that VMS was effective, particularly for emergency rescue functions (73.4%). The automatic transmission of the vessel's location via GPS every two or three hours received the highest rating (78.7%) from respondents. Additionally, most fishers (68.5%) believed that the core requirements of VMS were appropriate. Based on the study's results, practical recommendations were proposed to stakeholders to improve the effectiveness of VMS. Keywords: IUU fishing, Ca Mau, VMS, management effective.

**Keywords:** Ca Mau, effectiveness, IUU fishing, VMS.

**PID 3512**

### **Effectiveness of Vessel Monitoring Systems in Managing and Monitoring Fishing Vessels in Ca Mau Province, Vietnam**

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**Abstract:** This study identified the requirements, issues, and characteristics of the fishermen in San Antonio, Northern Samar. The socio-demographic characteristics of the respondents were carefully documented. The socio-economic issues that the fishermen in San Antonio, Northern Samar encountered were also discovered, as were the requirements of the fishermen in their fishing operation and finally the government's initiatives for local socioeconomic development. The descriptive-survey research design was utilized to collect data necessary for the investigation, and the survey questionnaire was used as the tool. The study's key findings were as follows: As to the profile of the respondents, majority were thirty-one to forty-five years old, males, married, composed of four to six family members, had an income of one thousand to five thousand a month; were working ten years and more as fishermen, and had other financial sources. According to their demographics, the respondents were mostly male, between the ages of thirty-one and forty-five, married, with four to six family members, earning between one thousand to five thousand per month, working as fishermen for 10 years or more, and having other sources of income. The socio-economic problems experienced by the fishermen had moderate impact. Ten (10) needs for fishermen were identified, including the following: (1) availability of bantay-dagat to reduce offenders; (2) additional fishing equipment; (3) alternative livelihoods; (4) fishing gears; (5) local government unit fishery program; (6) ordinances for fishery regulation; (7) financial assistance; (8) technology transfer or fishery management training; (9) aquaculture, materials, and seedlings; and (10) permanent fishery contacts to do business from local fisher people. Three government measures in total for the local socioeconomic development are as follows: (1) strict and consistent enforcement of rules, (2) levying fines or fees on offenders, and (3) providing legal services and gear for fishermen.

**Keywords:** aquaculture, fisherfolks, fishery, technology transfer, local development.

PID 4462

## The Harvest Function: A Case Study of Khanh Hoa's Fisheries

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**Abstract:** The performance of fishing vessels is influenced by both endogenous and exogenous factors, including fish-eries policies such as fuel cost subsidies, climate change, and other external factors. This study evaluated the impact of these factors on the catch quantity of offshore gillnet vessels in Khanh Hoa, Vietnam, by estimating the harvest function using survey data from three fishing seasons (2008, 2013, and 2018). The study found that endogenous factors, including engine capacity, number of nets, number of fishing days, and vari-able costs, have a positive effect on catches, but the coefficients are smaller than in previous studies, indicating the scarcity of resources. Additionally, the stock proxy had a small coefficient, suggesting that offshore resources are becoming depleted. The study found no effect of fuel cost support, while climate change awareness had a significant impact. The results suggest that fishermen's awareness of climate change may help them adapt, and subsidies may not be sustainable for open-access fisheries.

**Keywords:** Harvest Function, Gillnet, Endogenous Factors, Exogenous Factors, Offshore, Fisheries, Khanh Hoa.

PID 4467

## Anti Illegal, Unreported and Unregulated Fishing for Sustainable Development of Fishing in Vietnam - Practice and Some Issues Posed

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**Abstract:** Situated on the west bank of the East Sea, the largest of the world's six great seas, the Vietnamese sea has a fairly high biodiversity with about 11,000 marine species discovered, which creates a favorable condition for the development of our country's seafood industry. From a small-scale, artisanal fishery, Vietnam's fisheries have developed into one of the industries contributing significantly to the key economic development of the country. However, the flip side of this is that fishery resources, specifically Vietnam's fish resources, are rapidly declining. Illegal fishing acts such as fishing without a license, fishing in the prohibited area, during the period of prohibition of fishing, using prohibited fishing gear or fishing gear, or illegally fishing. aquatic species on the list of endangered, precious and rare aquatic species... are causing the current decline in Vietnam's aquatic resources in both quantity and quality. From an environmental perspective, unsustainable fishing strongly affects the physiological characteristics of aquatic species, particularly fish, such as loss of body weight, leading to changes in the reproductive cycle and resilience of fish stocks, food chains and marine ecosystems. From an economic viewpoint, the decline of aquatic species will directly affect the efficiency of the fisheries industry in the near future, there will be very few fish left in the sea to be caught. Therefore, whether from economic or environmental reasons, the prevention of illegal fishing practices is extremely important for Vietnam. The content of the article will first analyze the practice of Vietnam's anti-illegal, unreported and unregulated (IUU fishing) activities, from which, make some recommendations to enhance the effectiveness of the fishing activities. in this activity aimed at sustainable development of fisheries in Vietnam.

**Keywords:** Anti-illegal, unreported and unregulated (IUU fishing), sustainable development.



PID 4686

## Effect of Different Transportation Strategies on the Daily Growth Rate, Bacterial Count, and Phenotypic Characteristics of *Kapapphycus* Species

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**Abstract:** This study presents the ten different transportation strategies applied to the *Kapapphycus* sp. that were obtained from Tiabas, San Dionisio. The transportation strategies are in I.) covered treatments: a = only seaweeds in polystyrene boxes, b = ice and seaweeds in polystyrene boxes, c = seawater and seaweeds in polystyrene boxes, d = seawater, ice and seaweeds in polystyrene boxes, e = seaweeds in rice sacks; and same with II.) Sun-exposed treatments. Only the daily odor, color, bacterial count and daily growth rate were observed. Among the transportation strategies, seaweed transported in rice sacks got the poorest odor score, also the seaweed transported inside polystyrene boxes without water under the heat had the worst color and high bacterial count, and seaweed transported in polystyrene boxes with seawater under the heat had the lowest daily growth rate at  $-2.11 \pm 1.16$  % day<sup>-1</sup>. Seaweed transported in boxes with seawater and ice measured a low bacterial count, also seaweed in boxes with water showed a superior color score, both in covered vehicles. However, seaweed in sacks exhibited the best odor and daily growth rate measurement at  $4.37 \pm 1.163$  % day<sup>-1</sup>. Therefore, seaweed transported in sacks is recommended given 3 hours of travel only even under the heat.

**Keywords:** *Kapapphycus* sp., transportation strategies, biosecurity, sustainability.

PID 4693

## The Effects of Different Salting Procedures on Physical and Chemical Properties of Heavily Salted Atlantic Mackerel (*Scomber scombrus*)

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**Abstract:** The effects of two different salting procedures on physical and chemical properties of Atlantic mackerel (*Scomber scombrus*) from two processing companies were investigated. Group I and group III were treated with single dry salting and group II and group IV were treated with pre-brined dry salting and stored in waxed carton boxes at 13°C. Samples of salted and desalted fillets from each group were taken at the beginning of storage, day 7 and day 14 of storage and analysed for physical components (soaking yield, cooking yield, processing yield, and colour) and chemical components (water content, salt content, water activity, pH, TVB-N, lipid, free fatty acid, peroxide values, and thiobarbituric acid). The yield in fish treated with pre-brined dry salting was higher than of the single dry salting. The salt content in pre-brined dry salting was lower than the single dry salting. The lightness (L value) in pre-brined dry salting was higher than the single dry salting and the b value was lower than single dry salting. Pre-brined dry salting caused greater lipid hydrolysis in the mackerel muscle than the single dry salting resulting from higher free fatty acid content. In conclusion, the changes of physical and chemical properties of Atlantic mackerel depend on salting method, storage time and temperature and the quality of raw material.

**Keywords:** Atlantic mackerel (*Scomber scombrus*), brining, dry salting, lipid oxidation, quality, stability.

PID 4874

## Marine Macro Molluscan Bivalves and Gastropods Diversity in The Intertidal Areas of Barangay Paniman, Caramoan, Camarines Sur, Philippines

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**Abstract:** There have been very few studies on mollusk diversity in remote areas of the Philippines. The coastal areas of Caramoan, Camarines Sur, are ideal for studying marine mollusks because they have been discovered to be abundant, diverse, and important to the locals' livelihood. However, due to the inaccessibility of the mentioned area, this lack of information remains scientifically lacking. Thus, the aim of this study was to determine the diversity of marine macro-molluscan bivalves and gastropods in the intertidal areas of Barangay Paniman, Caramoan, Camarines Sur, Philippines. Purposive sampling and transect methods were used to assess the species composition, abundance, and occurrence of marine macro bivalves and gastropods. The Shannon-Wiener index was used to determine the area's diversity, while the coefficient of correlation was used to determine the relationship between the physicochemical properties of seawater and the diversity index value. A total of 557 individual mollusks were sampled and classified, obtaining 52 species of bivalves from 33 genera and 16 families and 54 species of gastropods from 33 genera and 18 families. The family Veneridae had the highest among the bivalves and the family Strombidae had the highest species richness among the gastropods. The H' was positively correlated with seawater temperature, whereas pH and salinity were negatively correlated. This study provided baseline information on the status of marine macro molluscan bivalves and gastropods in the intertidal area of Barangay Paniman, Caramoan, Camarines Sur, Philippines. As a result, this will provide solid empirical evidence for conservation and sustainability plans.

**Keywords:** Bivalves, gastropods, macro mollusks.

PID 5057

## Ecological and Carbon Stock Assessment of Seagrasses in Siargao Island, Surigao Del Norte

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**Abstract:** Seagrass ecosystem is classified as blue carbon ecosystem because of its capacity to capture and store carbon in the marine sediments for a long time which helps in mitigating climate change. In this regard, loss of seagrass cover can result for the stored carbon in its sediment to be released back into the atmosphere or waters. Siargao Island is a famous tourist spot for its beaches and surfing waves and is also a protected area due to its rich biodiversity with a seagrass cover of 5,393 hectares. This study estimated the carbon stock of seagrasses in eight coastal municipalities of Siargao Island. A total of eight seagrass species were identified namely, *Cymodocea rotundata*, *Cymodocea serrulata*, *Enhalus acoroides*, *Halodule uninervis*, *Halodule pinifolia*, *Halophila ovalis*, *Syringodium isoetifolium* and *Thalassia hemprichii*. The top three seagrass species that dominated Siargao Island were *C. rotundata*, *S. isoetifolium* and *T. hemprichii*. The highest percentage of C-stock in all of the sampling stations was accounted to the sediment, followed by the belowground biomass and the least contributor was the aboveground biomass. The top four areas with the highest total organic carbon stock were Alegria, Sta. Fe, Poblacion 1 and Caridad

because these stations were dominated by medium size seagrass species (Cymodocea and Thalassia) with high shoot density. The seagrass meadow in Siargao Island is estimated to store about 201, 752 Mg C which is equivalent to 740, 430 Mg CO<sub>2</sub>. Therefore, conservation and restoration of seagrass ecosystems should be implemented as they serve as nature-based solution to climate change and decline or loss of seagrass cover can lead to the risk CO<sub>2</sub> emission from the sediment.

**Keywords:** Siargao Island, blue carbon, mitigation.

**PID 5108**

### **Promoting Vietnam's Seafood Exports Post Covid-19 Pandemic**

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**Abstract:** The fisheries sector is a spearhead economic sector that has made important contributions to the development of Vietnam's economy over the past decades. However, during and post Covid-19 pandemic, the industry has been confronted with various difficulties and challenges as the demand in the major export markets is slowing down due to the risk of a global economic recession, the protracted Russia- Ukraine conflict, rising inflation and stiffer competition from low-cost rivals. This study aims to evaluate the current situation and examine challenges facing Vietnam's seafood export activities in order to propose some practical solutions to promote Vietnam's seafood exports in the coming years.

**Keywords:** Seafood exports, challenges, Covid-19 pandemic, Vietnam.

**PID 5194**

### **Stock Assessment of Traditionally Fished Aquatic Species in Non-Wadeable Rivers in Samar Island Natural Park**

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**Abstract:** The Samar Island Natural Park (SINP) is an important protected area in the Philippines under Republic Act No. 4221. The study aims to conduct a survey of indigenous diminutive freshwater fishes in three selected study areas in the SINP in Samar, Philippines, each harboring representative isolated crater lakes, mountain streams, and waterfalls that can serve as the basis for the development of strategies for their sustainable use and conservation. A descriptive survey method was used in this study to identify the commonly used fishing gear for catching freshwater aquatic species. The dominant catches of indigenous aquatic species were species of *Macrobrachium* sp., predominantly found in the downstream areas of the river. The identification of the expensive and commercially important endangered species, commonly known as the President's Fish or Lobed River Mullet (*Cestraeus plicatilis*), which was discovered from the deni point of the Ulot rapids to Basey Samar, provides baseline data for the formulation of resource management strategies and policies.

**Keywords:** SINP (Samar Island Natural Park), non-wadeable river, assessment.

PID 5205

## Distribution and Abundance of Hippocampus Species in The Coastal Waters of Three Selected Municipalities of Northern Samar

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**Abstract:** This study aimed to investigate the distribution and abundance of seahorses in selected coastal municipalities of Northern Samar, while examining the environmental parameters influencing their presence. The objectives were to identify seahorse species and assess their geographic distribution and abundance, measure variations in seagrass cover across different locations, and explore the relationship between seahorse abundance and percent seagrass cover. A descriptive-correlational research method was employed to analyze the connection between seahorse abundance and seagrass cover. The study revealed that environmental parameters exhibited slight variations that had minimal impact on seahorse distribution and abundance. Among the sampled areas, Lavezares had the lowest number of seahorse individuals, whereas San Jose had the highest. Only *Hippocampus kuda* species was found in all sampling areas, showing a preference for seagrass species such as *Enhalus acoroides*, *Halodule uninervis*, *Cymodocea rotundata*, and *Thalassia hemprichii*, along with a diverse group of seaweeds. Significant differences in percent cover were observed for *E. acoroides* and *H. uninervis* across the sampling areas, while no significant differences were noted for *C. rotundata* and *T. hemprichii*. Furthermore, the study revealed a significant relationship between the abundance of *H. kuda* and the percent cover of the identified seagrass species. These findings indicate that slight variations in environmental parameters have limited effects on seahorse distribution and abundance. It is recommended to conduct further in-depth studies to gain proactive insights and develop long-term strategies aimed at protecting seahorse habitats, minimizing damage, and fostering environmental conservation. These efforts should be driven by the research and extension units of academic institutions, considering ecological, economic, and conservation strategies.

