

Parallel Sessions

SESSION 1: FISHERIES BIOLOGY AND OCEANOGRAPHY

Moderator: Dr. Wilfredo Campos

Rapporteur: Dr. Alex P. Camaya

PS1-1:

The first presenter discussed their proposed study on the establishing High Frequency Doppler Radio Scatterometers (HFDRS) in Luzon Strait, especially at the Northern Philippines i. e. Cagayan region which is known to have dynamic yet complicated current intrusion due to NEC that bifurcates northerly (e.g. Kuroshio Current) from mid-eastern Philippines. Using the traditional mooring device and satellite-tracked drifting buoys, ocean currents have been measured only at single points, economically expensive and real-time telemetry is relatively difficult. Since HFDRS are installable at land-based areas, this made the present technology to be more accessible, easy to install and operate and, cost-effective. Integrating the data from the similar device installed on the south coast of Taiwan, North coast of Luzon and on offshore islands by the collaborating institutions from Taiwan and USA., the data to be obtained will provide benchmark numerical circulation model of the area. The surface current data will also benefit biochemical oceanographic studies along with ecology and fisheries monitoring information. The proposed device is being develop to be owned by the Philippines for its future technical uses, such as goal of establishing permanent Luzon Strait Ocean Observing Systems of HFSWRs.

PS1-2

Sea urchin (*Tripneustes gratilla*) is one of the valuable fishery resources in which the gonad and egg are highly commercialized in the Indo-West Pacific Region such as the Philippines. The species is known also to have high growth rate, high capacity to feed and reproduce, resist starvation and other beneficial aspects. Ecologically, the species used to persist in the wide range of habitats with macrofloral species and hydrodynamics, such as in typhoon-prone region of the country such like Palau Island, NE Philippines. Due to this condition, studies on the factors that affects gonads and egg production in the locality is addressed in this study. The effect of quantity and type of food are highly studied in controlled condition rather than in the field. Experiment have showed that species found at the seaweed-dominated sites with higher water movement had higher quality gonads, higher fecundity and higher percentage fertilization as compared to those species found in the seagrass-dominated areas. However, despite of these differences the consumption rate, gonad size

and density of samples found in two habitats have no significant differences. The assimilation of seaweeds as food is possible more efficient than seagrass. It further appears that the species exhibits a compensatory mechanism related to food quality in wave-exposed areas by having a better-quality gonads and eggs.

PS1-3

Eastern Luzon of the Philippines become an interesting location among oceanographers due to the presence of Kuroshio Current (KC) which dynamically bifurcates toward northern areas. This ocean current affects seasonal and inter-annual climate variability of the region. Using real-time satellite altimetry data from Ocean Topography Experiment (TOPEX/Poseidon, Envisat, Jason-1 and OSTM/Jason-2) where geostrophic flows were being quantified, predicting the regional circulation was significantly improved. Determining the temporal and spatial variability of the Kuroshio Current from 1993 to 2018 using the sea level anomalies and geostrophic currents have showed that as NEC bifurcation latitude (NBL) shifts northward, the Kuroshio intrusion in the Luzon Strait increases. As it shifted northward, KC decreases. Monsoon also affects as the NBL occurred at the lower latitude of the Philippines during Southwest monsoon (June) while persisted at the higher latitude during Northeast monsoon (January). This condition occurred also in gyres which reverses between monsoon following the sea level anomalies, except at the Eastern Philippines.

PS1-4

NEC that used to bifurcates at the Eastern Philippines results into Kuroshio and Mindanao Currents can be altered by the mesoscale eddies which carries parcels of water with coherent properties. Eddies can be formed through various modes such as ocean current meanders, as well as barotropic and baroclinic instability. This phenomenon is known to be ecologically important in the nutrient enrichment of oligotrophic waters, horizontal advections of phytoplankton and in transferring heat and salt. Once developed, the path and the intrusion of the KC into the Luzon Strait may be affected. Using satellite-derived sea level anomaly data (SLA) data covering from 19 2018, results have shown that the propagation of eddies follows with the path of KC at the interannual bifurcation of NEC. Higher Y_p propagate less upstream Kuroshio that move more westward and can pass Luzon Strait. While the lower Y_p propagate more at the upstream Kuroshio. In the Luzon Strait, eddies with long lifespan decay when it encountered shallow water at the Kuroshio current.

PS1-5

Otolith in fishes varies which could be useful factor in determining their habitat as well as the genetic identity. In this study, *Siganus canaliculatus* found at the East and West coasts of Albay have been examined to determine the regional variations of its otolith size and shape. Sagittal otoliths were extracted, micrographed and analyzed using ShapeR and Vegan package written in R software. Morphometric analysis of the species in both regions were statistically compared using t-test. Data have showed that regional differences in otolith morphology is evident. The variations due to separation only affect otolith shape locally, mainly in the rostrum and antirostrum parts. Crenulate appearances in east coast sample is very evident suggesting for highly variable food provision. The environmental condition greatly affect otolith morphology as suggested by the wavelet analysis. These differences can be supported by both biogeographical considerations and genetic disposition.

