

# The 8<sup>th</sup> International Symposium on Kuroshio Science

“Kuroshio University League Network Formation Toward  
the Establishment of a Sustainable Society in the Kuroshio  
Region Through Cross-Border Education”



Kochi U. Asakura Campus, Common Lecture Bldg. 2, Room 212

September 12, Friday, September 13, Saturday: Conference

Office of Kuroshio Science : 088-864-5786, km03@kochi-u.ac.jp

# The Eighth International Symposium on Kuroshio Science

## Kuroshio University League Network Formation Toward the Establishment of a Sustainable Society in the Kuroshio Region Through Cross-Border Education

### **1. Background and Objectives**

Kuroshio region is an area that is under the influence of the Kuroshio current driven by Coriolis force of Earth's rotation. In the Edo period, this current is recognized as a black river rapidly running in the Pacific Ocean at the north of Hachijyo island that is located 300 km South of Edo (Tokyo).

This region shares typhoons, earthquakes, and volcanoes together with various resources. We have been engaged in studies for maintaining this area in a sustainable condition and named those studies Kuroshio Science. We have had conferences on Kuroshio Science starting with a Workshop and developed to a Symposium, beginning in 2007. Two cycles of conferences on Kuroshio Science were held in Kochi University, National Sun Yat-sen University (Kaohsiung), and Bicol University (Legaspi/Tabaco). Last year, we held the 7th Kuroshio Symposium in Pontianak city co-organized by University Malaysia Sarawak and Tanjungpura University.

This year, Kochi University would like to provide an opportunity for researchers and students to discuss the sustainability of the Kuroshio region in the following topics, hoping to form a solid platform and stimulate the collaboration among institutions along the Kuroshio current and those located in areas influenced by this current.

At the beginning of the third cycle of this Conference Series, We would like to put emphasis on the Cross-Border Education in this Kuroshio Region to establish a sustainable society in this area.

### **2. Venues**

Common Lecture Bldg. 2, Room 212, Kochi University, Asakura, Kochi, 780-8520, Japan

### **3. Period**

Symposium: September 12, 13, 2014

Banquet: September 12, 2014 (18:00 Kochi Palace Hotel)

Field Survey: September 14, 15, 2014

Plan 1 (Sept. 14, 2014)

The Kochi Prefectural Makino Botanical Garden (Kochi city)

Plan 2 (Sept. 14, 2014)

Food processing factory (Susaki city)

“Kamaboko” (“Surimi” product), “Katsuobushi” (Dried bonito)

Museum of Tosa Japanese Papers (Ino town)

Plan 3 (Sept. 14-15, 2014: \*Only participant in plan 1)

Deep sea water facility (Muroto city)

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## Program

1st Day  
12<sup>th</sup>, SEP, 2014

### Opening ceremony

10:00 - 10:30    **Greetings and Forwards**

Hirokuni Taguchi	Kochi University
Yoshiaki Iiguni	Kochi University
Houng Yung Chen	National SunYat Sen University
Te-Hao Chen	National Dong Hwa University
Milagros Morales	Bureau of Fisheries and Aquatic Culture Region 2

### Morning Session

#### Keynote Lecture 1

Chairperson : Akira Tominaga

K-1

10:30 - 11:00    **Cross-Border Education in Kuroshio Region**

Fay Lea Patria M. Lauraya, Maureen Mamansag-Maceres

K-2

11:00 - 11:30    **Ocean Management: Integrated Approach of Science, Technology and Human Dimensions**

Hiroyuki Matsuda

#### Lunch

11:30 - 13:00

Afternoon Session

Session 1-1 : Network Formation and Studies of Kuroshio Ecosystems and Biodiversity

Chairperson : Hin-kiu Mok, Gyo Itani, Plutomeo M. Nieves

S1-1

13:00 - 13:20 **Reproductive Biology of Christian Crabs (*Charybdis feriatus*, Linnaeus, 1758) in San Miguel Bay, Philippines**

Plutomeo M. Nieves, Nelson R. Olfindo, Aldrin Mel Macale

S1-2

13:20 - 13:35 **Coastal Marine Ecosystems and Biodiversity of the Kuroshio Region: Intertidal and Mangrove Associated Gastropods in Catanduanes Island, Philippines**

Kristian Q. Aldea, Minerva I. Morales, Jimmy T. Masagca

S1-3

13:35 - 13:55 **The Mechanism of Swarming Rhythm in *Perinereis aibuhitensis* (Polychaeta) Population**

Yan Yi Wu, Keryea Soong

S1-4

13:55 - 14:10 **Different Responses of *Richelia*-diatom Symbioses between Hosts *Rhizosolenia* and *Hemiaulus* under Enhanced Nitrate Concentration**

Sing-how Tuo, Yuh-ling Lee Chen

Coffee Break

14:10 - 14:20

Session 1-2 : Network Formation and Studies of Kuroshio Ecosystems and Biodiversity

Chairperson : Maki Teramoto, Shuntaro Tsubaki, Ching-Nen Nathan Chen

S1-5

14:20 - 14:35 **Designing the Primers for Detecting *nifH* Gene of Potential N<sub>2</sub>-Fixing Heterotrophic Microorganisms ( $\alpha$ -,  $\gamma$ -proteobacteria) in the South China Sea**

Tien-Yi Chen, Yuh-ling Lee Chen, Der-Shyan Sheu

S1-6

14:35 - 14:55 **Pigment Production of a New Thermotolerant Microalga *Coelastrella* sp. F50**

Che-Wei Hu, Lu-Te Chuang, Po-Chien Yu, Ching-Nen Nathan Chen

S1-7

14:55 - 15:15 **N<sub>2</sub>-Fixing Organisms and Their Ecological Importance in the Kuroshio Current**

Houng-Yung Chen, Yuh-ling Lee Chen

S1-8

15:15 - 15:30 **Utilization of Algal Biomass by Microwave-Assisted Hydrothermal Reaction**

Shuntaro Tsubaki, Ayumu Onda, Tadaharu Ueda, Masanori Hiraoka

Morning Session

Keynote Lecture 2

Chairperson : Kimio Fukami

K-3

9:00 - 9:30      **UP-Marine Science Institute Studies on the Oceanology and Marine Science of Waters being Fed to the Kuroshio Current**

Rhodora V. Azanza

Session 2-1 Network Formation and Studies of Marine Resources and Management

Chairperson : Rhodora V. Azanza, Te-Hao Chen, Akihiro Takemura

S2-1

9:30 - 9:45      **Assessment of San Jose Marine Protected Area Gonzaga, Cagayan Philippines**

Jamelita T. Flores, Alejandro Belen, Quirino G. Pascua

S2-2

9:45 - 10:00      **Pen Grow-Out Culture of the Deposit-Feeding Sea Cucumber, *Holothuria scabra* in Fish Farm Impacted Sediments**

Rafael Junnar Dumalan, Marie Antonette Juinio-Meñez

S2-3

10:00 - 10:20      **Whole Effluent Toxicity Testing of Sewage Discharges in Kenting National Park, Taiwan: Lethal and Sublethal Effects in Embryo-Larval Zebrafish**

Te-Hao Chen, Yi-Ling Chen, Chia-Yang Chen, Jing-O Cheng, Fung-Chi Ko

S2-4

10:20 - 10:40      **OPLAN Sagip Ludong: An Inter-Agency Network's Initiatives to Conserve Ludong (*Cestreaus* spp.) in Cagayan Valley, Philippines**