**Keywords:** Abundance, distribution, hippocampus kuda, seahorses, northern samar.

PID 5309

## Dominance of Toxin-Producing Plankton Species in Ramsar Site: The Case of Las Pinas-Paranaque Wetland Park (Lppwp) and Its Nearby Waters

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**Abstract:** Plankton populations can serve as indicators of pollution in the aquatic environment as their assemblages are sensitive to changes in water quality. Here, we described the assemblage of marine plankton within the protected area and immediate waters. Further, we test the assumption that plankton density is associated with water's physico-chemical and heavy metal levels. Diversity indices were used to describe the condition of plankton communities. Water quality parameters were analyzed using SMEWW methods, and heavy metals using Flame-AAS

method. Data was used to derive the Water Quality Index. Canonical Correspondence Analysis (CCA) was used to determine the interaction between plankton and water parameters. A total of 17 genera of phytoplankton belonging to diatoms and dinoflagellates group were identified. The density of diatoms ranged from 1,800 to 2,723,733 cells/L. *Chaetoceros* sp. had the highest density in all stations. The density of dinoflagellates, which was dominated by *Prorocentrum micans*, ranged from 1,367 to 8,367 cells/L. For zooplankton, eight taxa were identified, with a density between 667 and 18,167 cells/L. Copepod nauplii dominated in all stations. The Shannon diversity index ( $H'$ ) and Pielou evenness index ( $J$ ) for phytoplankton is from 0.56 to 1.28, and 0.146 to 0.206, respectively. For zooplankton, values were at  $H'=0.965$  to 1.756 and  $J=0.6562$  to 0.9459. These values imply very low to moderate diversity, indicating a plankton under stress possibly due to poor water quality. Moreover, water quality was classified as poor, some levels were below the acceptable standards. The findings of this study suggest that the abundance of plankton, particularly toxin-producing species such as *Chaetoceros* sp., *Skeletonema* sp., and *Bacteriastrium* sp., is influenced by the levels of nitrate, phosphate, biological oxygen demand, ammonia-N, and dissolved oxygen. Continuous monitoring of water quality is crucial for effectively monitoring algal blooms. Further, the study recommends the implementation of integrated strategies to reduce sediment and nutrient runoffs draining towards the area. Carrying capacity for aquaculture may also be considered to limit the existing number of fishpens that could interfere with water circulation and minimize eutrophication due to excess feeds.

**Keywords:** Heavy metals, LLPWP, phytoplankton, Ramsar, water quality, zooplankton.

**PID 5312**

### **Abundance and Characteristics of Microplastic among Commercially Important Pelagic Fish in Zamboanga Peninsula and Agusan del Norte, Philippines**

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**Abstract:** The ingestion of microplastic by a diverse range of marine organisms such as fish, mammals, and invertebrates had posed serious physical consequences as well as mortality. This study documents the microplastic ingestion of pelagic fish from selected bays in Mindanao waters. Fish samples used for the examination of the presence of microplastic in their gastrointestinal tracts were collected from fish landing sites in the bays of Dipolog, Pagadian, and Butuan. A total of 377 fish individuals representing 15 species were obtained from these areas. Out of these 377 fish, 333 individuals had microplastic with a total of 92 plastic particles removed and recorded from their digestive tracts. These microplastic particles comprised mainly of fibers (55%) and fragments (45%) with sizes ranged from 0.066mm to 3.3mm. Different microplastic colours were noted, with black being the most dominant. FTIR analysis identified five plastic polymers namely, rayon, polyamide nylon, polypropylene, polyethylene, and polyester. The data showed that *Selaroides leptolepis* had the highest occurrence of microplastic in their GIT (26.09%) followed by *Selar crumenophthalmus* (21.74%) and *Hemiramphus* far (11.96%). The abundance and size of ingested microplastic were not significantly correlated with fish length and body weight. The result provides the first proof of microplastic ingestion by some commercially important pelagic fish from selected areas in Zamboanga Peninsula and Agusan del Norte, a clear indication of the vulnerability of these fish to the increasing amount of microplastic that litters the world ocean in general and the Philippine waters in particular.

**Keywords:** Microplastic, FTIR, pelagic fish.



PID 5543

## Characteristics of Collagen Extracted Enzymatically from the Skin of Basa Fish (*Pangasius bocourti*)

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**Abstract:** Type I collagen is a fibrillar structure collagen, which plays an important role as the essential structural composition and mechanical scaffold of several tissues. The aim of the study was to extract type I collagen from Basa fish skin using acetic acid as the extraction solvent with the assistance of pepsin. The collagen extraction yield was 520.5 mg/g of fresh fish skin on the basis of lyophilized dry weight. The denaturation temperature (Td) was 34.8°C by measuring its viscosity. The identity and purity of collagen protein were examined by ultraviolet-visible spectroscopy (UV- Vis) at 230 nm. Based on sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE), the molecular weight (Mw) of collagen  $\alpha 1$ ,  $\alpha 2$ , and  $\beta$  subunits were approximately 130, 118, and above 200 kDa, respectively. By high performance liquid chromatography (HPLC), 17 proteinogenic amino acids were found in the collagen sample, in which the hydroxyproline content was 68.3 mg/g. The scanning electron microscope (SEM) images confirmed the fibril structure of collagen. Fourier transform infrared spectroscopy (FTIR) spectrum indicated characteristic bands according to the presence of amide A, B, I, II, and III bonds in collagen chemical structure. Therefore, purified collagen obtained from this study can be further used in various fields of application.

**Keywords:** Basa fish skin, type I collagen, enzymatic extraction, proteinogenic amino acids, hydroxyproline.

PID 5664

## Mechanization of Milkfish Culture Operation: Automatic Feeders in Floating Net Sea Cages in the Philippines

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**Abstract:** Increasing aquaculture production to cope up with the demand of the continuously growing population is not merely intensification and expansion of area. Mechanization of some, if not all of the culture operations could be done specially in feeding. Five feeding regimes namely: manual feeding (control); kinetic/demand feeder; automatic top feeder; automatic bottom feeder; and combination of automatic top and bottom feeders, were evaluated in an 80-day feeding trial on growth performance of milkfish. Weight gain, specific growth rate and survival (96%-98%) were similar in all treatments. Feed conversion ratio (FCR) although similar among machine-fed populations, was significantly lower in the combined feeding regime compared with the hand-fed populations. Results showed that the use of automated top and bottom feeding can replace manual feeding. Combination of automatic top and bottom feeding improves feed utilization evidenced by better size distribution at harvest and markedly reduced FCR thus, reduces operational cost and organic pollution in the farms. With more precise feeding protocols, sustainable production increases through intensification may be realized.

**Keywords:** feeding regimes, manual feeding, kinetic feeder, automatic feeder.

PID 6022

## Ecological and Carbon Stock Assessment of Mangroves in Siargao Island, Surigao Del Norte

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**Abstract:** Mangroves are halophyte organisms that thrive both in the estuarine and saline coast, yet subjected to stressful environment. The mangrove ecosystem provides a wide variety of ecological and economical services. Blue carbon sequestration is one among these functions and is considered a highly important cost-effective mitigation to climate change. This study estimated the aboveground and belowground biomass and carbon stock of the mangrove by generating a site-specific allometric equation for the mangroves in Siargao Island, Surigao del Norte. Results showed eighteen (18) mangrove species that were identified in six (6) mangrove sites namely; *Avicennia corniculatum*, *Avicennia marina*, *Avicennia officinalis*, *Avicennia rumphiana*, *Bruguiera gymnorrhiza*, *Ceriops tagal*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, *Campostemon philippinensis*, *Heritiera littoralis*, *Excoecaria agallocha*, *Lumnitzera littorea*, *Osbornia octodonta*, *Pemphis acidula*, *Scyphiphora hydrophyllacea*, *Sonneratia alba* and *Xylocarpus granatum*. The highest percentage of C-stocks was accounted to the sediment biomass (88%), followed by the belowground or root biomass (8%), while the least contributor was the aboveground biomass (4%). Given the entire mangrove stands of the island which covers 8,620 hectares, there is a great potential of the island to store a substantial quantity of 2.81 million t C ha<sup>-1</sup> and an estimated amount of 10.31 million t CO<sub>2</sub> ha<sup>-1</sup> hence, this mangrove forest needs to be conserved, managed properly and its use must be regulated to realize its potentials.

**Keywords:** Blue carbon, siargao island, allometry.

PID 6957

## Applying the Polyurethane (Pu) and Composite Materials in Improving the Freezer Holds on Vietnamese Fishing Vessels

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**Abstract:** Vietnamese fisheries is small-scale, based-on citizens' right fisheries. The fishing vessels is belong to private people. The capture fishery is small. So, the goal of industrialization of the fishing industry is still difficult due to many obstacles. Through a number of previous survey on capture fishery in various coastal province in Vietnam, it was found that preservation of products on board was mainly still using ice which brought from the shore, preservation tools by trays or plastic bags. The traditional storage tanks onboard were made by woods, Styrofoam, Nylon and PE foam. This lead to poor cold retention. At the same time, the polluted water/fish liquid can easily run/soak into wood/PE foam/Styrofoam. So, microorganism/bacteria/virus can stay and spread out there. After that, microorganism/bacteria inside of tanks can attack/infect the fish, lead to reduce fish quality. To overcome this problem, it is essential to innovate the fish preservation onboard by polyurethane (PU) and composite technology which replace woods, Styrofoam, Nylon and PE foam in order to improve fish quality, ensure seafood safety and hygiene. The project has built 24 models (24 off-shore fishing vessels) of product preservation using PU and Composite materials in 10 coastal provinces of Vietnam. The results show that the PU and composite freezer holds onboard help waterproof, ice efficiency up to 95% (Traditional tunnel is about 60-70%), limit water breakers, prolong fishing time at sea up to 30 days, tunnel life from 15 - 20 years (Traditional cellar 3-4 years), quality preserved products, sold at higher prices, bringing economic efficiency to offshore fishing fleets. It means the fishermen has higher income

which contributing to improve the lives of their families. Thanks to the PU and composite technology that adheres to the inside of the ship's hull (wood is less susceptible to water), limiting the ship's breaking water, reducing shipwreck accidents at sea; Increasing the life of the ship's hull also means reducing deforestation for shipbuilding wood, contributing to forest protection and environmental protection.

**Keywords:** Polyurethane (PU) technology, composite technology, freezer holds (tankers), fish quality.

**PID 7115**

### **Reproductive Biology and Morphometric Characteristics of Mackerel Caught in the Coastal Waters of Catbalogan City**

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**Abstract:** The study of reproductive biology is relevant and essential in order to preserve and propagate a particular fish species. Despite its significance, the lack of such data frequently led to the overuse of the stock and, at times, to a failure of the management strategy. The initial result on the study of *Rastrelliger* species in Samar seas points out to the presence of three species namely *Rastrelliger kanagurta*, *Rastrelliger faughni* and *Rastrelliger brachysoma*. The three (3) examined mackerel species from the analysis of its length indicates that these fishes enter into the peak of exploitation phase before attaining the standard mature length. The gonad developmental stages in each month consisted of one or two dominant stages with a small number of other sequential stages. These results reflect the uniformity of gonadal states among fish examined each month. For sex ratio, males outnumber females in terms of abundance in the majority of the observed months, and the statistical analysis shows that males and females are not equally represented in the population during the investigation and in some way deviate from the expected 1:1 ratio. As higher GSI values are regarded as indicative of spawning season, the maximum GSI value of females was observed in Calbayog for the month of October, whereas the minimum was in June.

**Keywords:** Gonad, mackerel, morphometric, *rastrelliger*, reproductive biology.

**PID 7469**

### **Assessment of coastal key habitats of Malanton Islet of Zumarraga, Samar**

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**Abstract:** Public education and management action must be built on a solid foundation of knowledge about the natural and modified coastal ecosystem. This study was conducted to assess the coral reef ecosystem of Malanton Islet in Zumarraga, Samar and provide recommendations for its conservation and management. Rapid aquatic resource appraisal (RARA) was performed to gather preliminary information on physico-chemical parameters of the area as well as fish species and other flora and fauna. Malanton Islet has a fringing reef bordering its 139.24 m coastline. The total reef area is approximately 5,477m<sup>2</sup> and is geographically located at coordinates 11°39'12.97" North and 124°52'54.57" East. Eight species of fish were identified, dominated by *Cheilodipterus novemstriatus* (41.70%), but have no commercial value. *Siganus lineatus* was highest in terms of biomass. Manta tow and line intercept transect method revealed that abiotic

components dominated the total reef substrates at 32% of the total reef area. Total live coral cover was relatively fair at 25%. Siltation was observed throughout the reef area and the total live coral distribution was sporadic. Of the 7 coral species identified, 25% were soft corals dominated by *Euphyllia divisa*, and 75% were hard corals dominated by coral species from the family Fungiidae. The species diversity of corals was relatively low which denotes the low species diversity and recruitment of fish species. It is recommended to propose Malanton Islet become a marine sanctuary and establish a coral reef network, participatory coral reef monitoring, and continuous education on marine ecology and responsible aquaculture and fishing technology.

**Keywords:** Ecosystem profile, coastal, line intercept, manta tow, rapid aquatic resource appraisal.

PID 7605

### Trace metal accumulation in and Food Safety of Shark Silky Shark (*Carcharhinus Falciformis*) in the Pelagic Zone of Indian Ocean around Sri Lanka

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**Abstract:** The aim of this study was to assess the fish quality with regard to the levels of mercury (Hg), lead (Pb), cadmium (Cd), arsenic (As), copper (Cu), iron (Fe), and zinc (Zn) contents. The research material was silky sharks (*Carcharhinus falciformis*) muscle tissue collected at two landing sites in Sri Lanka. Minerals and metals were determined using the method of atomic absorption spectrometry (AAS) using a microwave assisted digestion process. A significantly high amount of non-essential metals such as Hg ( $0.804 \pm 0.645$ ), As ( $6.685 \pm 6.882$ ) and Cd ( $0.051 \pm 0.064$ ) mg/kg, wet weight were found in the samples. Zinc ( $4.701 \pm 5.193$  mg/kg, ww) was the highest amount of essential minerals found in the silky sharks followed by iron ( $3.254 \pm 4.343$ ). A 33% and 17% of the examined samples exceeded the permissible limit values in the European Union considering Hg and Cd. However, out of six metals and minerals, silky sharks pose no threat to adults in Sri Lankan. This was indicated by quality indices (THQ and HI) with s below one and the cancer risk factor within the range. However, due to the reported significant excess in the amount of non-essential metals in the sample, a continuous monitoring process is required.

