

Summary Report of the Symposium by Graduate Students

Marine Stations in the Kuroshio and South China Sea

The first session presented the marine stations in the Kuroshio and South China Sea regions. This session is important in forming links between stations and academy for future research collaborations. In total, thirteen stations participated, four from **Taiwan** (*Green Island Marine Research Station of Academia Sinica, National Museum of Marine Biology and Aquarium, Dongsha Atoll Research Station of National Sun Yat-sen University and Taiping Island Research Station of National Taiwan University*), two from the **Philippines** (*Bolinao Marine Laboratory of the Marine Science Institute University of the Philippines and University of San Carlos Marine Station*), and one from **Japan** (*Amakusa Marine Biological Laboratory of Kyushu University*), **Vietnam** (*Doson Marine Research Station, of the Institute of Marine Environment and Resources*), **Guam** (*University of Guam Marine Laboratory*), **Thailand** (*Angsila Marine Science Station of Chulalongkorn University*), **Malaysia** (*Bachok Marine Research Station of University of Malaya*), **Singapore** (*St. John's Island National Marine Laboratory of National University of Singapore*) and **Indonesia** (*Yayasan Biodiversitas Indonesia a non-profit organization*). Relevant information was presented by each station, such as their research thrusts, expertise, case studies, affiliations, contact information, number of residing scientists/support staff and their specialties, available equipment and instruments, and facilities, among others. The stations have one interest in common – the conservation and restoration of marine ecosystems, the mangroves, seagrass/algal meadows, coral reefs and deep sea. Of these, most stations have special interest on the coral reef ecosystem. The stations studied the coral reef biology, ecology, reproduction, breeding, aquaculture and restoration. Successful case studies of coral breeding and restoration were also presented. Other areas of interest by the stations are on marine biodiversity, macroalgal and seagrass biology, fish ecology and biology, aquaculture, phyto- and zoo- plankton ecology, algal blooms, marine toxicology, marine microbiology, marine turtles, invertebrate ecology, marine physics, ocean acidification, genomics, population genetics and biogeography. The stations also offer and support training workshops, educational trips, student training, public information seminars, community extension and environmental monitoring.

(Donna Masion Guarte)

Student Presentation

The student presentation highlighted seven reports from

different aspect of marine studies. Presentations include papers on early life histories and stages of fish larvae in western Pacific, revision of croakers in the southern South China Sea, impact of extreme weather phenomenon on corals reefs and its associated reef fishes, and the use of biorock to coral transplantation. The effect of parasite on brachyuran crabs was also investigated while macroinvertebrates were assessed in a marine protected area in the Philippines.

Ms. Donna Guarte presented the first paper and discussed the early life history of *Auxis* larvae of the two commonest species of frigate tuna harvested in Japan. The taxonomy of the two *Auxis* larvae was assessed using their pigmentation patterns, body form, morphometric measurement and abundance pattern. The study was conducted to resolve the problem on the identification of the two *Auxis* larvae for the purpose of resource management. Meanwhile, the diel changes of early stages of *Maurollicus japonicus* were determined from the study of Ms. Liezel Paraboles. Differences in the distribution of this species from Japan Sea and western Pacific were influenced by the presence and interaction with mesopelagic fishes. While occurrence of both eggs and larvae of *M. japonicus* in the water column was influenced by the upwelling in the area. The negative impact and widespread mortality on the fish assemblage structure in coral reefs caused by extreme weather conditions was demonstrated from the report of Ms. Janice Leriorato. A massive mortality of corals was recorded in two reefs in Tosa Bay due to the lower temperature. Half of the species in the area declined with more than 70% of its abundance. The study showed strong association of the decrease in fish families and coral habitat. Identification and phylogenetic relationships of croakers from the southern South China Sea (SSCS) was the report presented by Mr. Norhafiz Hanafi. Thirty-two species of croakers were identified surrounding SSCS and this was divided into two main groups the sciaenid and the *Johnius* based from their morphology. All genera were monophyletic inferred from 16S mitochondrial rDNA sequences and molecular phylogeny of the croakers were identical with morphological delineation.

Shore crabs are important in structuring the benthic community. Mr. Jonel Corral presented a study how these marine organisms have been affected by the infestation of the crustacean parasite, the bopyrid isopod. Based from the report, parasitic effect was observed on male and female host weight and the secondary sexual character (cheliped of male host only) for three brachyuran crabs (*Gaeticus depressus*, *Hemigrapsus takanoi*, *Carcinoplax longimanus*). He also reported the possibility of parasitic castration in the reproductive capacity for *G. depressus* and *H. takanoi* due to infestation.