Evelyn C. Ame, Milagros Morales, Jovita P. Ayson

Coffee Break

10:40 - 10:55

Session 2-2 Network Formation and Studies of Marine Resources and Management

Chairperson : Yohei Nakamura, Milagros Morales, Yoshinori Morooka

**S2-5**

10:55 - 11:15    **Lunar Impact on Spawning Rhythmicity in Tropical Fishes and Its Application to the Management of Fisheries Resources**

Akihiro Takemura, Victor Soliman, Felix Ayson, Evelyn De Jesus Grace, Endang Sri Susilo

**S2-6**

11:15 - 11:30    **Important Petroleum-Oil Degraders in Tropical Seawater**

Maki Teramoto

**S2-7**

11:30 - 11:45    **Economic Analysis of Climate Change Adaptation Strategies in Selected Coastal Areas in the Philippines**

Asa Jose U. Sajise, Maripaz L. Perez, Paul Joseph Ramirez, and Glaiza Zamora

Lunch

11:45 - 13:15



Afternoon Session

Session 3 Cross-Border Education and Studies in Marine Biomedicine

Chairperson : Houng-Yung Chen, Akira Tominaga

S3-1

13:15 - 13:35 **Stargazers (Pisces: Uranoscopidae) Have More Bile for Calcium Uptake**

Jung-chen Hsu, Hin Kiu Mok

S3-2

13:35 - 13:50 **Molecular Cytogenetic Study on Scleractinian Corals (Detection of Characteristic Heterochromatin Distribution, Mini-Satellite DNAs Shared with a Human, and Highly Amplified rRNA Genes)**

Takahiro Taguchi, Satoshi Kubota, Takuma Mezaki, Satoko Sekida, Kazuo Okuda, Akira Tominaga

S3-3

13:50 - 14:05 **Pseudoalteromonas A and B, Two Novel Metabolites from *Lobophytum crassum* Associated Bacterium *Pseudoalteromonas* sp. CGH2XX**

Yu-Hsin Chen, Yu-Chia Chang, Jimmy Kuo, Mei-Chin Lu, Tsong-Long Hwang, Ping-Jyun Sung

S3-4

14:05 - 14:20 **Inhibitory Effect on Carbohydrate Digestive Enzyme by the Plants**

MST Tamanna Niger, Kazuhiro Ohtani

S3-5

14:20 - 14:35 **Milkfish Lectins: Significance on Aquaculture Industry and Potential Application in Biomedicine**

Joshua Rovie Lee Daclan, Anacleto Argayosa

S3-6

14:35 - 14:50 **Suppression of Eosinophilia by *Petalonia binghamiae* Polysaccharides May Relate to Their Eotaxin-Binding Ability**

Akira Tominaga, Takahiro Taguchi, Yuko Konishi, Hiromi Okuyama, Yutaka Kusumoto, Shiro Ono

Coffee Break

14:50 - 15:00

2nd Day  
13<sup>th</sup>, SEP, 2014

Session 4 History and Societies along Kuroshio Current; Network Formation of Cross-Border Education in Kuroshio Region

Chairperson : Fay Lea Patria M. Lauraya, Sylvano Mahiwo, Yoshiaki Iiguni

**S4-1**

15:00 - 15:20    **Kuroshio Regions: Global Currents in the Meta-Nation State Highways**

Sylvano D. Mahiwo

**S4-2**

15:20 - 15:40    **Cross-Border Education and Credit Transfer Scheme**

Yi-Ching Huang

**S4-3**

15:40 - 15:55    **Power Generation by Biomass Originated in Broad-leaved Trees : A Feasibility Study**

Yuji Fukuda, Yoshiaki Iiguni

**S4-4**

15:55 - 16:10    **Impacts of Changing Human Lifestyle on Water Quality Surrounding MPAs along Lagonoy Gulf: A Study at San Miguel Island**

Katrina L. Canon

General Discussion

16:10 - 16:50

Closing Ceremony

16:50 - 17:00

Kimio Fukami

Kochi University

## CROSS-BORDER EDUCATION IN KUROSHIO REGION

**Fay Lea Patria M. Lauraya, Ph.D<sup>1\*</sup>, Maureen Mamansag- Maceres<sup>2</sup>**

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### ABSTRACT

Nowadays, countries around the world are being pressed by significant challenges and opportunities that transform the landscape of Higher Education Institutions (HEIs) worldwide. Some of these challenges are internationalization and globalization that led to rapid technological changes and unprecedented mobility of labor and capital. Academic mobility or cross-border education is one key elements of internationalization. Cross border education can play an important role in facilitating country-level lessons, good practice experiences and understanding Kuroshio's common programs or issues. The term Kuroshio, from the publication of Kochi University, the Kuroshio Science, is a Japanese word which means "black current" which describes the bluish-black color of the water where this current traverses. This ocean current flows north from along the eastern coast of Philippines, turns right off the southern coast of Taiwan and then runs eastward along the Pacific coast of Japan, forming a triangle between these three countries, thus the term Kuroshio triangle. The cross border education in the Kuroshio Region offers numerous opportunities for collaboration to help build its human capital development and to understand the phenomenon affecting the region. This paper discusses the experience of Bicol University and Kochi University in the pursuit of cross-border education in the Kuroshio Region.

**Keywords :** Cross-border education, Kuroshio Region, globalization, internationalization, academic mobility

## **Ocean management: Integrated approach of science, technology and human dimensions**

**Hiroyuki Matsuda**<sup>1,2\*</sup>

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### **ABSTRACT**

After the enforcement of UNCLOS (United Nations Convention of the Law of the Sea), a variety of ocean sciences, from oceanography to marine policy, sought integrated approaches on ocean management. Ocean differs from land area in ownership, but territorial user rights exist and differ between high seas, exclusive economic zones (EEZ) and territories. There are international conflict in territoriality and EEZ, while UNESCO encourages to make trans-boundary protected areas such as world heritage and biosphere reserves. The economic value in continental shelf is highly evaluated because a variety of ecosystem services that includes material cycling and water purification. Surface and in-depth area of coastal zones are also specially utilized for marine transportation, recreation, and reclamation. Ecosystem functions of coastal area are heavily damaged by river flood control, shore protection works, reclamation, eutrophication, pollution, fisheries and other kind of human impacts. Offshore is still frontier of human activities, especially in deep-sea where many kind of mineral, fossil, and living resources with new genetic resources probably exist.

Traditionally, marine area is developed by fisheries. Especially in offshore fisheries, overexploitation is critical for sustainability. Therefore, there are three types of conflicts between nations in ocean resources, between fisheries and nature conservation, and between fisheries and other kind of human activities in ocean (e.g., renewable energy). Because of user rights, fisheries and other kind of human activities can coexist even in the same location. Scientists seek to find a solution that is agreeable by all stakeholders.

In this talk, I will explain three case studies: (1) How the scientists convince the necessity of fisheries management to chub mackerel fishers, (2) Why did fishers expand the seasonal fishing ban area in Shiretoko World Heritage site, and (3) Fisheries co-management in Japanese coastal fisheries.