**Keywords:** Heavy metals, target hazard quotient, hazards index, health risk.

PID 8288

### Species Composition, Abundance, and Conservation Status of Macroinvertebrates in Sibuyan Island Romblon Philippines

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**Abstract:** The marine ecosystem of Sibuyan Island is one of the underrated research areas in the Romblon. Most of the researchers' eyes across the country focused on the terrestrial, particularly on Sibuyan Island. Although Sibuyan Island is dubbed as "Galapagos of Asia", studies on its marine biodiversity and utilization of marine resources are scant. Hence, this study was realized. This study assessed the species composition, abundance, diversity, and conservation status of important macrobenthic invertebrates in shallow reefs and seagrass beds surrounding the island. This study was conducted last July to August 2022 in coastal areas of Sibuyan Island. The survey was conducted in three municipalities. Four sites were established where two sites were located in pristine areas and the other two were located in disturbed areas. An English et al. (1997) survey method with 100 meters transects was used. A total of 39 species of macrobenthic invertebrates were identified in the shallow coastal water of Sibuyan Island, Romblon Philippines. All study areas were dominated by sea urchins specifically *Echinometra mathaei* (Blainville, 1825). The majority of the species belonged to IUCN "Not Evaluated" category and the highest species richness was recorded in Magdiwang and Cajidiocan. However, Magdiwang was found to be the most diverse among all areas. In terms of evenness, the highest index across three areas was observed in San Fernando. Meanwhile, the highest dominance index was recorded in Cajidiocan. Based on the findings and conclusions of this study, it is suggested that a follow-up study of macroinvertebrates be conducted on an annual basis. It is recommended that the sampling sites established should be monitored. Intensive follow-up studies, particularly in monitoring the population of *Holothuria scabra* (Jaeger, 1833) is recommended. To provide the necessary recommendations for the sustainability of the Sibuyan Island marine ecosystem, a more detailed study of the entire Island of Sibuyan and careful monitoring are required.

**Keywords:** Diversity, macro-invertebrates, sibuyan Island.

PID 8438

### Molecular Phylogenetics of Family Chaetodontidae Collected in Panay and Guimaras Islands

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**Abstract:** This study presents a molecular phylogeny of the family Chaetodontidae, comprising 13 species from Panay and Guimaras islands, Philippines belonging to five genera (*Parachaetodon*, *Chaetodon*, *Heniochus*, *Chelmon*, and *Coradion*) and an outgroup under the genus *Chaetodontoplus*. Maximum-Likelihood, Neighbor-Joining, and Minimum-Evolution phylogeny have produced a well-supported phylogenetic tree at the species-level, affirming the monophyletic Chaetodontidae. Molecular phylogenetic analysis across all 6 genera has shown 30 - 100% bootstrap levels across all three phylogenetic trees, with Neighbor Joining yielding the highest bootstrap values. The results of this study provided a deeper understanding of the importance and differentiation of molecular, morphological, and meristic taxonomic examination as well as relationships between Chaetodontid species. In a country with a high level of marine fish diversity such as the Philippines, data generated can be used in different biological and ecological investigations that will magnify the importance of Chaetodontids in the ecosystems and industries they support.

**Keywords:** Butterflyfishes, distribution, ecological, phylogenomic, species – level.



PID 8644

## Optimization of Microwave-Assisted Heat Pump Drying Parameters of Vietnamese Black Tiger Shrimp Using Response Surface Methodology

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**Abstract:** This article uses response surface methodology (RSM) to optimize the microwave-assisted heat-pump (HP-MW) drying process of black tiger shrimp to ensure shortened drying time with better quality production. We aim to assess the multi-objective function founded on the technological factors' influence, such as drying time, rehydration ratio, and specific energy consumption. Optimization parameters were air temperature ( $20 \div 40$ )°C, air velocity ( $1 \div 2$ ) m/s, and microwave power ( $100 \div 500$ ) W. The research results show that the optimal drying conditions for the best quality of dried black tiger shrimp and the highest drying productivity are a drying temperature  $t$  of 34.74°C, a drying airspeed  $V$  of 1.87 m/sec, a microwave power MW of 135.78 W and a humidity RH of ( $15 \div 17$ )% with characterized by maximum desirability function (0.993). Furthermore, the experimental results demonstrate the completed product values with the time drying of 13.7 minutes, the rehydration ratio of 2.33, and the specific energy consumption of 3.23. This study would contribute to developing technical capabilities for designing microwave-assisted heat pump dryers applicable to such high-valued foodstuffs.

**Keywords:** Microwave drying, drying black tiger shrimp, response surface.

PID 9048

## Bivalves as Future Source of Sustainable Natural Omega-3 Polyunsaturated Fatty Acids

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**Abstract:** The increasing global population poses a huge challenge to food security, especially in terms of providing adequate sustainable and affordable high quality lipids. This article reviews the sources of natural omega-3 LC-PUFA and identifies the future direction for producing high quality lipids to meet growing market demands. In general, bivalve lipids appear to be a high quality source of lipids that are beneficial to human health regardless of species and habitat. There is also reason to believe that the development of bivalve farming worldwide and selective breeding of bivalves to increase the accumulation of omega-3 LC-PUFA can meeting some, if not all, of the growing demand for omega-3 LC-PUFA. Such information will aid to establish a promising source of high quality natural omega-3 LC-PUFA and ensure that all consumers have access to sufficient omega-3 LC-PUFA at an affordable price to support a healthier and balanced diet.

**Keywords:** LC-PUFA, natural alternative, bivalve, omega-3, omega-6, PUFA, SAFA, aquaculture.

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**Abstract:** As a well-known example of “living fossil”, horseshoe crabs are ecologically significant macroinvertebrates in coastal and estuarine ecosystems. The tri-spine horseshoe crab, *Tachypleus tridentatus*, has been widely utilized for *Tachypleus* Amebocyte Lysate production and food consumption since the 1980s, which led the considerable population declines along the west coast of the Pacific Ocean. The declining horseshoe crab population is expected to have ecological and social impacts. Restocking through captive rearing of juveniles is cited as an important alternative to repopulate the native *T. tridentatus*, which in turn supports sustainable resource utilization and research activities. The hatchery production techniques for this species have gradually developed following the mass culture efforts in Japan since the late 1980s. However, the previous studies have primarily concerned the feed types and husbandry conditions to maximize the growth and survival of the juveniles. Little is known about the practicability and effectiveness of releasing large numbers of hatchery-bred individuals through restocking programs. In this paper, we (1) summarize the available captive breeding and rearing techniques, (2) discuss the release strategies that could improve the survival of released juveniles, and (3) identify the future opportunities and challenges in monitoring, evaluation and management of the released stocks based on the current restocking attempts mostly conducted along the Chinese coast. Considering the increasing anthropogenic stresses in the estuarine environment, we emphasize the dire need for establishing frameworks to support scientifically sound restocking programs for *T. tridentatus*, which require concerted efforts from biologists, resource/habitat managers and local stakeholders.

**Keywords:** Captive rearing, optimal diet, release strategy, size at release, tagging.

# Topic 5

## MARINE INNOVATIONS



PID 268

## Biogeographical Distribution of the Family Teredinidae in the Different Realms of the World

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**Abstract:** Teredinidae is a family of marine bivalve molluscs commonly known as Shipworms from their worm-like appearance and wood-burrowing habits. They are responsible for the fragmentation and breakdown of water-submerged woods, making organic material turnover easier. Shipworms are widely distributed worldwide and have long been known, but limited studies have been conducted concerning their geographic range and distribution. Knowing these species' current distribution and locations is significant because of their destructive capabilities and for providing baseline data for sample collectors of future studies. This study mapped out the biogeographic distribution of 17 total recorded species under the Teredinidae family, which have been mapped according to their presence in the world's biogeographic realms. The IndoMalayan region has recorded 11 present species. This is followed by the Palearctic realm, which recorded 10 species, then the Australasian realm, with 5 species. The Neotropical and Oceania realms had 2 of the same recorded species. However, the Nearctic and Afrotropical realms had 1 species recorded each. Meanwhile, no data was recorded on shipworm presence in the Antarctic region up to this report. *Teredo navalis* was the most dispersed species and have been reported across all the realms. New species were also recorded in the Philippines; *Lithoredo abatanica*, a rock-boring shipworm, while a seagrass burrowing *Zachsis zenkiwitschi* was newly reported in parts of Japan, Malaysia, and Indonesia. The study was also able to identify temperature and salinity as major prevailing abiotic factors found to influence the survival, dispersion, and distribution of the Teredinidae family.

**Keywords:** Teredinidae, biogeographic realm, distribution map, wood-boring, abiotic factor.

PID 360

## Crack Detection Using Pre-Trained Deep Convolutional Neural Network

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**Abstract:** Crack detection is important for ensuring the durability, serviceability, and safety of structures. Machine learning in combination with image processing technology can improve the efficiency and reduce the cost of crack detection. In this paper, we proposed to use a pre-trained Convolutional Neural Network (CNN) model SqueezeNet for surface crack detection of concrete structures. The CNN model extracts features from the image, enabling it to distinguish between cracked and non-cracked images. Adopting a pretrained model instead of starting from scratch reduces the time for learning and increases the probability of correct detection.

**Keywords:** Crack detection, deep learning, Convolutional Neural Network, SqueezeNet.

PID 758

## Investigation on Microplastics in Some Bivalves at Binh Dien Market in Hochiminh City, Vietnam

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**Abstract:** Microplastics (MPs) and their risk to living things and human health have been attained a lot of attention worldwide. Reports on the MPs in mollusks used as seafood are being increased in all continents. However, the information is limited in Vietnam. This study aimed to identify the quantitative presence of MPs in three bivalves (*Anadara granosa*, *Meretrix lyrata*, and *Ensis sp.*) in Hochiminh City which are popularly used as daily seafood by local residents. Samples of the bivalves were bought biweekly from the wholesale market Binh Dien, Hochiminh City, from February to April 2022. All three bivalve species were found with fiber MPs in their tissues. The concentrations of MPs (mean  $\pm$  standard deviation) were  $8.9 \pm 5.4$  items/individual (idv), and  $4.2 \pm 3.2$  items/gram wet weight (g ww) in the *A. granosa*;  $6.4 \pm 2.6$  items/idv, and  $1.1 \pm 0.4$  items/g ww in the *M. lyrata*; and  $5.9 \pm 2.8$  items/idv, and  $0.7 \pm 0.3$  items/g ww in the *Ensis sp.* The shorter length the fiber MPs were, the higher concentration they were, in the samples. Eight different colors of MPs in the bivalves were observed including blue, black, red, yellow, green, white, pink and grey in which the blue color was dominant in the samples. Chemical analysis with the fourier transform infrared microspectroscope revealed that 50% of fibers were polyethylene terephthalate (PET), polyethylene (PE) and rayon. This study firstly reported the MPs in the *Ensis sp.* and the *A. granosa* (as items/g ww). The total fiber intake from the three bivalve consumption was approximately 3,992 items per person per year. The presence of MPs in the bivalves used as food in Hochiminh City possesses a health risk to local people who commonly consume them as daily food. Further insight studies on the effects of MPs from food on human health in Hochiminh City are suggested.

**Keywords:** Bivalves, fiber, blue color, polymers, health risk.

PID 954

## Impact of Corporate Culture on Product Innovation Capacity: Evidence of Vietnam Maritime Bank

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**Abstract:** The purpose of this study is to examine the impact of Maritime bank's corporate culture on its product innovation in Vietnam. The empirical results from analysis of data collected from 268 respondents point out that corporate culture has significant effects on Vietnam Maritime bank's product innovation through two factors which are innovative culture and leadership. The study's results are expected to help Maritime bank managers use direct efforts and resources in the most effective and efficient way to encourage bank's product innovation to improve their business in the long run.

**Keywords:** Product innovation, knowledge absorption, maritime bank.



PID 1227

## Benthic Habitat Mapping and Bathymetry Retrieval in The Shallow Water of Cham Island, Vietnam

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**Abstract:** Coral reef ecosystems are under enormous pressure from human use and global climate change, particularly in the nearshore region. Cu Lao Cham island and its surrounding water is a highly biodiverse marine area, it is home to 290 coral species together 370 species of underwater plant life, and nearly 280 reef fish species. Human activities like indiscriminate fishery and excessive tourism activities have had a great impact on these coral reefs. Thereby breaking the structure of marine ecosystems, leading to a decline in the number and types of aquatic and marine products. Therefore, high spatial resolution benthic habitat information is essential for coral reef protection and management in Cham Island. Planet Scope (PS) with very high spatial resolution (3 m) and temporal resolution (almost daily) can provide an ideal system for benthic habitat and seagrass mapping. In our study, several algorithms were applied with PS to provide bathymetry estimation, bottom reflectance retrieval, and per-pixel classification algorithms (Vector Machine – SVM, and Random Forest – RF) to identify different benthic compositions in the shallow water of Cham Island. The field measurements were used to validate classification results. Our results illustrate the benefit of using the bottom reflectance to discriminate the benthic features, with overall accuracy of 90.95% with SVM, and 90.55% with RF.

**Keywords:** Planet Scope, coral reef, bathymetry, shallow.

PID 2921

## Numerical Study on Cavitation Reduction Using Pressurepores Technology

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**Abstract:** The requirements in marine propeller design are rising in quantity and quality in recent decades. Besides hydrodynamic performance demand, the targets in reducing propeller cavitation and its side effects need to be considered such as underwater radiated noise and pressure pulses, to ensure comfort requirements and environmental regulations. Using numerical simulation, the present paper investigates the reduction of propeller tip vortex cavitation (TVC) as well as the effects on its performance by employing PressurePores technology. This study uses the Potsdam Propeller Test Case (PPTC) model with commercial code STAR CCM+. The CFD results are compared with the test results in the cavitation tunnel to validate the reliability of numerical simulation. In addition, cavitation mitigation of the propeller is estimated and an obtained average performance degradation is only 2% for different cases, in terms of pore diameters and drilling methods (cylindrical pore and conus pore). This research also provides the changes in pressure distribution, turbulent viscosity, and vorticity around the propeller to clarify the reason for cavitation reduction together with the hydrodynamic efficiency degradation of the propeller.