The success of marine protected area (MPA) can be

determined by the improvement in the biophysical condition in terms of species abundance. This was the topic presented by Ms. Julissah Evangelio where marine macroinvertebrates were assessed inside and outside the marine sanctuary of Cuatro Islas Protected Landscape and Seascape (CIPLS) in Leyte, Philippines. From the report, 63 species of macroinvertebrates from six phyla were collected from both inside and outside of marine sanctuary which were dominated by molluscs and echinoderms. The density and diversity of macroinvertebrates were higher inside the sanctuary, which may be an indication of effective management of the sanctuaries in Cuatro Islas. On the other hand, Mr. Munandar Samidon presented the results in coral growth, increase using biorock technology at a marine ecotourism park from Sabang, Indonesia. Using the biorock technique, the growth rate was higher four times from a non-biorock method of transplanted corals.

(Jonel Mangente Corral)

Giant Clams Conservation

This session comprised seven studies preceded by Dr. Keryea Song as the session chair. First among the studies presented was about the “Conservation and production of the true giant clam, *Tridacna gigas*, in the South China Sea” by Gomez et al. Their study elaborated that among the South East Asian countries, only the Philippines have the significant broodstocks of the true giant clam. Hence, they are initiating ideas for future collaborations involving the managers of the nearby countries in creating strategic plans and designating conservation and commercial production areas. Another study demonstrated that restocking of giant clams *in situ* enhances local biodiversity and ecosystem services in some of the selected areas in the Philippines, by Cabaitan & Conaco. In their study, restocking of giant clams not only contributed to the restoration of degraded coral reefs, but have also instigated the increase in abundance of fishes in the area. On the other hand, Kwong et al.’s study elaborated the *in-situ* distribution and sizes of giant clams within Taiwan. They have found that *T. maxima* is the commonly distributed species of giant clams in their sites, where the only Dongsha atoll appeared to have the highest density with no observed occurrences in Keelung and Taipei. Three species of *Tridacna* have also been reported occurring in Penghu, Taiwan, by Hsieh et al. They have demonstrated the artificial reproduction of these giant clams for restoration purposes. Yet, due to many threats to the restoration success of giant clams, local artificial reproduction would never be enough in replenishing the *in-situ* population, hence they expected collaborations from other broodstock holders in fulfilling this purpose. Conversely, Zhang et al. elaborated that the survival of artificially reproduced giant clams, *T. maxima*, depend on the type of settlement substrate.

Among their tested substrate, coral skeleton and basalt appeared to have a higher survival rate for juvenile giant clams than brick substrates, which could be a potential way in successfully restoring giant clam populations. Lim et al. have also reported the *in-situ* distribution and population structure of *T. maxima* and *T. squamosa*, which appeared to have been healthily replenishing the population around the Perhentian Islands in Malaysia. Alternatively, Chen et al. demonstrated the need for collaborations in identifying the phylogeographic distribution of giant clams in the South China Sea, as its connectivity within the Kuroshio Region is currently lacking. Finally, the session has been rationally summarized by Dr. Keryea Song that giant clam restoration is adequate practice. Of which, to be able to fulfill such practice, choice of flagship species should be carefully considered, thereby promoting “reseeding not introduction”.

(Janice Cabusao Leritorato)

Algal Biology

Algae are ubiquitous, plant-like organisms typically inhabit a wide range of habitat, including rock, moist soil, marine and freshwater environment among others. Disregarding the reported events for coral-algal habitat shift due to a number of habitat loss and degradation, natural algal community has shown to support a number of species and are key components of interconnected tropical seascapes providing services similar to other subtidal habitats. Around the Kuroshio region, algae, particularly seaweeds are being utilized and processed for human consumption and thus, a number of commercial companies had been established to propagate seaweeds for mass production in timely manner. Given its ecological and commercial importance, understanding their biology, life cycle and correct identification are likewise prerequisite in any management effort or in culture procedures.

During the 12th International Kuroshio Science Symposium and South China Sea marine stations Conference, at least eight studies were presented about algal biology. One paper was about identification of *Halimeda* through morpho anatomy, two papers about identification using a combination of morphological and molecular method, environmental role and baseline assessment of crustose coralline algae (including identification by molecular method), new strains of seaweed, extraction of glycolipid biosurfactant and the cellular function in airborne green microalgae. The paper of Schils and Mills reported a case study in the changes of benthic community and the role of crustose calcifying red algae as habitat modifiers in reef community of Guam. Based on the DNA barcoding, 46 species had been identified and *Peyssonneliales* group harbored a total of 31 species. In addition, 94 potentially new

species was further reported. In the Taoyuan Algal Reef of Taiwan, *Lui* presented a baseline assessment on the identification of crustose coralline algae based on barcoding plastid *psbA* DNA for utilization in conservation and management measures of this algal reef. Identification through morphological and molecular technique of *Sargassum* from Eastern Philippines was the done by *Yap-Dejeto et al.* In their paper, they reported seven morphotypes from 34 samples: *S. cinerium*, *S. crassifolium*, *S. cristaefolium*, *S. hemiphylum*, *S. incisifolium*, *S. polycystum* and *S. ringgoldianum*. However, upon molecular analysis, only four species matched the DNA sequences: *S. polycystum*, *S. integerrimum*, *S. naozhouense* and *S. zhangii*, with the latter 3 species identified as first to record in the Philippine archipelago.