**Keywords :** fisheries, marine protected area, UNCLOS, ecosystem services

## Reproductive Biology of Christian crabs (*Charybdis feriatus*, Linnaeus, 1758) in San Miguel Bay, Philippines

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### ABSTRACT

The reproductive biology of *Charybdis feriatus* was investigated from April 2012 to March 2013 to determine gonad maturity, GSI, fecundity, breeding cycle and size at first maturity. Monthly sample of 30 specimens was randomly collected for gonado-somatic index (GSI), gonad maturity, and fecundity. Gravimetric and volumetric methods were used to estimate fecundity and GSI based on gonad weight/total weight (100). Maturity Stages are based on published literature. Results showed that *Charybdis feriatus* is a continuous breeder with a distinct period of peak reproductive activity during NE monsoon with peak in January where higher values of GSI, matured, and ovigerous females observed. Mean GSI of female and male were 7.35 and 6.27%. Ovigerous females were present year round, the highest occurring is in December (50%). Fecundity ranges from 1,514,000 to 6,357,000 eggs. Smallest reproductively active female was 8.3cm carapace width (CW). The fecundity relationship with size (CW) showed high correlation ( $R^2=0.92$ ). Recommended options include (1) close season, (2) size regulation, (3) no taking of egg-bearing swimming crabs, and (4) egg-bearing crabs contained in a spawning tank and allowed to release its eggs and the larvae released in fishing ground or marine protected areas.

**Keywords :** *Charybdis feriatus*, Gonado-somatic index (GSI), Gonad maturity, Fecundity, Breeding cycle, Size at first maturity

## **Coastal Marine Ecosystems And Biodiversity Of The Kuroshio Region: Intertidal And Mangrove Associated Gastropods In Catanduanes Island, Philippines**

**Kristian Q. Aldea<sup>1</sup>, Minerva I. Morales<sup>2</sup>, and Jimmy T. Masagca<sup>3</sup>**

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### **ABSTRACT**

Kuroshio Region is considered one of the most biologically diverse marine eco-zones but actually faces fluctuations in the recent times. The fact that southern half of this region is bordered by developing countries such as the Philippines, ecological dilemma is bound to continue since a marginalized sector of this country largely depends on it for food, dry goods industries or even medicine while preservation and coastal management are left behind. Some of the most heavily exploited taxa on its coasts are the marine gastropods which in most cases cannot cope to population recovery and habitat loss as people collect more than the rate of their reproduction. Although several gastropod studies in the past show a high species richness, the paper discusses the diversity of gastropods in the mangroves, sea grasses and other intertidal ecosystems where it points out that it is highly likely that a decline is noted from 1999 to 2003 and in 2013. This is due to ecological factors such as overhunting, siltation and farmland residues. Several biodiversity parameters were found to assess the population of marine gastropods where results show a rapid decline. Future studies are recommended for the next five years which will focus on the critically endangered giant triton *Charonita tritonis* and to evaluate biodiversity growth accompanied by mitigation and restoration which will include shellfishing regulations, monitoring and possibly establishing more marine protected areas.

**Keywords :** biodiversity, Catanduanes, gastropods, intertidal, marine

## The mechanism of swarming rhythm in *Perinereis aibuhitensis* (Polychaeta) population

**Yan Yi Wu, Keryea Soong**

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### ABSTRACT

Lunar/semilunar rhythms of reproductive activities are common in shallow seas. In a few species, the rhythms are endogenous, i.e., controlled by a clock-like mechanism of the organisms itself. In other species, the environmental factors alone cue the cyclic behavior. In this study, we focus on the swarming phenomenon in a polychaete worm, *Perinereis aibuhitensis* spawning. Two questions are explored. The first is whether an endogenous circa(semi)lunar clock is involved. The alternative hypothesis to this is that the worms are simply responding directly to the external environmental factors that has a lunar/semilunar cycles. We designed mono-moonlight (just giving full moonlight in first month) as treatment group and multi-moonlight (giving full moonlight every month) as control group. We gave  $0.01\mu\text{Em}^{-2}\text{sec}^{-1}$  artificial moonlight for 4 consecutive evenings every 30 days to imitate natural moonlight. The mono-moonlight group still showed swarming rhythm and the period was about 15 days (analyzed by cosinor software). So, the hypothesis of a biological clock with circasemilunar period is supported. The second question is how the period of this endogenous rhythm is controlled. We raised a total of 5 hypotheses, i.e., “An independent clock”, “Coincidence of two endogenous clocks (circadian and circatidal)”, “Counting endogenous circadian cycle”, “Counting exogenous LD cycle” and “Accumulating light or dark hours”. We designed 5 treatments “constant dark”, “constant light”, “22.5h”, “24h” and “25.5h” five different Light-Dark cycles to test the hypotheses. The result showed that the period of five groups were all the same (analyzed by cosinor software), so the hypothesis of a circasemilunar clock independent of light/dark condition is supported.

**Keywords :** *Perinereis aibuhitensis*, swarming rhythm, circasemilunar, endogenous, independent endogenous clock

## Different responses of *Richelia*-diatom symbioses between hosts *Rhizosolenia* and *Hemiaulus* under enhanced nitrate concentration

Sing-how Tuo<sup>1</sup>, Yuh-ling Lee Chen<sup>1,2\*</sup>

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### ABSTRACT

*Richelia intracellularis*, a heterocystous filamentous cyanobacterium often found symbiotic inside certain diatom hosts, is one of the important N<sub>2</sub>-fixers in the oligotrophic open ocean. Based on a 10-year data set collected from the upstream Kuroshio Current and the northern South China Sea, two genera of diatom hosts, *Rhizosolenia* and *Hemiaulus*, were found showing different symbiotic patterns with the changes of seasons. During winter when temperature and light intensity dropped but nitrate availability enhanced (higher nitrate concentration in surface water together with shoaled nitracline depth), both genera of diatoms had lower symbiotic percentages than that of the summertime. But the abundance of *Rhizosolenia* was increased, in contrast to a decrease in abundance for *Hemiaulus* during then. As many environmental factors fluctuating simultaneously with seasons, a 7-day time-series nitrate enrichment experiment was conducted onboard to discern the effects of high nitrate concentration on symbioses relationships between two groups of diatoms. The results showed that enhancing the nitrate concentration alone would result in a reduced symbiotic percentage for both species of diatoms. And the abundance of *Rhizosolenia clevei* was increased, but that of *Hemiaulus membranaceus* was decreased. Both the field data and the result of the experiment pointed to the same conclusion that *Hemiaulus* was more dependent than *Rhizosolenia* on the nitrogen fixation by *Richelia*. Nitrate repletion that is favorable to most diatoms might suppress the *Richelia* symbioses with hosts *Hemiaulus* or *Rhizosolenia* through different patterns.

**Keywords :** *Richelia intracellularis*, *Rhizosolenia clevei*, *Hemiaulus membranaceus*, symbiotic patterns, nitrate



## Designing the primers for detecting *nifH* gene of potential N<sub>2</sub>-fixing heterotrophic microorganisms ( $\alpha$ -, $\gamma$ -proteobacteria) in the South China Sea

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### ABSTRACT

Recent reports suggested that heterotrophic diazotrophs (N<sub>2</sub>-fixers) such as  $\alpha$ - and  $\gamma$ -proteobacteria may play an important role in nitrogen cycle in the South China Sea (SCS). The purpose of this study was to design highly specific primers to quantitatively detect the *nifH* gene copies of  $\alpha$ - and  $\gamma$ -proteobacteria, respectively, in the northeastern SCS. Used a nested PCR protocol, *nifH* genes were amplified from water samples collected in the northeastern SCS. A gene library of the PCR product was then constructed. In the preliminary screening results of 72 *nifH* clones, there was no one derived from  $\alpha$ -proteobacteria. Next Generation Sequencing (NGS) was further adopted to resolve the PCR amplified *nifH* genes. And *nifH* genes derived from  $\alpha$ - and  $\gamma$ -proteobacteria were both shown. The phylogenetic tree analysis indicated that there were two distinct subgroups of *nifH* genes for each of  $\alpha$ -proteobacteria and  $\gamma$ -proteobacteria. A specific primer set was designed for each of these four subgroups of  $\alpha$ - and  $\gamma$ -proteobacteria *nifH* genes. The cross reaction, specificity and sensitivity of each primer set will be examined before the primer sets being used to detect the field samples from the SCS.