**Keywords:** Numerical simulation, PressurePores, Propeller efficiency, TVC reduction.

PID 3011

## Time Dependent Outcomes After Different First-Aid Approaches in Life Threatening Chirodropid Sting Assay Models

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**Abstract:** Stings from jellyfish are one of the most common causes of marine injuries all around the world. Box Jellyfish (Phylum Cnidaria, Class Cubozoa) venom contains fast-acting proteins called porins. When its tentacles come in contact with the human skin, venom is injected deep into the tissue and can cause severe injury or even death within minutes. Lethal species of box jellyfish are seasonally abundant in certain coastal areas of the Philippines and represent a serious a public health threat. This study examines the effectiveness of the different first-aid interventions on live-tentacle stings from locally prevalent Chirodropid species (order Chirodropidae, Class Cubozoa) using the in vitro sting models: tentacle skin blood agar assay (TSBAA), tentacle blood agar assay (TBAA), and a tentacle pig skin assay (TPSA), in a timedependent manner. The researchers used Adobe Lightroom and ImageJ for the image processing of the collected data. The results show that the least amount of visible damage after live-tentacle stings in the TPSA occurred when the first aid comprised the application of StingNoMore® spray, StingNoMore® cream, or the sequential application of both. The second most effective first aid was the application of 45°C for 45 minutes. Significantly less hemolysis occurred in hot pack treated TBAA versus control. Conversely, application of ice packs temporarily delayed hemolysis, but then profoundly increased hemolysis with a dramatically higher and sustained venom activity for over 7 hours. Taken together, the data demonstrate that rapid evidence based first aid is essential for optimal outcomes and that tissue damage continues for over 12 hours, if no-, or deleterious- interventions are used.

**Keywords:** Box jellyfish sting, chirodropid, first-aid, time response, blood agar, model sting assays.

PID 3239

## Numerical Investigation on The Performance of Two Elliptical Solar Stills

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**Abstract:** Freshwater distillation using renewable energy is vital for remote and inaccessible areas, and islands. In these regions, freshwater and availability of high-grade energy are limited. Hence solar energy is feasible to evaporate water in seawater. In this study, solar stills with elliptical shell were investigated to determine water production and sustainability in terms of entropy production. The elliptical shell is oriented vertically or horizontally. Two-dimensional numerical simulation with laminar fluid flow and species transport model were conducted to the solar stills, and their performance compared with a circular shell solar still. Results showed that the circular still yielded the highest production. But the configuration exhibited larger entropy

generation than that of horizontal elliptical shell. The vertical shell indicated the smallest hourly yield and the biggest exergy destruction. This is because the small cross-sectional area of the vertical shell contributed to high temperature and vapor mass fraction inside the distillation chamber. Therefore, the performance of the vertical elliptical solar distiller is minimum. Water production and entropy production of circular, horizontal, vertical elliptical shells are respectively 0.81, 0.78, 0.77 kg/(hr.m<sup>2</sup>) and 0.61, 0.57, 0.62 W/(m<sup>3</sup>.K). Diffusive entropy generation earned the largest portion followed by thermal entropy generation and frictional entropy generation. The largest local volumetric entropy generation was observed at the peak of the shell and two sides of the water surface.

**Keywords:** Entropy generation, marine distillation, mass transfer, remote island, species transport.

**PID 3297**

### **Study on Bio-Inspired Hydrofoils to Reduce Cavitation and Induced Noise Emission**

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**Abstract:** This study investigated the adaptive geometry of leading-edge protuberances for controlling cavitation and induced noise in fluid flow. Two wavelengths of 12.5% and 25%, together with 2% and 4% amplitudes of the mean chord length, were used to characterize the geometries of these sinusoidal leading-edge modifications. Results showed that the cavity inception on the modified hydrofoils earlier (with a low Reynolds number "Re" and a higher cavitation number " $\sigma$ ") than the baseline and cavitation was mostly confined to the regions directly below the protuberance troughs. Cavitation can be decreased by up to 60% under certain conditions. Analysis of sound pressure level (SPL) and quantitative image processing revealed that the flow over A02L250 had the maximum cavitation reduction, and A02L125 had the best noise reduction performance. The comparison of cavitating flow patterns and SPL between baseline and modified hydrofoils shows the potential applicability of this passive flow control technology.

**Keywords:** Cavitation, Protuberance, Humpback Whale, Cavitation-Induced Noise, Sound Pressure Level.

**PID 3337**

### **Design of a Robotic Arm Control System with 06 DOF Applied in Ship Hull Welding by PLC S7.1200**

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**Abstract:** The paper is about the design of a robotic arm control system with 06 DOF applied in ship hull welding by PLC S7.1200 and HMI teaching arm. The robot is responsible for welding the joints that need to be welded among the hull pieces. On the basis of the theory of solving kinematic problems and dynamic problems (kinetic energy, potential energy, moment of inertia and differential equations of motion), the robot controlling system is designed on Python software and connects with PLC S7-1200 via S7.net virtual library. It helps control the working trajectory through flexible control of 6 motors and control soldering iron Mig to weld the joints at the end of the operation. The control system restores the entire control system for the robotic arm, which can be applied to extend to similar 6 DOS robotic arms as well as directly improve the hull welding

productivity in the manufacturing industry with simple operation to help workers completely master the technology.

**Keywords:** Robot arm, robot 6 DOF, controller PLC S7.1200.

**PID 3512**

### **Fisherfolks Needs, Issues, And Profile: Contributions to Local Development Socio-Economic Initiatives**

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**Abstract:** This study identified the requirements, issues, and characteristics of the fishermen in San Antonio, Northern Samar. The socio-demographic characteristics of the respondents were carefully documented. The socio-economic issues that the fishermen in San Antonio, Northern Samar encountered were also discovered, as were the requirements of the fishermen in their fishing operation and finally the government's initiatives for local socioeconomic development. The descriptive- survey research design was utilized to collect data necessary for the investigation, and the survey questionnaire was used as the tool. The study's key findings were as follows: As to the profile of the respondents, majority were thirty-one to forty-five years old, males, married, composed of four to six family members, had an income of one thousand to five thousand a month; were working ten years and more as fishermen, and had other financial sources. According to their demographics, the respondents were mostly male, between the ages of thirty-one and forty-five, married, with four to six family members, earning between one thousand to five thousand per month, working as fishermen for 10 years or more, and having other sources of income. The socio-economic problems experienced by the fishermen had moderate impact. Ten (10) needs for fishermen were identified, including the following: (1) availability of Bantay-Dagat to reduce offenders; (2) additional fishing equipment; (3) alternative livelihoods; (4) fishing gears; (5) local government unit fishery program; (6) ordinances for fishery regulation; (7) financial assistance; (8) technology transfer or fishery management training; (9) aquaculture, materials, and seedlings; and (10) permanent fishery contacts to do business from local fisher people. Three government measures in total for the local socioeconomic development are as follows: (1) strict and consistent enforcement of rules, (2) levying fines or fees on offenders, and (3) providing legal services and gear for fishermen.

**Keywords:** Fisherfolks, livelihood, fishery, aquaculture, technology transfer.

**PID 3524**

### **An Improvement on the Application of Association Rules in Predicting National High School Admission Scores**

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**Abstract:** The paper discusses how the traditional method of association rule mining based on user-defined minimum support and confidence can result in either too many or too few association rules. This could lead to valuable information being missed or redundant rules being generated, which is not practical and can be costly to implement. The paper proposes an improvement of DARIT algorithm to mine association rules without redundancy and applies it to

data from previous years of National High School Exams. The goal is to use the results to build an admissions counseling system that can help students increase their chances of being admitted to universities based on their exam results.

**Keywords:** Data mining, Association rule, Missing value, DARIT, consulting system.

**PID 3794**

## **Modeling and Experimental Studies on the Efficacy of Anchored GeoTubes for Coastal Protection**

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**Abstract:** The paper describes the Modeling and Experimental Studies on the Efficacy of using GeoTubes as coastal protection lining strengthened with Anchors in the form of Sheet Piles or Precast RCC Piles encased in PVC pipes and connected through hinged supports with the geotubes at ground level to enhance Energy Dissipation during wave attacks.

Geotubes serve as containers for deadweight against the waves. Their deadweight is derived from infill using boulders as in Breakwaters. Geotubes being permeable, allow free but slow and safe flow of water across the cross section thereby avoiding rupture during the wave attack.

To add to the stability, Anchor Piles in the form of Sheet Piles or Precast RCC Piles encased in PVC pipes are installed along the sea shore pinned under the length of the geotubes. The piles are either vertical or inclined or provided in both ways as per the wave profiles and the local geomorphology. The number, depth and dimensions of the anchor piles are designed similar to Pile Groups designed for structures along hill slopes vulnerable to landslides.

The geotubes filled with rockfill maximize the dead weight but particle sizes are graded to maximize free cross seepage of sea water so as to optimize energy dissipation and thereby minimize the strain and damages to the geotube set-up. The Anchor Piles in singles or in group provide the stability against sliding. The hinged supports connecting the Pile(s) with the base of the Geotube relieves the resultant stresses developed during wave attack.

The use of this flexible hinged system proves to be of high efficiency in energy absorption and dissipation, The cost economics of creating and installing this composite system is far cheaper when compared with the conventional sea wall. The modularity of this composite system can be realised easily both in the design and construction stages. Another inherent advantage of the above system is its easy reparability. Any damages due to overloading or due to sabotage can be easily repaired at a very short notice.

The best natural advantage is that, a firm base is laid for natural growth of vegetation which will gradually develop into a full fledged mangrove belt along the shore giving maximum protection from the vagaries of sea waves. The paper describes the various parameters qualitatively and quantitatively through modeling and experimental studies.

**Keywords:** Coastal protection, energy dissipation, erosion, geotube, anchor piles.



PID 3933

## Species Composition of Macromolluscs in Barangay Talaotalao, Lucena, Quezon Province, Philippines

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**Abstract:** Degradation of upland vegetation and the continuous environmental insults on coastal ecosystems negatively impact the inhabiting molluscs. In particular, macromolluscs present in the intertidal zones of coastal communities in the Philippines are directly affected by human activities and the fast-changing climate. However, a limited number of studies have investigated global warming and its effect on the composition of the Philippines' intertidal molluscs. This study assessed the species composition of macromolluscs in Lucena, Quezon, and the underlying ecological parameters, pH, salinity, and temperature that dictate the presence and abundance of these marine animals. To address these concerns, handpicking and purposive sampling of marine molluscs were conducted, and the various physicochemical parameters of the area were taken. This study reported 62 different species at the intertidal zones of Lucena, Quezon, with species originating from the family Strombidae being the most abundant organism in the area. Analysis of ecological parameters showed a positive correlation between an increase in species composition with the increase in water temperature, while a negative correlation between a decrease in salinity and an increase in pH may suggest that, as ecological parameters diverge from the optimal range, the species abundance proportionally decreases. Together, these findings suggest a high species composition and abundance of macromolluscs inhabiting the intertidal zone of the Lucena, Quezon, highlighting the drastic effects of changing marine ecosystem to the ability of various species to occupy a specific area in the marine environment.

**Keywords:** Macromollusk, Climate change, Global warming, Species composition, Ecosystem.

PID 4274

## A Short Review of Marine Renewable Energy: Generation, Storage, and Applications

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**Abstract:** Renewable energy is a sustainable and green energy converted from renewable energy resources in the nature. There is a huge amount of renewable energy resources in the ocean that can be changed into useful energy like electricity, store for long time use, or apply in the daily energy consumption. These marine renewable energies (MRE) include wave energy, ocean thermal energy, tidal energy, ocean current energy, salinity gradient energy, and offshore energy. With a big area, the oceans have been prospected that it brings endless renewable energy sources for social development and human demand. The renewable ocean energy shows many advantages of sustainable energy, clean energy, and non-carbon dioxide emissions by generating from wave and water in the ocean with an enormous amount of natural energy resources. The MRE can service at many areas of off-shore, on-shore, and remote areas where need energy to drive daily living demands. The MRE reveals some disadvantages such as the influence of daily, monthly,

season, and period of time. The solutions have been developed to solve the limitations of the MRE such as developing the storage method to store energy for long time use or making the balance of the output performance to improve quality of the renewable energy. The MRE has also received many concerns from countries by promulgating policies, strategies, and plans to develop the renewable ocean energy such as green economy development, blue economy strategy, carbon dioxide emission reduction, and encouragement of using marine renewable energy. This paper reviews current marine renewable energy with its generation, storage, and application. The work also mentioned some advantages, disadvantage, policies, strategies, and solutions to encourage the development of the renewable ocean energy in over the world. The results hope that it will be spread development, exploitation, and application of marine renewable energy in the near future.

**Keywords:** Marine renewable energy, energy storage, generation, application, sustainable energy.

**PID 4395**

### **Watercraft Tracking and Monitoring System Towards Safe and Resilient Marine Communication System**

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**Abstract:** In this research, a watercraft tracking and monitoring tracking system is proposed and designed to monitor the watercraft, and sea conditions to provide a safer and more resilient marine communication system. The proposed method puts together an application of contemporary technology using the fused location provider API to retrieve the device's current location. In addition to managing the underlying location technologies, like GPS and WiFi, the fused location provider offers a straightforward API that you may use to specify the desired level of service. The work includes calibrating the compass, GPS, and Global System for Mobile Communication (GSM) for vehicle tracking and monitoring using Android sensors of mobile phones. The GPS provides the present site of the watercraft; GPRS sends the tracking information to the server and thus an alert message generated is transmitted to the registered monitoring systems. This scheme is deployed in the watercraft to monitor location and sea conditions, which are to be determined on the web page and supervised in real-time. Hence, if the watercraft is at a critical level, alert messages will be sent to the monitoring system, and the registered mobile phone number of the watercraft, also the warning display and sound are produced by the device. These could be recommended for use onboard a watercraft throughout the country for the effective management and monitoring of the performance of such watercraft, and low-cost instrumentation as a stand-alone system through modern technologies.

**Keywords:** Marine communication system, monitoring system, tracking system, SEAWAVES tracking and monitoring system.

**PID 5384**

### **First Aid Practices and Self-Reported Cases of Box Jellyfish Sting Injuries in the Selected Coastal Communities in the Philippines**

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**Abstract:** Box jellyfish envenomations in numerous coastal regions of the Philippines result in serious injuries and deaths, with profound seasonal- and locality specific- public health impacts. However, systematic reporting has not been practiced and records of serious injuries and deaths due to box jellyfish envenomation in the Philippines are scarce. This cross-sectional survey research assessed the awareness, attitudes, and practices of the residents in the coastal communities in the provinces of Masbate, Mindoro, and Zambales, the Philippines. It also determined the number of sting injuries that occurred in the community through self-reporting of incidence. An online survey link (Google Form) was sent to the intended residents of the coastal communities. A total of 492 respondents (male = 43.90%; female = 54.07%; did not disclose = 2.24%) completed the survey, from which 154 (31.30%) self-reported incidence of box jellyfish sting injuries. The logistic regression model shows that 6 of 27 socio-demographic qualities are protective factors for box jellyfish sting injuries, while 5 of 27 are considered risk factors. These factors are salient data in formulating community-based intervention strategies in addressing this public health issue.