The systematics, species diversity and biogeography of the brown algal genus *Padina* based on morphological and molecular data was shown by *Win and Tokeshi*. This study revealed a number of new species in the Indo-Pacific and Mediterranean Seas, with southern Japan reported to have more than 70% increase in the Indo-Pacific species. Four additional new species of *Padina* were uncovered in southern Japan. Furthermore, the total number of *Padina* species has increased to 25 species, showing a three times increase in species richness. While majority of the presented papers utilized molecular method to support morphological identification, *Nacorda et al.* however identified *Halimeda* species from the mesophotic reefs of the Benham Bank Seamount, Philippines through morpho-anatomy. Based on this method, the identified species are: *Halimeda discoidea*, *H. simulans*, *H. tuna* and *H. velasquezii*.

As seaweed *Kappaphycus* showed high biodiversity in the Philippines and has been long cultivated for both local and commercial purposes, farming of this seaweed became popular in any coastal community of the country. However, due to the lack of genetic variation, they are prone to diseases and vulnerable to environmental stresses. Hence, *Roleda* studied on how to develop a new strains of *Kappaphycus* for farming. He reported a wide variation of color expression cultivated from bicolor parental tetrasporophyte (brown and green individual) and female gametophyte with dark brown cystocarps. He suggested that such phenomenon is within the species natural pool of genetic variability and an adaptive mechanism to its environment. Apart from being sources of livelihood, marine algae shows to be a valuable source of glycolipids with numerous application in pharmaceutical industries. Therefore, *Geraldino* studied on isolating effective glycolipids-producing microorganisms through conversion of macroalgal materials and to develop a procedure for maximum glycolipid productions. At the cellular level, *Chiu and Chen* study focus on the environmental stress tolerance of airborne microalgae collected on Dongsha Island. Their study showed

that the cell wall thickness was positively correlated to the survival rates under UV stress, through UV absorption.

(Liezal Cordel Paraboles)

General Marine Biology

The general marine biology session highlighted nine research papers dealing with conservation of the environment and marine organisms. Dr. Shang Liu presented a research on the possible effect of site fidelity on genetic structure and relatedness among juveniles of sharptooth lemon shark at the Dongsha Atoll National Park. Based from the report, behavior of site fidelity was not a factor for the population subdivision of shark in Dongsha Atoll while the juveniles were genetically unrelated in each cohort assigned. Dr. Helen Yap, emphasized the importance of financial and other resources to achieve a long-term environmental conservation based from her integrated analysis of habitat and livelihood in Mindoro, Philippines. Meanwhile, Dr. Irene Rodriquez, presented the complex feedback mechanisms between various physical and chemical factors that are critical in the nitrogen fixation by *Trichodesmium*, the most important contributors of bioavailable nitrogen in the tropical and subtropical oceans. An interesting finding about the effect of increased water flows on the health of coral was presented by Dr. Atsushi Fujimura. High water flow and high-temperature regime resulted less bleached from a laboratory condition. Understanding the hypothesis that high flow rates can mitigate coral bleaching as well as bleaching mechanism might help coral reef management and conservation. Dr. Cuong The Chu, presented the decline of sea turtle population in Vietnam due to decades of human activities. The population of five species of foraging and breeding sea turtles dramatically declined and one them almost disappeared from their traditional nesting beaches. The diversity of marine chordates in Taiwan, the amphioxus, was presented by Dr. Hsiu-Chin Lin. Five species of amphioxus have been recorded along the coast of Taiwan and *Asymmetron lucayanum* was the most dominant species at the main islands of Taiwan. The morphology and identity of egg-collar of nine species of Naticidae in Taiwan was presented by Dr. Dun-Ru Kang. From the egg-collars described, seven of them were described for the first time based from the results of genetic analysis. Dr. Teruyuki Shinbo presented a comparison of the Philippine and Japan MPAs in terms of policy used for conservation of coral reefs. The results showed that the present guidelines of the Japanese government are not sufficient enough to prevent the degradation of coral reefs. A stronger legal framework and law enforcement were seen in the Philippine setting, however to function effectively, a well-designed incentive system for rural residents' participation is necessary. Finally, Dr. Hung-Yen

Hsieh, presented the bioaccumulation of PAHs in marine zooplankton in the Gaoping coastal waters of Taiwan. The highest PAHs levels in mesozooplankton were found near the

Kaohsiung harbor and may easily transported to higher levels of marine organisms by a traditional food chain.

(Jonel Mangente Corral)