**Keywords :** proteobacteria, *nifH* gene, primer, phylogenetic tree, South China Sea, Kuroshio current

**Pigment Production of a New Thermotolerant Microalga *Coelastrella* sp. F50****Che-Wei Hu<sup>1</sup>, Lu-Te Chuang<sup>2</sup>, Po-Chien Yu<sup>1</sup> and Ching-Nen Nathan Chen<sup>1\*</sup>**<sup>1</sup>Department of Oceanography, National Sun Yat-sen University, Kaohsiung 804, Taiwan<sup>2</sup>Department of Biotechnology University, Yuanpei University, Hsinchu 300, Taiwan

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**ABSTRACT**

Microalgae are good crops to produce natural pigments because of their high growth rates. Tropical zones are better locations than temperate areas for microalgal cultivation because they have longer duration of daylight and more stable temperatures throughout the year, but the high temperatures pose a challenge to microalgal cultivation. A newly isolated thermotolerant microalga produces reddish pigments under environmental stress. Morphological and molecular evidence including meridional ribs on the cell wall, pigment production, and its 18S rDNA sequence suggests that this microalga belongs to the genus. Salt stress and high light intensity accelerated biosynthesis of the pigments, and significant quantities of oil accumulated as the cells experienced stress due to nutrient deficiency. This microalga could withstand temperature of 50 °C for more than eight hours, which is a necessary trait for outdoor cultivation in tropical areas. The pigments contain astaxanthin, lutein, canthaxanthin, and  $\beta$ -carotene as analyzed by using HPLC.

**Keywords :** Microalgae, carotenoids, thermotolerance, environmental stress, *Coelastrella*

## N<sub>2</sub>-fixing organisms and their ecological importance in the Kuroshio Current

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### ABSTRACT

The nitrogen cycle controls biological productivity in marine systems and is thus associated with flux of carbon in the ocean. Some components of the nitrogen cycle are potentially involved and play important roles in climate changes. Researches in the last decade have revealed the complexity of the nitrogen cycle and the diversity of organisms involved. These findings have changed our understanding of the pathway and components of the marine nitrogen cycle. The increased adoption in knowledge of genes and molecular biology has greatly impacted our understanding of the importance of nano- and pico-plankton in the marine nitrogen cycle. Nitrogen-fixing microorganisms reduce atmospheric N<sub>2</sub> to ammonia, which is an important nitrogen source for plants. In the Ocean, N<sub>2</sub> fixation is carried out mostly by filamentous and unicellular nitrogen fixers (diazotrophs). The filamentous cyanobacteria *Trichodesmium* are the most important diazotrophs in the Kuroshio Current and its associated waters. Productivity studies in the Kuroshio have revealed during summer a high water-column integrated primary productivity but a limited nitrate-based new production rate, implying during then N<sub>2</sub> fixation likelihood the important N source to support the productivity. *Trichodesmium* and its associated N<sub>2</sub> fixation rate was found high in warm season in the Kuroshio. As *Trichodesmium* fix nitrogen, they pass the nitrogenous products to their neighboring diatoms. The Kuroshio, with supplement of N<sub>2</sub> fixation from *Trichodesmium* and an efficient trophic transfer system in warm season sustains a medium primary productivity year round, renders an ecosystem that supports an array of migratory fish and mammals.

**Keywords :** N<sub>2</sub> fixation; Kuroshio Current; diazotrophs; *Trichodesmium*

## Utilization of algal biomass by microwave-assisted hydrothermal reaction

**Shuntaro Tsubaki<sup>1\*</sup>, Ayumu Onda<sup>2</sup>, Tadaharu Ueda<sup>2</sup>, Masanori Hiraoka<sup>3</sup>**

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### ABSTRACT

Macroalgae and microalgae are the promising biomass feedstock to produce biofuels, biochemicals and value added bio-based materials. Hydrothermal reaction is capable of degrading algal body into useful chemicals without drying of highly wet algae. In this study, microwave energy was employed to initiate hydrothermal reaction by direct and internal heating of reactants and water molecules that predominantly present in algae. Microwave is a kind of electromagnetic wave between 300 MHz – 300 GHz which is widely used in telecommunication and radar. Microwave is also capable of heating materials by molecular friction due to rotation of dipole, vibration of ions in solution as well as Joule heating of conductive and magnetic materials, and these phenomenon have been successfully applied as domestic cooking device. In the present study, microwave reaction was applied to hydrothermal hydrolysis to produce rare sugars by degrading algae. Subsequently, solid acid catalyst was developed by combining microwave absorbing materials to improve hydrolysis of algae with better microwave heating efficiency. Finally, molecular interpretation underlying dielectric property of algal substrates in water was investigated by using dielectric measurement.

**Keywords :** algal biomass, microwave-irradiation, hydrothermal reaction, solid catalyst

## **UP-Marine Science Institute Studies on the Oceanology and Marine Science of Waters being Fed to the Kuroshio Current**

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### **ABSTRACT**

The eastern boundary currents off the coast of the Philippines are critically important in the general flow circulation of the Pacific Ocean. The westward flowing North Equatorial Current (NEC) runs into the Philippine coast and bifurcates into the northward Kuroshio Current (KC) and the southward Mindanao Current (MC). Kuroshio forms on the east of Luzon, passes through the Luzon Strait, meets the East China Sea Run-through current, and waters exchange in large scale with the currents of South China Sea, the Yellow Sea and the East China Sea.

The Marine Science Institute of the University of the Philippines has been involved in several researches/cruises that aim to understand how the NEC bifurcates into KC and MC and how it affects the biodiversity and marine resources off the eastern coast. Past programs/projects like the Pacific Seaboard Research and Development Programs (PACSEA I & II), were undertaken to increase knowledge on the coastal resources (seaweeds, seagrasses, fishes, corals and other reef-associated plants and animals) at the eastern side of the Philippines. Information generated from these programs could be used in planning for the sustainable management of these resources. A concerted study of the marine biodiversity and marine resources of the Pacific coast is important in the face of the growing needs of an expanding population. A more recent US-Office of Naval Research (ONR) funded project entitled “Shelf Pacific Interaction in Luzon (SPIL)”, looks at how the complex coastline and shelf configuration off eastern Luzon interacts with the NEC bifurcation and the Kuroshio Feeder Current, and how the interaction impacts primary productivity in the area. Quantifying the spatial and temporal characteristics of the ocean processes governing the stratification and circulation on the eastern coasts of the Luzon will be essential in understanding the possible linkage of these processes/dynamics to the development of Kuroshio.