**Keywords:** Box jellyfish, public health, first aid treatment, marine-related injuries.

**PID 6219**

**Innovative Approaches for Sustainable Marine Ecosystem  
Conservation and Pollution Mitigation in the Philippines: A  
Comprehensive Analysis of Technological and Policy Innovations**

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**Abstract:** The marine ecosystem is one of the most important natural resources that provide food, income, and livelihood to millions of people worldwide. In the Philippines, marine resources play a significant role in the economy, with the fishing industry alone providing jobs to more than a million people. However, the exploitation of these resources has led to numerous environmental problems such as pollution, overfishing, and habitat destruction, which have detrimental effects on the ecosystem's health and productivity. This review paper aims to provide an overview of innovative approaches that have been developed in the Philippines to address these environmental issues. These approaches include technological innovations such as ocean monitoring systems, marine robotics, and bioremediation, as well as policy innovations such as the establishment of marine protected areas, the implementation of sustainable fishing practices, and the reduction of plastic waste. The paper highlights the importance of collaboration between stakeholders, including government agencies, non-government organizations, and local communities, in the development and implementation of these approaches. Furthermore, the paper stresses the need for continuous monitoring and evaluation of these innovations to ensure their effectiveness and sustainability. In conclusion, this review paper provides valuable insights into the innovative approaches that have been developed in the Philippines to address environmental issues in the marine ecosystem. These approaches offer potential solutions that could be applied in other regions of the world, where similar environmental problems exist.

**Keywords:** Marine ecosystem, pollution, sustainable conservation, technological innovations, policy innovations.

PID 6350

**An IoT Solution Designed for A Remote Supervisory to Operating Parameters of An Electric Generator – Internal Combustion Engine Set and Gottwald Crane at Cam Ranh International Seaport in Vietnam**

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**Abstract:** Cam Ranh international seaport is becoming a leading multi-purpose seaport operator in the South Central Coast region, Vietnam. It is offering the first-class quality of maritime, tourism and logistics services that bring in effectiveness and highest interest for customers. However, most of systems such as electric generator - internal combustion engine set, crane, etc. in Cam Ranh seaport do not have any remote supervisory systems. The operators have to stand near the equipment to supervise its operating parameters by their eyes on site at Cam Ranh seaport, which have caused many issues and challenges such as low performance, wasting too much time, high cost, and easy to get mistake. This paper designs a remote supervisory system for an electric generator - internal combustion engine set (DSEGenSet) of Deep Sea Electronics Company, and GOTTWALD crane based on LoraWAN. The data will be read from the DSEGenSet electronics control unit, and PLC S7-1500, and sent to a local server, about 500 meters far from there, through Lora devices before being sent to a cloud server. The data will be also processed and shown on a smartphone/tablet of operators through internet. The design will be implemented and tested before being applied to similar systems in Cam Ranh seaport.

**Keywords:** IoT, Gottwald crane, remote supervisory, Cam Ranh international seaport, etc.

PID 6533

**Environmental Pollution Along the Coast of Binh Thuan Province, Caused by the Discharge of Wastewater into the Main River Basins from the Mainland**

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**Abstract:** Socio-economic activities of Binh Thuan province are associated with rivers flowing through districts, towns, and cities in this province. Along with the strong socioeconomic development, seven river basins have to receive a large amount of wastewater from industrial parks, livestock farms and urban areas as well, these are the main sources that lead to coastal water pollution. For the purpose of both economic growth and environmental protection in coastal areas, the study used survey methods to collect data on socio-economic activities and waste discharge activities from the mainland. In addition, the study also conducted statistical processing of monitoring data and predictive analytics for forecasting water quality. The results have shown that environmental pollution in the coastal area of Binh Thuan province originates from the discharge of wastewater from the mainland. Furthermore, this study contributed to proposing solutions being able to prevent and protect the coastal environment effectively.

**Keywords:** Binh Thuan, coastal water environment, discharge, main river basin.

PID 6539

## Comparative Cnidome Composition of Indo-Pacific Chirodropid Species

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**Abstract:** Cnidarians in Class Cubozoa, “box jellyfish”, belonging to the order Chirodropida, account for the highest number of serious- and lethal- marine stings each year in the Indo-Pacific. The specific types of discharging stinging capsules, called cnidae, that pack the surfaces of the tentacles comprise the “cnidome”. The cnidome is generally species-specific but may also be affected by prey availability and jellyfish maturity. The cnidome is the precise set of cnidae types, akin to an arsenal of different types of weaponry, by which cnidarians feed and defend themselves. Thus, once established, analyzing and documenting the specific types of cnidae found packing the tentacle surface can be used like a “fingerprint”. For this reason, sticky tape lifts of sting sites can be used to identify the stinging organism by comparing the cnidae transferred to the skin during a sting with known cnidomes. In this study, live tentacles of Chirodropids and isolated cnidae were qualitatively and quantitatively analyzed using light microscopy to identify the different cnidae types comprising the cnidomes of known lethal Chirodropids from Indo-Pacific countries: Thailand, Indonesia, and the Philippines. Mastigophores and other nematocyst types were identified. The cnidome of the Philippine samples were most diverse. Small glutinant cnidae structurally comparable to anemone ptychocyts were also observed. This remarkable observation may underlie the notorious “sticky” nature of chirodropid tentacles after a sting.

**Keywords:** Chirodropida, cnidae, cnidome, cubozoan, indo-pacific.

PID 7082

## State Management of Sustainable Tourism in Khanh Hoa Province

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**Abstract:** This paper examines the sustainable state management of tourism in Khanh Hoa province, Vietnam. The study aims to analyze the various strategies and approaches the government employs to ensure sustainable regional tourism development. The research methodology involves a comprehensive review of existing literature, government policies, and case studies related to sustainable tourism management. The findings highlight the key initiatives the state authorities undertake in Khanh Hoa, including promoting environmental conservation, community engagement, infrastructure development, and tourism diversification. The study concludes that sustainable tourism management in Khanh Hoa province is crucial for preserving natural and cultural resources, improving local livelihoods, and ensuring long-term economic growth. However, challenges such as balancing economic interests and environmental preservation, stakeholder collaboration, and capacity building remain significant areas of concern. The paper suggests the need for continued policy implementation, monitoring, and evaluation efforts to achieve sustainable tourism in the province. The research contributes to understanding sustainable tourism practices and provides insights for policymakers, tourism practitioners, and researchers in the field.

**Keywords:** Sustainable state management, Khanh Hoa Province, sustainable tourism, policymakers.



PID 7876

## Evaluate and Propose Solutions for Sustainable Development of Water Resources in Coastal Areas of Binh Thuan Province, Vietnam

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**Abstract:** Binh Thuan province has a coastline of about 192 km, the coastline connecting with the surrounding space to create the coastal ecosystem. This is an important area for the socioeconomic development of Binh Thuan province. However, in the process of development, some existing problems have been revealed, limiting the manifestation of unsustainability, especially the use of water resources. Research results show that, at present, Binh Thuan province has 188 mining and mineral processing enterprises, which not only consumes a lot of water but also pollutes the environment and exhausts water resources of Binh Thuan province. In order to reduce water shortage in Binh Thuan province, it is necessary to have specific and strict solutions to improve water efficiency. On the basis of monitoring data and the help of Seawat model, the study has determined coastal water reserves of Binh Thuan province, thereby determining the amount of water to be safely exploited. These data have been integrated with the RCP4.5 scenario and forecast for the years 2030, 2060 and 2090. From there, we propose some solutions to overcome water shortage, serving sustainable development. coastal water resources of Binh Thuan province.

**Keywords:** Aquifers, Binh Thuan Province, Propose solution, Water resources, Water shortages.

PID 8156

## Time Interval and Histopathological Analysis of Philippine and Hawaiian Cubozoan Jellyfish Stings on Porcine Model Assay

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**Abstract:** Box jellyfish stings result in the injection of complex venom constituents deep into the skin; stings can cause localized pain, tissue damage and necrosis, and systemic outcomes, including death. Despite the threat, standardized first-aids are not established in local communities due to the lack of useful experimental models to test various first-aid approaches. After applying a live tentacle, this study compared the outcomes of different approaches to no treatment in an excised skin model. Specifically, various currently utilized first aid approaches were tested, including StingNoMore® Spray followed by StingNoMore® Cream, hot and cold packs, salt water, vinegar, and gasoline. These were applied onto freshly obtained pigskin after a sting from either Chirodropida tentacles or Carybdeida tentacles. Outcomes were scored semiquantitatively. Scores are compared in relation to time and statistically analyzed. Live piglets were also stung with live tentacles of *Alatina alata*, a Carybdeida. Treatment outcomes of these stings were also compared after various approaches, including 0.9% NaCl, ice, and StingNoMore®

Spray and Cream. The outcomes were statistically compared through histopathological analysis in relation to the parameters (dermal edema, vascular congestion, keratinocyte vacuolation, edematous stratum corneum, and vasodilation). Results showed the profound deleterious effect of applying gasoline to pigskin. Applying saline, followed by a 45minute exposure to ice, also worsened tissue damage. While StingNoMore® products showed remarkable efficacy ( $p=0.34$ ,  $p>0.01$ ). The relationship between the duration of a sting is directly proportional to its damage or degradation as time progresses. This study provides profound knowledge on comparing treatments and illustrates the lethality of spontaneous stinging of box jellyfish on human skin.

**Keywords:** Box Jellyfish, cubozoan, porcine bioassay, first aid, histopathology, time interval.

**PID 9829**

## **Design and Development of a UAV-based System for Marine Patrol and Emergency Search**

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**Abstract:** This paper presents an unmanned aerial vehicle (UAV)-based system for innovative marine applications. This system is responsible for automatic patrol and emergency searches. The UAV is integrated with the Internet of Things (IoT) and a satellite map database to transform a typical flying device into a smart one. We apply an optimization algorithm in this system to improve the emergency search procedure. Extensive simulations, and experiments, have been performed to demonstrate the performance of the designed system. The advantages are simplified not only search and patrol processes but also satisfying the demand for searching time minimization.

**Keywords:** marine innovation, unmanned aerial vehicles, drone, marine patrol, emergency search, satellite map, IoT.

## Special Session 01

### **THE UK-VIETNAM WORKSHOP ON A Shared Heritage of Sustainable University – Industry Links, Impactful Research, Digital Education and Academic Mobility (iRDAM)**



OR1

Activities and Potential Opportunities of British Councils in Vietnam

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**Abstract:** This presentation focuses on the principles that underpin sustainable development of university and industry and in particular, by looking back to identify the key pillars, looking at the current situation to see the changes that are gradually taking place, and looking forward to be better prepared for the immediate future so that the partnerships that have been formed will continue to be strengthened while creating new partnerships in order to make it a win-win situation for all the stakeholders. What has been happening over the years is that countries which were considered as developing countries have now become either fully developed countries or at least in the verge of becoming one. Cardiff University as a Russell Group university has a wealth of experience working with various countries across the globe including Asia all of which will be covered in the first part of the presentation. In the second part, some case studies will be presented to share good practice with other universities and industries so that they too can develop sustainable partnerships.

**Keywords:** Cardiff University, sustainable development, sustainable partnerships.

OR2

Impact Rankings and Integration of Principles of Sustainability and United Nations' Sustainable Development Goals into Study Programmes in Higher Education Institutions

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**Abstract:** The United Nations' Sustainable Development Goals (SDGs) are a set of 17 interconnected global goals, to address the world's most pressing social, economic, and environmental challenges by 2030. These goals recognize the interconnectedness of various global challenges and provide a comprehensive framework for governments, organizations, and individuals to work together towards a more sustainable and equitable future for all. The Impact Rankings, developed by Times Higher Education (THE), assess Higher Education Institutions (HEIs) worldwide based on their contributions to SDGs; it aims to measure HEI's social and environmental impact and their efforts in addressing global challenges, to showcase their commitment to sustainability and social impact, as well as to encourage collaboration and knowledge sharing among HEIs.

This presentation summarises the key points of SDGs and Impact Rankings, and the discussions about how to develop study programmes for both undergraduate and post-graduate study levels, especially the digital learning and teaching materials for stimulating the transnational educations (TNE) between the UK and ASEAN, in which the principles of sustainability and SDGs are

integrated into the study programmes, including the methodologies of Sustainable Design or Eco-Design and Sustainable Manufacturing, taking into account the emerging topics of Design Thinking, Innovative Product Development, Employability, Inclusivity, Equality and Global Challenges.

As a part of the collaborative project funded by British Council to commemorate 50 years of UK – Vietnamese diplomatic relations and 30 years of the British Council's presence in Viet Nam, to reflect on the past, present, and future bilateral relationship between the UK and Vietnam, the presentation also aims to stimulate the fruitful TNE partnerships, to share expertise, knowledge and experiences of Impact Rankings and SDGs, and finally to provide a proposed framework, roadmap and platform for HEIs and policymakers to address global challenges and contribute to creating a more sustainable future.

**Keywords:** United Nations' Sustainable Development Goals, Impact Ranking, British Council.

**OR3**

### **A Framework and Strategy for University Ranking and Performance Improvement**

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**Abstract:** University rankings are influential assessments that rank and compare higher education institutions based on various criteria, associated with quality education and research excellence, as well as academic reputation of higher education institutions (HEIs). There have been emerging needs and interests regarding university rankings, especially their influences on funding decisions, research collaborations, employer perception and student's decision-making process when selecting study programmes, as well as impacts on higher education policies and strategies; and they serve as a guideline for HEIs to assess their performance and progress. This presentation summarises and discusses about university rankings, with a proposed framework and strategy for improving the university ranking and performance, focusing on the shared experiences and specific cases at Hung Yen University of Technology and Education, Hung Yen, Vietnam. As a part of the collaborative project funded by British Council to commemorate 50 years of UK – Vietnamese diplomatic relations and 30 years of the British Council's presence in Viet Nam, to reflect on the past, present, and future bilateral relationship between the UK and Vietnam, the presentation also aims to stimulate the fruitful transnational education partnerships between the UK and Vietnam, to address global challenges in higher education and research, and contribute to creating a more sustainable future, taking into account the United Nation's sustainable goals, especially Goal 14 (Quality Education) and Goal 17 (Partnerships to achieve the Goal).

**Keywords:** University ranking, performance improvement, higher education, sustainable development goals, British Council.



OR4

## Research for Sustainable Development at University of Science and Technology of Hanoi

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**Abstract:** The University of Science and Technology of Hanoi (USTH) was established in 2009 within the framework of the intergovernmental agreement between Vietnam and France. USTH has the mission to become a research-oriented university offering excellent research to serve the development of Vietnam. USTH receives strong support from the Vietnam Academy of Science and Technology, the leading research organization in Vietnam, as well as from the USTH-consortium, an association assembling more than 30 universities and research institutions in France.

As decided in its strategic development plan (2022-2030 development plan), USTH is structuring its research in excellent pillars which all have the same goals, namely supporting the sustainable development of Vietnam. In realizing its ambitions, USTH will not only limit its cooperation with sister research institutes inside the Vietnam Academy of Science and Technology, with French partners but also actively look for fruitful cooperation with other domestic and international partners.