## Assessment of San Jose Marine Protected Area Gonzaga, Cagayan Philippines

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### ABSTRACT

This paper states the condition of the coral reef and fish resources in San Jose Marine Protected Area (MPA). It aims to assess the current condition of the resources present in the MPA thru line intercept transect method for the coral reef assessment and fish visual census in six monitoring transects. Results show that corals covers were found to be in **FAIR** condition with average live coral cover of 43% composing of *Acropora* 6% and Non-*Acropora* 37%. Other life benthic forms percentages were dead scleratinia at 41%, algae at 1%, other fauna at 6% and abiotics or non-living at 10%. Inside MPA core zone has a **FAIR** coral reef condition at 44% live coral cover with Transect 3 distinctly having **GOOD** corals at 52% live coral cover. Outside the MPA core zone still exhibits **FAIR** corals but in a lower percentage cover (41%).

For fish abundance, a total of 105 kinds of fish species belonging to 18 families were recorded. Out of all species counted, 21% or 448 are target species. Coral indicator species is 22% or 467 while major species is only 1%. Fish biomass of the MPA zones was also computed. Inside the MPA has the highest fish biomass 4 metric tons in average while Outside is 3 metric tons, there is 1 metric tons difference than the fish biomass Inside the MPA. This also means that there is more fishing pressure in the buffer zone of the MPA. The dominant fish species according to family are the surgeon fishes or *labahita* (Family *Acanthuridae*) at 41% of the total count, the Fusiliers or Dalagang bukid (Family *Caesionidae*) at 12% and *Labridae* or *Labayan* (Family *Labridae*) at 10%.

**Keywords :** Marine Protected Area (MPA), resource assessment, Gonzaga Cagayan

## Pen grow-out culture of the deposit-feeding sea cucumber, *Holothuria scabra* in fish farm impacted sediments

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### ABSTRACT

This study aimed to investigate the potential of deposit-feeding *Holothuria scabra* to utilize organically-enriched sediments. A two-phase pen grow-out experiment was conducted using 49m<sup>2</sup> sea pens located in fish farm impacted area and seagrass bed (reference site). Total suspended solids and sedimentation rate differed significantly between sites ( $p < 0.05$ ). Fish farm impacted sediments had higher chlorophyll and organic matter content than the reference site ( $p < 0.01$ ). Fish farm sediment is mostly composed of finer sediments ( $< 250\mu\text{m}$ ) while coarse sand and coral rubble dominated the reference site.

In the first grow-out trial, growth and survival of *H. scabra* ( $57.38 \pm 4.34$ ) was compared between sites at a stocking density of 1 ind m<sup>-2</sup>. *H. scabra* cultured near fish farm area grew significantly faster ( $1.16 \text{ g day}^{-1} \pm 0.23$ ) than those cultured in the reference site after 207 days ( $p < 0.05$ ). Highest specific growth rate was observed after 29 days of culture in both sites ( $1.46 - 1.02 \% \text{ day}^{-1}$ ) compared to other monitoring days. An estimated *H. scabra* biomass of 305.54 g m<sup>-2</sup> was reached in the fish farm area while pens in the reference only had 106.08 g m<sup>-2</sup>. In the second phase of grow-out, initial weight differed between sites to determine whether both sites can still support positive *H. scabra* growth at a stocking density of 0.5 ind m<sup>-2</sup>. Significant growth was only observed in the animals cultured in the reference site from 119.36 g ( $\pm 13.19$ ) to 205.41 g ( $\pm 29.64$ ) after 144 days ( $p < 0.05$ ). Meanwhile, *H. scabra* cultured in the fish farm area showed positive growth but was not significantly different among monitoring days. Moreover, there was no difference in the survival of *H. scabra* in both sites at 2 grow-out phases. This study demonstrated the feasibility of better pen grow-out culture of *H. scabra* in fish farm impacted sediments converting organic waste into a marketable product (sea cucumber biomass). A simple return-on-investment of a small-scale pen grow-out culture is also discussed.

**Keywords :** deposit-feeding, fish farm, grow-out culture, *Holothuria scabra*, sea pens

## **Whole effluent toxicity testing of sewage discharges in Kenting National Park, Taiwan: lethal and sublethal effects in embryo-larval zebrafish**

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### **ABSTRACT**

Domestic sewage containing complex pollutants may impact fish individuals or populations in the receiving water. This study aimed to use a zebrafish embryo-larval bioassay to test the whole effluent toxicity of sewage in Kenting National Park, a seaside resort area which attracts millions of tourists annually in Taiwan. Water samples were collected from downstream Shiniu Creek, Kenting Ditch, and Xiaowan Creek in Kenting area from May to October in 2010, and 28 target pharmaceuticals and personal care products (PPCPs) were analyzed. During the monthly bioassay, zebrafish embryos were exposed to the water samples or control water. Embryonic hatching rate, survival rate, and deformity were recorded. Larval locomotor behavior was also quantified using an animal movement tracking system. Hatching and survival rates were negatively affected at all sites in certain months. However, deformity rate was not significantly different between the groups. Interestingly, decreased swimming speed and activity level were observed in the morphologically normal larvae, indicating behavioral toxicity. High levels of some PPCPs, e.g., caffeine, DEET, and NP, were measured in the water samples. The results show that domestic sewage in Kenting area can cause lethal and sublethal effects in embryo-larval fish. Our study also demonstrates that whole effluent toxicity bioassays are useful for monitoring and early warning of water quality in areas with high tourist activity levels.

**Keywords :** Whole effluent toxicity, sewage, Kenting National Park, zebrafish



## **OPLAN Sagip Ludong: An Inter-Agency Network's Initiatives to Conserve Ludong (*Cestreus spp.*) in Cagayan Valley, Philippines**

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### **ABSTRACT**

Ludong (*Cestreus spp.*), also called the President's Fish, is one of the most expensive edible fishes in the Philippines today. Price range for a kilo in 2012 is from P4,500.00 to P5,000.00. Its rarity and its unique and captivating taste make it a favorite gourmet of the rich and well off families in the Cagayan Valley region. It inhabits the headwaters of Cagayan River and its tributaries and known to migrate from October to December of every year when flood waters upstream flow through the river system after heavy rains. Heavy exploitation, as result of its high market price, has led to a marked decrease on its natural population and size through the years. This paper discusses the initiatives undertaken on Ludong dubbed as "OPLAN Sagip Ludong" a multidisciplinary network of implementers that collaboratively conducted various researches and information campaign to provide policy recommendations on how the fish can be conserved. Aspects on reproductive biology, fishing technology, and socio economic were discussed in this paper.

**Keywords :** Ludong (*Cestreus spp.*), conservation, Cagayan Valley, OPLAN Sagip Ludong

## Lunar impact on spawning rhythmicity in tropical fishes and its application to the management of fisheries resources

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### ABSTRACT

Many teleost fishes inhabiting shallow sub-tropical to tropical waters repeat synchronous spawnings around the species-selective lunar phase during the spawning season. For example, the white-spotted spinefoot *Siganus canaliculatus* (formerly white-spotted rabbitfish) and the goldlined spinefoot *S. guttatus* (formerly golden rabbitfish) release their gametes around the new moon and the first quarter moon period, respectively. In addition, their fry migrate into mangrove and coast area around the following new moon period. Since the lunar phase utilized by these spinefoots does not change in any regions in the Indo-Pacific Ocean, it is likely that spinefoots can perceive cues from the moon and transduce them as internal signals. In fact, periodical change in moonlight intensity is expressed as plasma levels of melatonin, which is an indoleamine synthesized by the pineal organ and retina and an endogenous transmitter of environmental light/dark cycle. Among light sensitive components of the circadian system, mRNA expressions of cryptochrome (Cry3) and period (Per2) in the neural tissues fluctuate according to lunar cycle. To date, it is not fully understood how lunar cycle is regulated endogenously. However, our knowledge of lunar spawning periodicity in commercially important species may help management of fisheries resources; it offers information of appropriate periods and area for prohibition of fishing as well as efficient aquaculture techniques for inducing synchronous spawning. It is necessary to establish the international research and educational network, if we want to learn more about precise mechanism on lunar impact in marine organisms and to utilize it for sustainable development of our society.

**Keywords :** aquaculture, coral reef, fisheries, grouper, lunar cycle, rabbitfish, spawning

## Important petroleum-oil degraders in tropical seawater

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### ABSTRACT

Crude oil accidentally discharged into the marine environment can be degraded and remediated by indigenous microbes such as oil-degrading bacteria, which have been indicated to be ubiquitous in marine environments. A wide variety of the oil-degrading bacteria are known to date. However, the bacteria characterized are mainly from temperate marine environments and relatively few studies have been conducted on the bacteria in tropical marine environments. In recent years, the types of bacteria important for the degradation of crude oil in the tropical marine environment have been indicated by laboratory culturing (Teramoto et al., 2009). Also, it has been demonstrated that the types of bacteria, which have been indicated by laboratory culturing to be important for the degradation, would actually be major (important) degraders of petroleum hydrocarbons spilt in actual tropical seas by looking at the indigenous bacterial community in the Strait of Malacca (Teramoto et al., 2013). In this present report, I gave a brief summary of the important petroleum-oil degrading bacteria in tropical marine environments.

**Keywords :** Bioremediation, Petroleum hydrocarbons, *Alcanivorax*, *Oleibacter*, Tropical marine environment.

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- Maki Teramoto, Shu Yeong Queck and Kouhei Ohnishi. 2013. Specialized hydrocarbonoclastic bacteria prevailing in seawater around a port in the Strait of Malacca. *PLoS ONE* 8: e66594.

## Economic Analysis of Climate Change Adaptation Strategies in Selected Coastal Areas in the Philippines

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### ABSTRACT

This study documents a long-standing line of research of the Worldfish Center – Philippine Country Office (PCO) to identify cost effective public adaptation and understand the drivers of autonomous adaptation against climate change hazards affecting coastal communities namely: typhoon/flooding, coastal erosion, and saltwater intrusion. It employed a common methodology, which included a variety of techniques ranging from participatory-based approaches such as community hazard mapping and FGDs to regression techniques to analyze the results of the household surveys. Having a common methodology insured comparability and generalization of results in various sites and stages of implementation of the study.

Results show that indeed households in coastal communities face a confluence of hazards or risks and often adapt simultaneously to these risks. Impacts were mainly on loss of property and assets and foregone income from livelihoods. Monetary value of these impacts was however low largely because these communities are generally poor. Fishing households and those with high dependency ratios were most vulnerable to these hazards. Vulnerability and Hazard Analysis also revealed that man made environmental hazards such as siltation and sand mining often compounded impacts from these climate hazards.

Cost effectiveness analysis of community identified public adaptation options, on the other hand showed that ecosystem based strategies such as mangrove rehabilitation and biological restoration of riverbanks were cost effective strategies. This was a common and consistent result in the different study sites. Finally, multivariate probit regressions on the determinants of autonomous adaptation indicated that poor household act rationally against climate hazards. This negates the view that poor households are complacent against climate hazards. These autonomous adaptation strategies are effective but are not enough to protect households. Thus, there is a role for public adaptation strategies in increasing household resiliency. Public adaptation strategies however can either complement or crowd out private adaptation; therefore caution should also be exerted when implementing these strategies. These adaptation strategies were also conditioned on the nature of the hazards (i.e. extreme vs. slow and creeping events) and have a gender dimension. The level of social capital also was found to increase autonomous adaptation. Thus, increasing trust within communities and organizing communities can help increase household resiliency in coastal areas..

**Keywords :** Vulnerability and Impact Assessment, Cost Effectiveness Analysis, Multivariate Probit, Public and Autonomous Adaptation, Coastal Communities, Philippines

**Stargazers (Pisces: Uranoscopidae) have more bile for calcium uptake****Jung-chen Hsu<sup>1</sup>, Hin Kiu Mok<sup>1\*</sup>**<sup>1</sup> Institute of Marine Biology, National Sun Yat-sen University, 70 Lienhai Road, Kaohsiung 80424, Taiwan

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**ABSTRACT**

Our elementary anatomical investigations indicate that the stargazers (Uranoscopidae) have a relative smaller brain and larger bile volume than other fish species we examined. To explain why they need so much bile, two hypotheses are proposed: (1) the bile is acting as sex pheromone, and (2) the bile enhances calcium uptake efficiency as calcium is essential for building strong bone. The bile volumes were not significantly different between the female and male stargazers and the bile volumes showed no monthly difference. Besides, the number of olfactory epithelium and the neuron density of the telencephalon in stargazers were not higher than the other species examined. As such, the hypothesis of its serving as sex pheromone cannot be supported. The cranium hardness, bone density, and calcium content in stargazers were significantly higher than other examined species. Most fish species uptake calcium by the gills and the intestine from water and food, respectively. However, the marine stargazers often hide in the sand and wait for the preys such that there the gills might not be the main route of calcium uptake. Therefore, stargazers possibly need much more bile to help absorb calcium through the digestive system.

**Keywords :** Uranoscopidae, bile, brain, sex pheromone, calcium uptake.

## **Molecular Cytogenetic study on scleractinian corals (Detection of characteristic heterochromatin distribution, mini-satellite DNAs shared with a human, and highly amplified rRNA genes)**

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### **ABSTRACT**

There are many genera in scleractinian corals (more than 800 species) but their classification is still obscure. Even though coral biologists have extensively addressed classification of scleractinian corals by molecular and morphological approaches, there still remains to be some inconsistency among the recent studies. Coral cytogenetics is one way to overview relationships among corals in order to contribute to coral classification. However, available cytogenetic information concerning scleractinian corals is limited. Karyotypic (chromosome) data can provide a helpful framework for future coral genome projects. Considerable information can be obtained by examining a karyotype, e.g., information relevant to evolutionary relationships, phylogenetics, and sex determination. The recent advent of molecular cytogenetic techniques is indispensable to the genetic study on many kinds of organisms. The key techniques of molecular cytogenetics such as a fluorescence in situ hybridization (FISH) complement conventional cytogenetics. Application of FISH technique is essential to develop coral cytogenetics and genome study. In this section, we talk about new molecular cytogenetic findings on the scleractinian corals about karyotypes, heterochromatin distribution pattern, mini-satellite DNAs shared with human, and rRNA gene (rDNA) mapping demonstrating by FISH techniques. These data will assist to explore the process of chromosome evolution and phylogenetics of scleractinian coral.