In this presentation, we will first describe our research organization with emphasis on three excellent pillars: Health-Care-Science, Sustainable Energy, and Environment-Climate Change. We will then share a few success stories on mobilizing efforts from USTH, VAST research institutes and French partners to tackle challenging issues with rather limited resources.

**Keywords:** The University of Science and Technology of Hanoi, sustainable development.

OR5

## Academic Mobility and Internships: A Shared Experience and Framework for Enhancing Student Employability and Professional Skills as well as Promoting Inclusivity and Diversity in Higher Education

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**Abstract:** Academic mobility and student internships are two important aspects of educational and professional development that provide students with valuable opportunities to enhance the professional skills, practical experience and employability. Academic mobility promotes cultural exchange, international collaboration, inclusivity and diversity, and acquisition of new knowledge and perspectives. Under the impacts of Industry 4.0, engineering and science students have been facing emerging challenges such as skill gaps, lack of industrial and work experiences, global competitions and job market dynamics. Student internships and industrial placements have been considered as effective solutions for significantly improving professional skills and personal experiences, to allow students to apply their academic knowledge and skills in real-world settings, to gain hands-on experience and improve backgrounds in their chosen field of study. This

presentation summarises the key points about academic mobility and internships, with a shared experience and framework for enhancing student employability and professional skills as well as promoting inclusivity and diversity in higher education, with a focus on the student internship platform at Hanoi University of Science and Technology, Vietnam. The presentation also aims to stimulate the fruitful transnational education partnerships, especially between the UK and Vietnam, to address global challenges and opportunities in higher education.

**Keywords:** Academic mobility, internships, industrial placement, inclusivity, diversity, higher education, Industry 4.0, British Council.

## **OR6      Development of Cellulose from Agricultural Waste for Water Treatment**

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**Abstract:** The increase in antibiotics in wastewater threatens human health and the environment. Semiconductor inorganic quantum dots, such as ZnS-capped CdSe and  $(\text{ZnS})_x(\text{CuInS}_2)_{1-x}/\text{ZnS}$  (core/shell) exhibit the light adsorption ability in both UV and visible regions and photoluminescence in visible regions. This distinctive property of quantum dots allows it to be used in photocatalytic reactions. However, these inorganic quantum dots pose a significant risk to living bodies and create hazardous immune reactions. They can cause secondary pollutants when entering water bodies, so their applications in water treatment are limited. Therefore, the use of biomass-derived carbon dots is investigated. Biomass-derived carbon dots are biocompatible materials, so they are suitable for wastewater treatment. However, the small size of carbon dots limits its direct application since it is difficult to retain the dots. This study uses aerogel prepared from biomass-derived graphene oxide and cellulose as a 3D structure to embed carbon dots. Cellulose was prepared from barley straw, while graphene oxide was synthesized from graphitic walnut shell carbon. The ability to use carbon dots to remove and degrade antibiotics will be explored. The porosity and functional groups of carbon dots aerogel will be examined to understand the reaction mechanisms, and they will be compared with results in the literature.

**Keywords:** Aerogel, antibiotic, carbon dots, graphene oxide.

## **OR7      Sporegen and Its Collaborative Activities in Vietnam**

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**Abstract:** SporeGen is a small biotech company founded in 2012 as a start up at the Royal Holloway University of London, UK. Since 2019 SporeGen has operated independently with labs at the London Bioscience Innovation Centre in central London.

The company's mission is to develop novel applications using bacterial spores. Currently, Sporegen has nine active licenses for innovative strains of *Bacillus* including a prophylactic medical food with Novozymes. This includes strains of *Bacillus* with a global presence such as the probiotic strain HU58 and the carotenoid-producing strain HU36.

More recently, SporeGen has worked closely with the PAN Group, a major Vietnam corporation including HURO Biotech based near Ho Chi Minh City. With HURO SporeGen has developed a

unique product, SperoMed, that prevents both COVID-19 and influenza and is currently on the market in Vietnam as a medical device. This has included completion of accredited toxicology studies, efficacy studies in the UK as well as a phase 1 safety study in Vietnam conducted at the Thai Binh University of Medicine.

SporeGen continues to work closely with HURO with the development of a unique therapeutic intervention to *H. pylori* infection. In addition, SporeGen has developed a novel feed-based vaccine to White Spot Syndrome Virus that causes infection in shrimp and presents a major financial loss to the Vietnam economy and for which SporeGen is looking for interested partners for co-development.

**Keywords:** *Bacillus subtilis*, spores, COVID-19, *helicobacter pylori*, probiotics.

**OR8**

**University-based Technology Start-ups: Generation, Protection and Commercialization of Intellectual Property Rights**

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**Abstract:** Technology start-ups or spin-off companies play an important role in product and service innovations; they form the backbone of an entrepreneurial ecosystem, directly contribute to economic growth, job creation and industrial transformation, as well as stimulate fruitful university-industry collaborations in research and innovation (R&I), especially the ones that originate from universities. Formulation of successful university-based start-ups is very much dependent on the R&I capacity and capability that facilitate generation, protection and commercialisation of intellectual property (IP) rights, with the involvements of different stakeholders, including researchers, Technology Transfer Offices (TTOs), students, university administration, funding agencies, industry collaborators, patent offices, legal experts, investors and entrepreneurs. This presentation summarises and discusses the important issues and the process of establishment of successful technology start-ups, with a focus on the overview of innovation and entrepreneurship eco-systems in Vietnam that support commercialisation of R&I results, and the shared experiences from the LIFVietnam network, which was established since 2014, with the support from the Leaders in Innovation Fellowships (LIF) programmes funded by the UK Government's Newton Fund, which provides engineering and technology innovators with access to experienced mentors, an international network of peers, and high-quality skills training focused on commercialisation and maximising the technology's impact on society. The presentation also aims to stimulate the fruitful research and innovation partnerships between the UK and Vietnam, as a part of the collaborative project funded by British Council to commemorate 50 years of UK – Vietnamese diplomatic relations and 30 years of the British Council's presence in Viet Nam, to reflect on the past, present, and future bilateral relationship between the UK and Vietnam, especially research and innovation partnerships to address global challenges and contribute to creating a more sustainable future.

**Keywords:** Technology start-ups, intellectual property rights, IP right generation, IP right protection, IP right commercialization, Leaders in Innovation Fellowships, LIFVietnam.

OR9

## University-Business Partnerships on Digital Transformation of Vietnam's Coffee Industry: A Case of Study of Iced Coffee on INNSA Project

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**Abstract:** The Iced Coffee was established in 2012 and has developed a system of coffee farms, factories and shops in Vietnam. The success in business is followed by the control of quality and cost value that customers appreciate. The report aims to introduce the company and its partnership with Nha Trang University within Vingroup Innovation Foundation-funded INNSA project, with a focus on digital transformation of Vietnam's coffee industry based on innovative and sustainable solutions of digital and smart agricultural technologies: Smart devices and Internet of Things (IoT), Big data, Artificial Intelligence (AI), Blockchain and traceability technology, Sustainable design & manufacturing. After testing and evaluating, the INNSA platform has evolved based on business models and data. The results show that technological solutions have improved Vietnamese coffee supply chain and value chain. Based on the research results, the article recommends high-tech solutions for innovation in coffee production, processing and exporting enterprises.

**Keywords:** Coffee industry; digital transformation; high-tech innovation in coffee production enterprises; producing, processing and exporting coffee.

OR10

## Artificial Intelligence & Coffee Value Chain

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**Abstract:** Vietnam is the world's second biggest producer of coffee and has been an exporter for several decades. However, Vietnam has been facing many well-documented issues and challenges in the whole coffee supply chain such as climate change; low productivity, poor quality and high cost; excessive use of fertilizing products and irrigations; poor collection, processing & storage solution; low sustainability & limited value-added coffee products; and low applications of smart and sustainable agriculture solutions. This presentation introduces an innovative and smart agriculture platform for the creation and operation of a sustainable coffee value chain, with the focus on enhanced quality and added values for key elements of the coffee supply chain in Vietnam. With the use of Artificial Intelligence (AI), the platform provides the ability to analyse market information, such as history coffee prices, to provide reports and predictive analysis for suppliers to adjust export plans. Besides, with deep learning-based technology, AI recognizes the images via camera to output advice about disease prevention. This platform provides real-time information about the cultivating regions. Finally, that information, after being stored, analysed

in real time, and fed into the traceability system, helps increase transparency about the origin of the product, thereby adding the value of the product.

**Keywords:** Artificial Intelligence, deep learning, smart agriculture, coffee value chain, coffee price prediction, coffee disease classification.

**OR11**

### **Digital Twins for Smart Manufacturing and Industry 4.0**

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**Abstract:** Digital Twin (DT) along with Artificial Intelligence (AI), Big data Analytics, Internet of Things (IoT) has been an important enabling technology for Smart Manufacturing and Industry 4.0, with potential and impactful applications in healthcare and industries.

This presentation summarises the latest development and applications of DT and demonstrates a conceptual model of a DT robot system, with a proof-of-concept (POC) prototype for demonstrations and further investigations of potential applications in telemedicine and in-home healthcare, including food and drug delivery, virus disinfection and telehealth services, as well as telesurgery and medical rehabilitation with robots. The POC prototype of a DT system was successfully developed based on the latest development of real-time simulations and three-dimensional interaction technologies; and it can be considered as the cost-effective solutions for demonstrating and evaluating potential applications of digital twins in industrial practices as well as in higher educations and research.

This presentation also aims to showcase the shared heritage on the impactful research and stimulate the fruitful research and innovation partnerships, as a part of the collaborative project funded by British Council to commemorate 50 years of UK – Vietnamese diplomatic relations and 30 years of the British Council's presence in Viet Nam, to reflect on the past, present, and future bilateral relationship between the UK and Vietnam.

**Keywords:** Digital twin, robotics, smart manufacturing, industry 4.0, British Council.

**OR12**

### **Does the Innovation Technology Deal with Environmental Degradation and Climate Change Issue?**

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**Abstract:** Addressing the environment issues such as air pollution and temperature increase is one of the world's pressing ways to achieve the United Nations' Sustainable Development Goals (SDGs). Vietnam is one of the world countries experiencing environmental degradation and climate change. The Vietnam Government acknowledges and has taken many actions to prevent Vietnam citizens from strong effects including encouraging the research, promulgate regulations. Innovation is expected to play a major role for the earth's decarbonization and improve air quality data.

This presentation summarizes the key points of research on the effect of extreme weather events and air pollution on human health in Vietnam; emphasizes the response and preparedness of the Vietnam health system on climate change. This presentation also discusses about the possible applications of innovation technologies which contribute to adapt to extremely weather in some circumstance for Vietnam. This presentation also heritage the fruitful impact research and innovation partnership as a part of collaborative project funded by British Council to commemorate 50 years of UK Vietnam diplomatic relation and 30 years of the British Council's presence in Vietnam.

**Keywords:** British Council, impact ranking, united nations' sustainable development goals.

**OR13**

### **Advanced Aerogels from Waste Tires and Coal Ash for Thermal and Acoustic Insulation Applications**

**Cuc Thi Le<sup>1,2</sup>, Thinh Quoc Truong<sup>1,2</sup>, Duy Phuc Thanh Nguyen<sup>1,2</sup>, Ngan Thi Kim Bui<sup>1,2</sup>, Xue Yang Goh<sup>3</sup>, Ha Ky Phuong Huynh<sup>1,2</sup>, Anh Tuan Nguyen<sup>1,2</sup>, Anh N Phan<sup>4</sup>, Thang Manh Ngo<sup>1,2</sup>, Son Truong Nguyen<sup>1,2,\*</sup>**

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**Abstract:** Over the years, as the economy has grown, numerous new materials have been developed to replace traditional ones. Among these materials, aerogels have become a topic of intensive research. However, the growth of the economy has also had negative impacts on the natural environment, particularly in industries like automotive and energy, which generate a significant amount of waste. To address these problems, researchers have synthesized an advanced aerogel using waste tire rubber powder (WTRP) and coal ash (CA), which not only helps to solve the dual problems of the environment but also produces a green material with high applicability. The resulting aerogel has an ultra-low density ( $0.055\text{g/cm}^3$ ) and high porosity (95.6%), making it an excellent insulator with a thermal conductivity of  $0.027\text{ W/m.K}$ . Additionally, the aerogel exhibits significantly enhanced rigidity, with a Young modulus of  $E_{\text{avg}} = 1.206\text{ MPa}$ . Furthermore, the composite aerogel also possesses a good sound absorption coefficient (noise reduction number NRC) of 0.414. The exceptional properties of the aerogel suggest that it holds great promise as a new generation of sustainable, effective, and low-cost materials for thermal and sound insulation.

**Keywords:** Waste tire, coal ash, aerogel, thermal insulation, sound insulation.

## Special Session 02

### THE UK-VIETNAM WORKSHOP ON Bioengineering and Sustainable Health: Spore Vectored Vaccine for *Helicobacter pylori* and New Technologies for Sustainability



Royal Academy  
of Engineering

OR1

## Prophylactic Immunization to *Helicobacter pylori* Infection using Spore Vectored Vaccines

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**Abstract:** *Helicobacter pylori* infection remains a major public health threat leading to gastrointestinal illness and increased risk of gastric cancer. Mostly affecting populations in developing countries no vaccines are yet available and the disease is controlled by antimicrobials which, in turn, are driving the emergence of AMR. Therefore, we engineered spores of *Bacillus subtilis* to display putative *H. pylori* protective antigens, urease subunit A (UreA) and subunit B (UreB) on the spore surface and evaluated their immunity and colonization in mice challenged with *H. pylori*. Oral immunization with these spores showed antigen-specific mucosal responses (fecal sIgA) including seroconversion and hyper immunity. Furthermore, following challenge, colonization by *H. pylori* was significantly reduced by up to 1-log. This study demonstrates the utility of bacterial spores for mucosal vaccination to *H. pylori* infection. The heat stability and robustness of *Bacillus* spores coupled with their existing use as probiotics make them an attractive solution for either protection against *H. pylori* infection or potentially for therapy and control of active infection.

Source of full text published: <https://doi.org/10.1111/hel.12997>.