**Keywords :** scleractinian coral, chromosome, rRNA genes, FISH, heterochromatin, mini-satellite DNA

## Pseudoalteromones A and B, Two Novel Metabolites from *Lobophytum crassum* Associated Bacterium *Pseudoalteromonas* sp. CGH2XX

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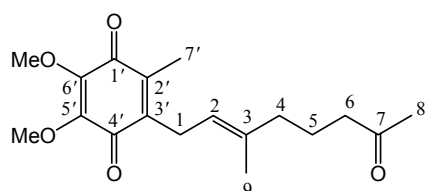
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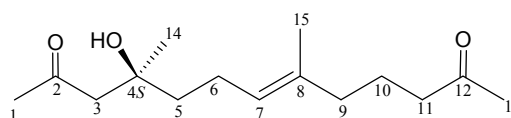
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### ABSTRACT

Two novel metabolites, pseudoalteromones A (**1**) and B (**2**) were purified from cultured-type *Lobophytum crassum* associated marine bacterium *Pseudoalteromonas* sp. CGH2XX. The structures of compounds **1** and **2** were established by spectroscopic methods. Pseudoalteromone A (**1**) is a novel ubiquinone derivative possessing a 9C nor-monoterpenoid moiety. Pseudoalteromone B (**2**) is a novel 15C compound possessing a novel carbon skeleton. Pseudoalteromone A (**1**) exhibited significant cytotoxicity toward the MOLT-4 (human acute lymphoblastic leukemia, IC<sub>50</sub> = 3.76 µg/mL) cells and displayed moderately inhibitory effects on the generation of superoxide anion (inhibition rate 38.0%) and the release of elastase (inhibition rate 20.2%) by human neutrophils at a concentration of 10 µg/mL. Pseudoalteromone B (**2**) displayed a modestly inhibitory effect (inhibition rate 20.7%) on the release of elastase by human neutrophils at a concentration of 10 µg/mL.



**1**



**2**

**Keywords :** *Pseudoalteromonas*, pseudoalteromone, *Lobophytum*, cytotoxicity, superoxide anion, elastase

## Inhibitory effect on carbohydrate digestive enzyme by the plants

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### ABSTRACT

Type-2 Diabetes mellitus is more common in diabetic populations. In this type of DM, inhibition of  $\alpha$ -glucosidase is a useful treatment to delay the absorption of glucose after meals. Carbohydrate digestive enzyme,  $\alpha$ -glucosidase is the key enzyme catalyzing the final step in the digestive process of carbohydrates.  $\alpha$  glucosidase inhibitors that could inhibit the activity of  $\alpha$ -glucosidase are potentially used for antidiabetic by suppressing postprandial hyperglycemia.

In this study, methanol extracts of several randomly selected twenty-two plants were tested inhibitory activity against yeast  $\alpha$ -glucosidase. Among them eight plants (*Quercus phillyraeoides*, *Mallotus japonicas*, *Sapium sebiferum*, *Elaeocarpus sylvestris* var. *ellipticus*, *Myrica rubra*, *Terminalia chebula*, *Emblica officinalis*, *Terminalia belerica*) showed high inhibitory activity against  $\alpha$ -glucosidase enzyme. Their methanol extracts were then separated using partition with n-hexane, ethyl acetate, n-butanol and water. The extract of *Q. phillyraeoides* leaf (ethyl acetate and n-butanol extract), *T. chebula* (BuOH extr.), *M. japonicas* leaf (BuOH extr.), *E. sylvestris* var. *ellipticus* leaf (ethyl acetate and BuOH extr.) represented excellent inhibitory activity against the enzyme. One  $\alpha$ -glucosidase inhibitor was isolated from the BuOH extract of *T. chebula*. Our study, for the first time, revealed the anti-diabetic activity and this study could be helpful to develop medicinal preparations or nutraceutical and functional foods for diabetes and related symptoms.

**Keywords :**  $\alpha$ -glucosidase inhibitor, Diabetes mellitus, *Terminalia chebula*



## **Milkfish lectins: Significance on aquaculture industry and potential application in Biomedicine**

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### **ABSTRACT**

Lectins are naturally occurring proteins that selectively bind carbohydrates and combine with the glyco-components present on the cell surface. They have been identified to recognize specific oligosaccharides on the surfaces of the cell and function in specific cell recognition process. In teleosts, lectins are known as important molecules involved in innate immune responses. In this study, fucose-binding protein (FBP) and mannose-binding protein (MBP) were isolated from milkfish serum. Through reducing SDS-PAGE, molecular weights of 10 kDa and 15 kDa were observed in milkfish MBP and FBP, respectively. Isoelectric focusing showed isoelectric points of pH 4 in FBP and pH 4 and pH 6 in MBP. Investigating fish lectins is useful in fish health, both in gaining understanding of the fish immune system and of the development of applications for fish disease prevention. Lectins can also serve as biomarkers in assessing fish health which can aid to further improve the aquaculture industry. In humans, studies have reported that the occurrence of certain disorders and susceptibility to infections are associated with alterations in lectin expression and structure. Thus, the purification and characterization of lectins in milkfish may also serve as reference in understanding the roles of lectins in higher order vertebrates such as humans and subsequently provide a potential application in the field of Biomedicine.

**Keywords :** lectins, milkfish, fish innate immunity, aquaculture industry, Biomedicine

## Suppression of eosinophilia by *Petalonia binghamiae* polysaccharides may relate to their eotaxin-binding ability

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### ABSTRACT

We have reported that *Petalonia binghamiae* polysaccharides suppressed the delayed-type hypersensitivity (DTH) via a Toll-like receptor (TLR) 4 signal. Treatment with either *Petalonia binghamiae* polysaccharides strongly suppressed DTH and eosinophilia in C3H/HeN mice but not TLR-4 mutant C3H/HeJ.

*Petalonia binghamiae* polysaccharides but not alginic acid or fucoidan suppressed the DTH in C3H/HeN mice in either oral or intraperitoneal administration. Number of eosinophils at the site of inflammation was decreased significantly by the administration of *Petalonia binghamiae* polysaccharides but not by that of alginic acid or fucoidan.

In this study, we examined whether *Petalonia binghamiae* polysaccharides can bind to eotaxin, a potent chemoattractant for eosinophils. We found that *Petalonia binghamiae* polysaccharides bind to eotaxin more efficiently compared with alginic acid and fucoidan in terms of a surface plasmon resonance analysis.

In conclusion, *Petalonia binghamiae* polysaccharides suppressed the migration of eosinophils toward the site of antigen challenge at least, in part, by binding to eotaxin. Although the binding ability of algae polysaccharides to eotaxin does not always correlate with the degree of suppression of DTH, this is one of the criteria that we can use for selecting materials before applying them in vivo