**Keywords:** *Bacillus subtilis*, spores, *Helicobacter pylori*, oral vaccine.

OR2

## A Novel Mouse-Adapted *Helicobacter pylori* Model: Genomic Insights and Vaccine Pre-Clinical Evaluation

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**Abstract:** *Helicobacter pylori* infection is a major global health concern, linked to the development of various gastrointestinal diseases, including gastric cancer. In order to study the pathogenesis of *H. pylori* and develop effective intervention strategies, it is essential to establish appropriate animal models that closely mimic human infection. In this study, we report the development of a novel mouse-adapted *H. pylori* model specifically tailored to Vietnam and Southeast Asian populations. To establish the mouse-adapted *H. pylori* model, we collected and whole-genome sequenced clinical strains of *H. pylori* from infected patients in Central Vietnam as well as performed genomic analysis of many strains of *H. pylori* in Southeast Asia. Whole-genome sequencing and analysis revealed common genetic signatures, antimicrobial resistance genes and virulence factors in these strains, suggesting their adaptation to the regional host population. In parallel, we conducted preclinical studies to assess the pathogenicity and host immune response

of the mouse-adapted *H. pylori* strains. Infected mice (Mlac:Icr) exhibited gastric inflammation, epithelial erosion, and dysplastic changes that closely resembled the pathology observed in human *H. pylori* infection. In addition, comprehensive immunological characterization demonstrated a host immune response, including antigen-specific mucosal responses (fecal sIgA). Oral vaccination with candidate vaccine strains elicited a significant reduction in bacterial colonization. Our findings demonstrate the successful development of a novel mouse-adapted *H. pylori* model specifically designed for Vietnam and Southeast Asian populations, highlighting the potential of the model for vaccine development. This model holds significant promise for advancing our understanding of *H. pylori*-associated diseases and developing region-specific interventions to combat this global health burden.

**Keywords:** Genome sequencing, *Helicobacter pylori*, mouse-adapted *Helicobacter pylori* model, oral vaccine, preclinical evaluation.

OR3

Development of spore vaccine strains against *Helicobacter pylori*

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**Abstract:** *Helicobacter pylori* is a Gram-negative, microaerophilic bacterium adapted to survive in the stomach of humans where it can be one of causative factors in chronic gastritis, peptic ulcer disease, gastric MALT (mucosal-associated lymphoid tissue) lymphoma, and gastric adenocarcinoma. Treatment of this bacterium is still significantly based on antibiotic therapy, but antibiotic resistant strains have arisen. *Bacillus subtilis* spores have received growing attention regarding potential biotechnological applications, including the use as probiotics and in vaccine formulations. In this study, we successfully cloned the gene encoding urease subunit A (*ureA*) of a clinical *H. pylori* strain from Vietnam in the fused form to the *cotB* (spore coat protein gene) in *B. subtilis*. The recombinant cells were confirmed by colony PCR, and Sanger sequencing. *B. subtilis* spores were purified for Western blot analysis to display the *H. pylori* UreA protein on the spore coat. The recombinant *B. subtilis* strain carrying the UreA antigen in this study was used as a fusion partner with CotB to develop a potential *B. subtilis* spore vaccine for protection against *H. pylori* infection.

**Keywords:** *Bacillus subtilis*, *Helicobacter pylori*, pThyA, spore vaccine, *ureA*.

OR4

Next-generation Sequencing for *Helicobacter pylori*'s Genome

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**Abstract:** *H. pylori* strains from unrelated humans exhibit a high level of genetic diversity due to an elevated mutation rate and a high rate of intraspecies genetic recombination. To study the relationship between pathogenicity and the geographical distribution of *H. pylori*, it is necessary to obtain a complete genome of bacterial isolates. Vietnam has a high incidence of *H. pylori* infection and related gastric cancer, but limited data is available for the complete genome information of HP isolates found in Vietnam. In this study, we used Illumina and Oxford Nanopore sequencing platforms to assemble the closed genome sequence of an HP isolate in Vietnam. The assembly of long-read and short-read sequences produces a single contig representing a complete

circular genome of the HP34 isolate with 1.600.602 bp in length. Detailed analysis of the consensus sequence revealed that the studied HP isolate harbors mutations that facilitate resistance to Quinolone, Metronidazole, and Amoxicillin but not to Rifamicin and Streptomycin. The core genome comparison indicated that the *H. pylori* strain exhibited a close relationship to reported isolates found in Vietnam (hspEastAsia). In summary, we presented a method combining short and long-read sequencing to complete a high-quality circular HP genome. This data could serve as a newly sequenced *H. pylori* reference genome, facilitate deep research with this strain, and provide a foundation for molecular evolution studies of genetic basis for its adaptation to the local environment.

**Keywords:** Illumina, Oxford Nanopore sequencing, *Helicobacter pylori*, complete genome.

OR5

### Development of Cellulose from Agricultural Waste for Reduced Antimicrobial Resistance in Water Towards Improving Human Health

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**Abstract:** The increase in antibiotics in wastewater threatens human health and the environment. Semiconductor inorganic quantum dots, such as ZnS-capped CdSe and  $(\text{ZnS})_x(\text{CuInS}_2)_{1-x}/\text{ZnS}$  (core/shell) exhibit the light adsorption ability in both UV and visible regions and photoluminescence in visible regions. This distinctive property of quantum dots allows it to be used in photocatalytic reactions. However, these inorganic quantum dots pose a significant risk to living bodies and create hazardous immune reactions. They can cause secondary pollutants when entering water bodies, so their applications in water treatment are limited. Therefore, the use of biomass-derived carbon dots is investigated. Biomass-derived carbon dots are biocompatible materials, so they are suitable for wastewater treatment. However, the small size of carbon dots limits its direct application since it is difficult to retain the dots. This study uses aerogel prepared from biomass-derived graphene oxide and cellulose as a 3D structure to embed carbon dots. Cellulose was prepared from barley straw, while graphene oxide was synthesized from graphitic walnut shell carbon. The ability to use carbon dots to remove and degrade antibiotics will be explored. The porosity and functional groups of carbon dots aerogel will be examined to understand the reaction mechanisms, and they will be compared with results in the literature.

**Keywords:** Barley straw, cellulose aerogel, contaminant removal, phosphorus removal.

OR6

### Developing the Shrimp Farming Wastewater Treatment System using Biogas Technology with Supplementation of Microorganisms

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**Abstract:** White-leg shrimp is an important food production industry and has become a significant economic activity in many countries including Vietnam. However, a large amount of excess feed, shrimp carcasses and manure have been generated, exacerbating the accumulation of organic matters in the shrimp farming causing the blossom of harmful microorganisms as well as



problems in wastewater treatment. The major nitrogen and organic sources of shrimp wastewater contain high amounts of protein and amino acids. Therefore to develop the potential shrimp farming wastewater treatment became more interesting for researchers and also industries. To facilitate application of shrimp wastes into fertilizers by using biogas technology with supplementation of selection of microbial strains to convert wastes into fertilizers and plant growth promotion has greater advantage values. This study focused on isolating and characterizing the protease producing bacteria isolated from shrimp waste to supplementation to the biogas system which among to converting shrimp wastes into agriculture fertilizers, nitrogen metabolism and increasing the CH<sub>4</sub> production. Four bacteria strains includes *Bacillus tequilensis* ON1, *Stenotrophomonas rhizophila* MT1, *Pseudomonas plecoglossicida* IN1 and *Pseudomonas* sp. IN2 were isolated from local shrimp wastewater samples. The biogas system model was established and applied to treatment of shrimp wastewater with addition of microorganisms. The system was not only increasing the amount of CH<sub>4</sub> with the addition of *Stenotrophomonas rhizophila* MT1, but also more effective treatment of shrimp sludge through the parameters BOD, COD, TN and TP. The removal of BOD, COD, TN and TP by system was 72.5, 75.5, 73.7 and 37.8% respectively, after 90 days of experiment.

**Keywords:** Biogas, microorganisms, organic pollutant, shrimp aquaculture.

P1

### Environmentally Responsible Bioengineering for Spore Surface Expression of *Helicobacter pylori* Antigen

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**Abstract:** The development of genetic technologies and bioengineering are creating an increasing number of genetically engineered microorganisms with new traits for diverse industrial applications such as vaccines, drugs and pollutant degraders. However, the destiny of genetically engineered bacterial spores released into the environment as long-life organisms has remained a big environmental challenge. In this study, an environmentally responsible and sustainable gene technology solution based on the concept of thymine starvation is successfully applied for cloning and expression of a *Helicobacter pylori* antigen on *Bacillus subtilis* spore surface. As an example, a recombinant *Bacillus subtilis* strain A1.13 has been created from a gene fusion of the corresponding N-terminal fragment of spore coat protein CotB in *B. subtilis* and the entire urease subunit A (UreA) in *H. pylori* and the fusion showed a high stability of spore surface expression. The outcomes can open the door for developing highly safe spore vectored vaccines against this kind of pathogen and contributing to reduced potential risks of genetically engineered microorganisms released in the environment.

**Keywords:** *Bacillus subtilis*, genetically engineered microorganism, spore vectored vaccine, thymine starvation, urease.

P2

### Growth And Sporulation of *Bacillus subtilis* Strains Carrying *Helicobacter pylori* Urease Antigen

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**Abstract:** *Helicobacter pylori* (*H. pylori*) is a pathogenic bacterium with a high global infection rate, especially in developing countries, and has been identified as the main cause of peptic ulcer disease, which can lead to stomach cancer. There is currently no published vaccine against *H. pylori*. We have developed recombinant *Bacillus subtilis* strains expressing the *H. pylori* urease antigen gene fragments and then defined some characteristics of growth, morphology, sporulation efficiency, harvest time points, and stability of spores at different storage temperatures as well as in the conditions treated with simulated gastric fluids (SGF) or simulated intestinal fluids (SIF) in order to select suitable candidate vaccine strains for preclinical testing in animal models. The results showed that these recombinant strains were strictly dependent on thymine for survival. Application of lysozyme treatment step resulted in spore preparations with high purity (ranging 94-98% at different cultivation times). All spore preparations showed good stability at different reservation temperatures or after treatment with simulated digestive fluids for 28 days. The most suitable time to harvest spores ranged from 24 to 44 h for research strains using DSM broth medium. The final spore densities after lysozyme treatment were at least  $1.0 \times 10^{10}$  CFU/mL. Therefore, these strains have the potential to be used as candidate spore vaccines for preclinical trials, and if successful, they can continue to clinical trials and develop into oral vaccines for the prevention of *H. pylori* infection in Vietnam and other developing countries.

**Keywords:** *Bacillus subtilis*, *Helicobacter pylori*, spore vaccine, ureA, ureB.

P3

### The Adaptation Study of New Clinical *Helicobacter pylori* Strains in Mlac:ICR Mice to Provide A Pre-Clinical Model for Vaccine Development

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**Abstract:** The mouse model of *Helicobacter pylori* induced disease using Sydney strain (SS1) has been widely used in *Helicobacter* research. In this study, we evaluated the infection with a new strain of *H. pylori* (strain HP34) isolated from a clinical patient under duodenitis and peptic ulcer diseases (PUD) in a Mlac:ICR mouse model as a pre-clinical model for research and development of *H. pylori* vaccine.

Mlac:ICR mice (5-6 weeks old, n=5) were orally infected with strain HP34 (3 doses x 0.2 ml, OD = 1.6). The urease and polymerase chain reaction (PCR) assay were used for the rapid detection of *H. pylori* in gastric tissue of infected mice after 2 weeks. Biopsy and isolation of *H. pylori* from the stomach tissue of infected mice were performed for the next 2 weeks. *H. pylori* was isolated on selective Columbia medium supplemented with 8% defibrinated horse blood, 1% sodium lactate (Sigma), and 0.2% Skirrow's supplement (Sigma) under microaerobic conditions. After 4-6 days of culture, *H. pylori* was confirmed by colony morphology and oxidase and urease activities. The number of colony-forming units (CFU) of *H. pylori* of each stomach was determined and calculated to evaluate the degree of infection. The results showed that all mice infected with strain HP34 were found to have a positive urease reaction and *ureA* gene fragment of *H. pylori* in gastric tissue samples. The level of infection of *H. pylori* bacteria into the gastric tissue of mice was  $10^6$ - $10^7$  CFU/gram of tissue. The histopathological findings showed chronic inflammation of the gastric mucosa and acute inflammatory reaction against the background of chronic inflammation with characteristic features such as inflammatory cell infiltration, intestinal metaplasia, epithelial erosion, ... Thus, strain HP34 has infected and adapted well in Mlac:ICR mice and caused a chronic inflammatory response of gastric mucosa as a consequence of *H. pylori*'s infection process. Mlac:

ICR mouse model and strain HP34 are suitable to research the pathogenesis of *H. pylori*-related diseases and evaluate the efficacy of *H. pylori* vaccine candidates.

**Keywords:** *Helicobacter pylori*, vaccine, Mlac:ICR mice, strain HP34.

P4

### Blood Cell Characteristics and Leukocyte Isolation from Blood of Cultured Permit (*Trachinotus falcatus*)

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**Abstract:** White blood cells (WBCs) or leukocytes are cells of the immune system involved in defending the body against both infectious disease and foreign materials. The collection of fish white blood cells for nutritional and immunological studies in fish has been interested and performed in many laboratories. The aims of this study was to obtain a knowledge of blood cell characteristics of permit *Trachinotus falcatus*, one of the major cultured fish in central Vietnam. Blood samples were taken from the caudal vein of fish. Haematological parameters such as red blood cell count (RBC), white blood cell count (WBC), thrombocyte count (TC) and morphological analysis were measured in blood sample from 10 adult fish (0.8 – 1.2 kg) and 10 from fish with length 5 - 10 cm, those were all alive and collected from the fish markets and hatcheries around Nha Trang city. Blood smears were prepared immediately after blood was collected and stained with Diff-Quick stain. Blood cells and its nucleus length and breadth were measured. The result showed the number of RBC, WBC was  $1.8 \times 10^6$  -  $2.82 \times 10^6$  (RBC/mm<sup>3</sup>) and  $3.38 \times 10^4$  -  $10.3 \times 10^4$  (WBC/mm<sup>3</sup>) respectively. Permit fish's leukocytes were similar to many other marine fish species have been reported as lymphocyte, monocyte, neutrophil, eosinophil and basophil. Besides, using Ficoll® Paque (1.077 g/mL), fish leukocytes could be separated with parameters following: ration (1 blood : 1 PBS): (1 Ficoll: 1 PBS), the centrifugation speed of 400g (break off: and acceleration/deceleration at 0), 8 - 10 minutes, 20°C. After cleavage leukocytes were isolated and cultured separately using RPMI-1640 medium and incubated overnight. Cell suspension imaged under the microscope showing relatively stable leukemic cell growth with different morphology. The results from this study would be useful to establish a baseline value in order to monitor the health status of *Trachinotus falcatus* and established a process to separate and collect white blood cells to be involved to further research related to phagocytosis assay.

**Keywords:** Fish blood cell characteristics, Leukocyte separation technique, *Trachinotus falcatus*.

P5

### Exploring the Probiotic Potential of *Saccharomyces cerevisiae* Cultured in Hydrolyzed Green Seaweed *Ulva* sp. for Aquaculture Applications

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**Abstract:** Seaweed holds great promise as a biomass source in the realm of aquaculture feed. The central sea region of Vietnam boasts a substantial yield of green seaweed, particularly *Ulva* sp. This abundant resource has been proven to offer a sustainable and nutrient-rich profile, containing compounds that bolster the immune system of aquatic animals. In addition, the yeast *Saccharomyces cerevisiae* has exhibited favorable effects on the growth of domestic animals and demonstrates robust growth on hydrolyzed seaweed media. Therefore, fermenting the hydrolysate of *Ulva* sp. with *Saccharomyces cerevisiae* presents an opportunity to produce a probiotic-enriched product with potent nutritional components that yield beneficial effects on aquatic animals.

The present study focuses on utilizing raw materials sourced from *Ulva* sp. seaweed collected in the waters of Ninh Thuan. A preliminary experiment involved suspending 5g of dried seaweed powder in 100ml of distilled water and subjecting it to hydrolysis using Celluclast® 1.5L Novozyme at a concentration of 25 FPU/g for a duration of 24 hours. Subsequently, 20g of 70-degree brix molasses was added, and the pH of the hydrolyzed seaweed solution was adjusted to 6.5. A 10ml inoculum of *Saccharomyces cerevisiae* with a density of  $1.8 \times 10^8$  CFU/ml was introduced, and fermentation was conducted at room temperature for 72 hours, with a stirring speed of 120rpm.

The results revealed that the resultant product exhibited a yeast density of  $8.7 \times 10^{11}$  CFU/g of hydrolyzed seaweed. In terms of nutrient composition per unit of dry weight, the product displayed protein content of 18.69%, lipid content of 1.13%, cellulose content of 32.3%, and ash content of 24.5%. Consequently, the *Ulva* sp. seaweed product, after post-fermentation hydrolysis, emerges as a promising probiotic feed source for aquaculture, boasting a 27% increase in protein content and a 41% decrease in cellulose content compared to the original seaweed material. The resulting product exhibits favorable nutrient profiles, rendering it a valuable feed source for aquaculture. This novel approach holds promise for optimizing aquaculture practices by providing an efficient means to harness the potential of seaweed as a probiotic-enriched feed ingredient.

**Keywords:** Green seaweed, *Ulva* sp., *Saccharomyces cerevisiae*, probiotic-enriched product.

P6

### Probiotic-Oriented Screening of Bacterial Strains Isolated from the Digestive System of Pacific Oysters *Crassostrea gigas*

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**Abstract:** Oysters, recognized for their gustatory allure and nutritional richness, have achieved global acclaim as a prized seafood delicacy. Nevertheless, the oyster industry grapples with substantial challenges, including disease outbreaks, environmental stressors, and the pressing need for sustainable aquaculture practices. To address these obstacles, the utilization of probiotics in oyster production has emerged as a promising approach. Probiotics, comprising live microorganisms that confer health benefits when consumed in appropriate quantities, present a diverse array of potential advantages for oysters.

In this investigation, bacterial strains were isolated from the digestive tract of *Crassostrea gigas* specimens cultivated in the aquatic milieu of Ninh Hoa, Khanh Hoa, Vietnam. A total of 22 bacterial strains were isolated, comprising 15 gram-positive and 5 gram-negative strains. Given their origin from marine oysters, all strains exhibited noteworthy salt tolerance, enduring concentrations of up to 4%. Employing hemolysis screening assays employing blood agar plates, four strains (N4, N11, L5, and L14) were eliminated, displaying transparent zones ranging from 2 to 6 mm. Subsequently, the residual 18 strains were subjected to an evaluation of their antibacterial activities, resulting in the identification of nine strains manifesting resistance against *Vibrio parahaemolyticus* ATCC 43996, with inhibition zone diameters spanning approximately 5 to 10 mm. Moreover, investigations into their enzymatic capacities encompassed the assessment of cellulase, protease, and amylase production. Within this realm, the strain NH7 demonstrated the most remarkable extracellular enzyme productivity, yielding resolution rings measuring between 5 and 8 mm. Furthermore, explorations into growth conditions disclosed that NH7 thrived optimally at a pH of 7.5 and a temperature of 35°C, attaining robust development within a timeframe of 48 hours. The NH7 strain, therefore, presents auspicious prospects as an oyster probiotic; nonetheless, comprehensive optimization studies are imperative to definitively ascertain its probiotic efficacy.

**Keywords:** Marine oyster, *Crassostrea gigas*, Pacific oyster, probiotic.



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**Abstract:** Copepods are one of the most abundant invertebrate groups in the seas and oceans and are a significant food source for marine animals such as corals, fish, birds, and mammals. Due to the global warming, copepods may be vulnerable to elevated temperatures, however, the underlying mechanisms have been poorly understood. Recent advancements in molecular ecology have shed light on the critical role of gut microbiomes in shaping the susceptibility of host animals to warming, yet it is unknown how the gut microbiome of marine copepods may be altered in response to a warming environment. In this study, we addressed the fundamental knowledge gap by assessing changes in the diversity of the gut microbiome in the tropical calanoid copepod *Acartia* sp. Copepods were reared in one of three challenge temperatures, 26, 30, and 34°C, and in different development stages (Nauplii – N, copepodite –C, and adult –A) The gut microbiomes of copepods were generated using high throughput DNA sequencing of V1–V9 of 16S rRNA hypervariable regions. We recorded 1,262,987 highly quality sequences, which corresponding to the total of 392 OTUs. The highest number of OTUs was in 26°C experiment (126/392 OTUs), and the lowest in 34°C (31/392 OTUs). At the phylum level, Proteobacteria was the dominant group (29.9% - 87.2%), followed by Actinobacteriota (6.3% - 59.3%) in almost samples. For 26A and 30A, in contrast, Actinobacteriota was found as the more abundant taxa compare to Proteobacteria (the ratios of 44.4% (26A), 59.3% (30A) of Actinobacteriota, and 47.6% (26A), 29.9% (30A) for thermophilic Proteobacteria, respectively). At 34°C, Vibrionaceae was the highly abundant taxa (27.3-86.6%) in N-C stages at all temperature challenge, while large fluctuation reported at an adult stage. Weeksellaceae was found more commonly in C-A stages (absent at 30C) and showed a tendency to increase proportionally with increasing temperature at A stage (reach 36.3% at 34A). Rhodobacteraceae and Marinobacteraceae were dominate taxa at C-A stages at all temperatures, except Rhodobacteraceae at 34C. Brevibacteriaceae was occurring in all groups, however, it seems to be decreased when temperature increase at A stage. *Vibrio* genus was dominant in all samples, more common at N-C stages (37.9-89.1%) compared to A stage (18.7-34.4%). At N stage, *Brevibacterium* was unchanged (12%) at mediate temperature (26N and 30N) but decreased at 34N (2.6%). At C stage, *Vibrio* – the most pathogenic group - showed the increase proportion with the increase temperature (37.9%, 63.4% and 81.6% at 26C, 30C, and 34C, respectively). At A stage, *Marivita*, in contrast, reduce when temperature increase, and absent at 34C. *Brevibacterium* displayed the decreased proportion with increase temperature, while *Chryseobacterium* – pathogenic bacteria - showed the opposite trend (from 1.74 – 32%). These results may suggest 1) the role of thermophilic and pathogenic bacteria in the response of copepods to thermal stress; or 2) it may simply reflect the higher thermal optimum of Proteobacteria and *Vibrio* with no link to the fitness of copepods. The next logical step is to explore the functional role of these thermophilic groups concerning changes in copepod fitness, which will fundamentally advance our mechanistic understanding of the adaptability of tropical copepods and, more generally, marine invertebrates to the warming climate.

**Keywords:** Copepods, *Acartia* sp., temperature, metagenomics, climate change, marine heatwaves



**Comparison of the Pathogenicity of Different *Vibrio parahaemolyticus* Strains Caused Acute Hepatopancreatic Necrosis Disease (AHPND) in *Penaeus vannamei***

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**Abstract:** Acute hepatopancreatic necrosis disease (AHPND) has global spread rapidly, causing mass shrimp mortalities in shrimp aquaculture, especially in Vietnam. *Vibrio parahaemolyticus* carrying binary toxin PirA<sup>vp</sup>/PirB<sup>vp</sup> has been known as the main agent causing AHPND. Recently, mutant *V. parahaemolyticus* PirAB<sup>vp</sup> which has been frequently detected in shrimp infected with AHPND in Vietnam lack of pirA<sup>vp</sup> but carrying pirB<sup>vp</sup>. Three different *V. parahaemolyticus* strains including strain positive to pirAB<sup>vp</sup> (T3), positive to pirB<sup>vp</sup> (T7) and positive to non-pirAB<sup>vp</sup> (T16) was examined the degree of virulence on to farmed *P. vannamei* shrimp. Approximately 2 g of *P. vannamei* shrimps (n=20) were immersed with 10<sup>4</sup>, 10<sup>5</sup>, 10<sup>6</sup>, 10<sup>7</sup>, and 10<sup>8</sup> CFU shrimp-1 of each *V. parahaemolyticus* strains. Control was immersed with PBS. Experiment was conducted in triplicate in a 20L tank. Cumulative shrimp mortality was significantly higher caused by T3 compared to that of T7 and T16. LD50 of T3 was 0,5\*10<sup>5</sup> cfu/mL. Shrimp mortality was 100% and serious collapsed epithelia was observed after immersion with 0,5\*10<sup>5</sup> cfu/mL at 48 hours. The shrimps were treated with the same dose of T7 and T16 caused 20% and 5% mortality throughout the entire experiment respectively. Shrimps' hepatopancreas treated with T7 was observed to have moderate cellular damage while that of T16 was unchanged. Three different *V. parahaemolyticus* strains possess different virulence to *P. vannamei* shrimps.

**Keywords:** LD50, *Penaeus vannamei*, pirAB, *Vibrio parahaemolyticus*, virulence.

# NHA TRANG UNIVERSITY

Nha Trang University (NTU) is located in Nha Trang City - reputedly the most beautiful coastal city on the South Central Coast of Vietnam. It's a popular destination for sunbathing and enjoying beach activities. Nha Trang weather has two distinct seasons. Its monsoon period takes place from September until December. The dry period is from January until August. The town enjoys moderate temperatures throughout the year. Expect an average low of 20°C and an average high of 32°C when you're here.

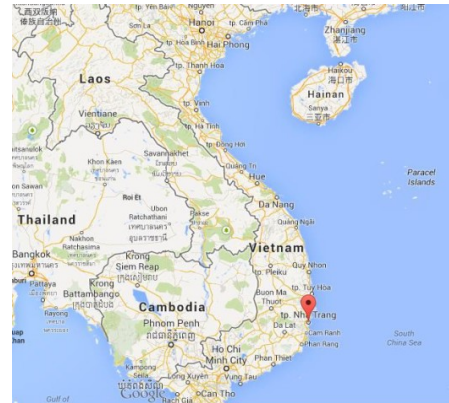
Starting in 1959 as the Fisheries Faculty of Hanoi Institute of Agriculture and Forestry, NTU took its debut as a separate institution in 1966 under the name "School of Fisheries". During its development process, the name was changed several times. In 2006, we took the current name - Nha Trang University.

During its 65 years of development, NTU has become a prestigious multi-disciplinary and multi-level institution with a strong foundation of fisheries and aquaculture. NTU has gained many achievements in training, scientific research, and international cooperation that have contributed tremendously to the socioeconomic development of Vietnam, particularly for the fisheries sector.

It has been and continues to be a leading university in the field of fisheries and aquaculture sciences at a national level, playing a significant role both in driving the development of marine economy in Vietnam and in generating the necessary human resources that can accommodate the inevitable integration process of the nation. Our vision is to become a prestigious university in training, research, and technology transfer and a leader in Southeast Asia in fisheries science and some selected areas in marine economy by 2030.

The full-fledge university currently has 25 faculties, institutes, research centers, technology transfer centers and 8 managerial departments. NTU now offers 37 programs for bachelor degrees, 16 programs for master's degrees and 6 programs for doctoral degrees. Additionally, the university also provides associate degrees and various programs for vocational training, short training courses, summer programs and so on to meet the demand of society. It has a stable enrolment of more than 3,500 new students annually and the total number of students is approximately 16,000. NTU students come from all over the country and numerous international nations. With 700 employees, including more than 100 PhDs, around 300 Masters, and more than 100 teaching staffs are pursuing their graduate programs, 40% of them have been trained at developed countries.

**For more information about NTU, please access our website at: <http://en.ntu.edu.vn/>**



## **INTRODUCTION OF VINGROUP INNOVATION FOUNDATION (VINIF)**

Vingroup Innovation Foundation (VINIF) was founded on August 21, 2018 aiming to support excellent scientists, young talents from universities, institutes in conducting scientific research and innovation for sustainable changes and developments in Viet Nam. The establishment of VINIF marked an important event in Viet Nam as it was the first time a private foundation with budget of thousand billion VNDs non-beneficially funding for the national science and technology developments. During 05 years of creative and continuous operations, VINIF has sponsored for 07 programs with the total expenditure of 750 billion VNDs including: Scientific & Technological Project, Master's & Ph.D. Scholarship, Postdoctoral Fellowship, Cooperation in Master's Education in Data Science, Preservation of Cultural and Historical Values, Conference & Event Sponsorship/Hosting and Short-term Course and Visiting Professor Sponsorship/Hosting.

VINIF, at the very beginning in 2019, strongly funded the spearhead scientific and technological projects in Viet Nam. Up to now, there have been 101 sponsored projects with the budget of nearly 530 billion VNDs. Following the program's success, VINIF continuously sponsored new programs as mentioned previously, including the postgraduate fellowships, cooperation in data science education in master degree, cultural and historical preservation, conferential and short-term/visiting professor events. These programs have approached to millions of people, and up to now, there have been more than 1,150 postgraduate candidates and 130 international conferential and visiting professor events established under the sponsorship of 220 billion VNDs.

The Program of Preservation of Cultural and Historical Values was established in 2021. Very quickly, in 2021 and 2022, 08 major projects and many influential related events have been funded with a budget of 8 billion VNDs. In 2023, the Program is strongly spreading to the society when some of the most important archaeological and intangible cultural heritage projects and events have been applied for the sponsorships.

Through the 05 years of sponsorship programs, the VINIF scientific committee includes about 300 national and international reputable experts in different natural and social fields. The committee has played the crucial role in guaranteeing the transparency, equality and high standard of the programs. The VINIF system of sponsorship has contributed to the generation of excellent knowledge, young talented scientists, high quality documentations, data and products having great impact on socioeconomics.



## NHA TRANG UNIVERSITY

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