**Keywords :** *Petalonia binghamiae*, polysaccharides, eosinophils, eotaxin, TLR4, surface plasmon resonance analysis

## Kuroshio Regions: Global Currents in the Meta-Nation State Highways

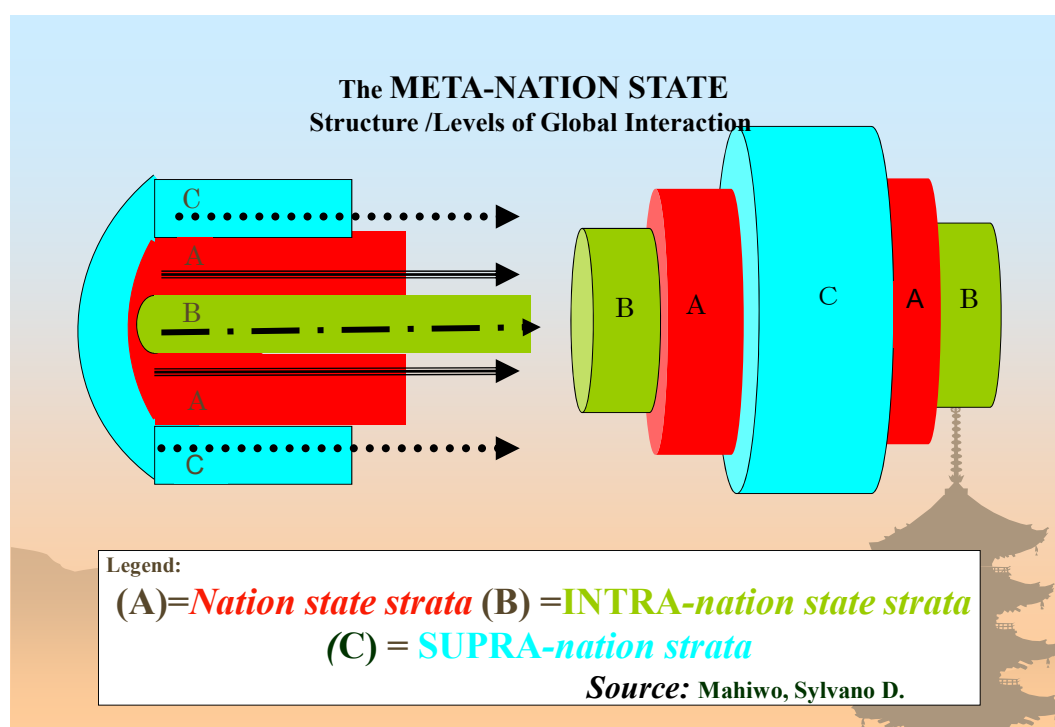
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### ABSTRACT

The paper situates the KUROSHIO regions in the Meta-nation state(1) relations concept with focus on the natural and deliberate trailblazing of KUROSHIO routes as a medium of peoples' community interactions in the Asia Pacific contemporary affairs.



The paper is a navigation of the KURSHIO regions through or via the Meta-nation state strata and highways as a model of theoretical/pragmatic approach to the KUROSHIO waves as state-generated and or non-state generated interactions (including EDUCATIONAL & CULTURAL inter-flows). On a more refined scale, the KUROSHIO Cross-border interflows or exchanges maybe categorized as A). nation-state wave currents, B). Intra-nation state wave currents and C). Supra-nation state wave currents across the borderless KUROSHIO communities /regions. The Meta-nation state perspective can sharpen challenges and opportunities in the identification and development of patterns of natural and deliberate interactions in the broad array of interplays that overlap in the areas of economic, political, security, and socio-cultural spheres. The KUROSHIO phenomenon is analyzed in an inter-disciplinary and multi-disciplinary approach could be a basic step in the search for new patterns and possibilities in local, regional, and global contemporary

networking.

**Keywords :** KUROSHIO regional multi-entities (players/actors), interaction venue, process dynamics; and the Meta-nation state relations paradigm, (nation state wave currents, intra-nation state wave currents, extra-nation state wave currents), archipelagic communities, common geo-cultural heritage, and NETWORK evolution.

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## Cross-border education and credit transfer scheme

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### ABSTRACT

The Kuroshio Current ties Japan, Taiwan, and Philippine together. It provides abundant nature resources on living and research to Kuroshio Region. Forming a cross-border education is the best way to share and utilize the recourses.

Under the cross-border education, students can take courses and do researches outside the school, even outside the country. It is also an efficient way to develop an in-depth cooperation between universities. By promoting student mobility program among the participate universities, such as exchange programs, dual degree programs and short-term study programs, knowledge and research result will be able to be spread in the region and create greater impact.

Below are the examples of cross-border education and how they work:

1. In Europe, European Unit created European Credit Transfer and Accumulation System (ECTS) is now used among higher education institutions across the European Union and other collaborating European countries as a standard for comparing the study attainment and performance of students.
2. University Mobility in Asia and the Pacific (UMAP) has also developed a pilot UMAP Credit Transfer Scheme (UCTS) to facilitate student mobility. UCTS model adopted the European Credit Transfer and Accumulation System (ECTS) in order to assist and facilitate the student mobility and create a flexible method to transfer credits between participating universities.

With the academic links existing among the region, we should be able to create a couple of long-term projects, such as lab intern and joint research, which will lead to our goal – Kuroshio League.

**Keywords :** cross-border cooperation, credit transfer, student mobility programs

## Power Generation by Biomass Originated in Broad-leaved Trees : A Feasibility Study

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### ABSTRACT

This study aims to examine whether woody biomass originated in broad-leaved trees will be able to provide enough resource for two thermal power plants newly established in Kochi Prefecture.

In Japan, feed-in tariff (FIT) system was introduced in 2012, which promotes alternative energy use, such like wind power generation, photovoltaic power generation and biomass power generation so on with high tariff for electricity. Taking this opportunity, in Kochi Prefecture two private thermal power plants were established in 2013. The stations contribute their share to social welfare by generating electricity carbon-neutrally and conserving forest by enlargement of thinning areas.

By now, it has been supposed that conifer trees (cedar and cypress etc.) would be the main resource demanded by the stations. However, in the case of conifer trees, there is demand for construction-use besides wood chips-use for power generation. Derived willingness to pay by the demand of construction industry is much higher than it by the demand of wood chips manufacture. As the result, the demand by chips industries in the conifer has been kept out in the logs markets. Now shortage of resource for the stations (woody biomass) is becoming serious concern.

To cope with this problem, we focused on broad-leaves trees, which cover about 34% of forest area in Kochi Prefecture, and examine the feasibility of power generation by biomass originated in broad-leaved trees through market analysis of logs for chips production.

The analysis is divided into three steps; 1) estimation of demand function of two power generation stations with specification of break-even price and shut-down price, 2) estimation of supply function of broad-leaved trees, 3) market equilibrium analysis and examination of profitability of the two stations.

The results are as follows; 1) the station can take profit out of the generation, 2) the supply of broad-leaved trees is enough to operate the two stations.

**Keywords :** Power Generation, broad-leaved trees, feed-in tariff (FIT) system

## **Impacts of Changing Human Lifestyle on Water Quality Surrounding MPAs along Lagonoy Gulf: A Study at San Miguel Island**

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### **ABSTRACT**

This study generally aims to establish the impacts of changes in human lifestyle on the quality of water and its accompanying effects on MPA's along Lagonoy Gulf. Moreover, it specifically aims to determine the following: (1) status of the water quality of Lagonoy Gulf in terms of the physico-chemical parameters; (2) level of phosphorus and surfactants loads in water; (3) determine traces of phosphorus and surfactants in marine mollusks; and (4) determine changes in the day to day activities in the area. The results of several studies conducted in other parts of the world concerning on the effects of the chemical components, such as surfactants and phosphorus, in the materials used by humans especially detergents showed that the said compounds had impacts on water quality. Thereby, the same objective is the basis of determining the loads of the said compounds in San Miguel, in which, reliance on quality water is very critical, since there is an established marine sanctuary in the area that supports and protects mostly all of the marine flora and fauna inside its periphery. Therefore, this aims to create awareness on the impacts of their activities in the condition of water. In addition it can also provide baseline data useful for further studies the area.

**Keywords :** lifestyles, water quality, phosphorus, San Miguel, surfactants