PS1-6

Absent

PS1-7

The commercially important fish croaker, locally known as 'abo' have been extensively caught in San Miguel Bay, Bicol Region, Philippines. It is commonly processed into butterfly fillet and dried fish in the local market. Despite of its condition, the identification of the fish species remains unknown. In this study, the molecular identification of the fish have been examined using the partial sequences of 16S rRNA and cytochrome c oxidase subunit I (COI) mitochondrial gene. Phylogenetically, the 'abo' from San Miguel Bay fell under the same clade as *Otolithes ruber* and *Otolithes cuvieri*. However, the species was mostly near to *O. ruber* which is confirmed to have the latter identity.

PS1-8

The study determined the population parameters such as the sinusoidal growth, recruitment and exploitation ratio of the Buried Fan Scallop (*Mimachlamys funebris*) in Asid Gulf Philippines using different estimates of natural mortality. The result showed that the current exploitation ratio of 0.80 and 0.90 is relatively higher than the biological reference points for sustainable exploitation, hence overexploited. It is recommended that the exploitation ratio be reduced by 12%-26% to achieve the exploitation ratio at maximum sustainable yield (E_{max}). The fast growth and the availability of recruits encourage prospect for mariculture for the species.

PS1-9

Satisfying the lack of information on the feeding ecology of eels leads to understanding of their life history which

include growth, breeding, recruitment, migration and niche in an aquatic ecosystem. It has also implication to aquaculture science specifically on nutrition and feed development. Findings revealed that *Anguillids* in the tributary rivers of Lagonoy Gulf are carnivores that probably feed sporadically and are euryphagous, consuming a large variety of food items but preponderantly at crustaceans and mollusks. Feeding intensity is found to be higher during warm months (February to May) and lower during cold months (November to January). Eels of the same species but from different river habitats were found to have similar diets except during changes in river condition such as floodtide and change in weather pattern. Problems besetting the eel river systems include pollution, habitat alteration and destruction, occurrence of non-native species and quarrying.

PS1-10

Meso and microplastics which derived from the waste plastic pollutants are escalating. Eventually, they were accidentally ingested by the various commercially-important marine organisms such as fishes. To study the occurrences of these materials, the gastrointestinal tracts of the tuna (*Thunnus albacares*) (juvenile = 30; adult = 30) collected at the fish landing sites at Tabaco City Port, Albay, Philippines was examined using an stereo microscope. Data have showed that various types of meso and microplastic materials were significantly ingested both by juvenile and adult tuna. They were characterized as fragments, fibers, films and foams from various types of plastic polymers. However adult tuna was found to ingest larger amounts of plastic than juvenile one.

PS1-11

The relationship of the shrimp and goby had been an interesting field of study among researchers of which its distinct type of symbioses occur within the intertidal habitat in various areas. Previous studies have showed that gobies used to be obligatory symbionts to shrimps for the survival of the latter, while some literatures considered them as facultative. In this study, the behavior of the shrimp *Alpheus brevirostratus* and the facultative symbiotic goby *Acentrogobius sp.* was observed in the Tosa Bay, Kochi Prefecture, Japan (Western Pacific). Using video camera recorder installed in the tidal flats for 15 mins., the behavior of both species have been documented. Videos were analyzed where 9 partitions (area = 40x40 cm) surrounding the burrows have been plotted to facilitate the positional observation of the gobies. Result of the study showed that gobies used to stay in or near the burrows. Comparing the behavior of the organism at high and low tides, the fish tended to stay nearer the burrow entrance during high tides. The shrimp species was observed to make surface activity in the absence of gobies. However, during the presence of gobies, both were

observed to perform longer surface activities during low and high tides. This verifies that their relationship could be pronounced as a form of facultative mutualism.

PS1-12

The symbiotic ecology and morphometry have been found in the symbiotic alpheid shrimp, *Stenolpheops anacanthus* that utilizes the burrows of two crustacean hosts. It was analyzed that *S. anacanthus* has a non-random distribution (aggregate) in the burrows of *Upogebia yokoyai* and *Nihonotrypaea japonica* where multiples of 5 or more than five have been recorded. Also, analysis shows that females' second pleura width and second abdomen width are significantly larger than males while males are significantly larger in terms of carapace length and cheliped growth. The breeding season of the shrimp is suggested from June to October. Results of morphometric analysis show that variation in the species is size related and that *S. anacanthus* is a sexually dimorphic species. Future studies should examine if the sexual dimorphism and life history are adaptations on the shrimp's symbiotic lifestyle.

SESSION 2: Fisheries Resource Management 1

Moderator: Dr. Mudjekeewis D. Santos (DA-NFRDI)

Rapporteur: Dr. Jayvee A. Saco (Batangas State University)

The session mostly comprises assessment of different marine ecosystems i.e., mangrove, seaweeds, seagrass, coral reef and fishes and stock assessment of commercially important marine resources in relation to the changing climate, anthropogenic impacts and other physicochemical parameters.

This marine ecosystem assessment is utmost importance to determine the health, condition and status of the marine environment. Through this, the data provides a sound and science-based information for policy and ordinance formulation preventing marine resources depletion. In addition, this could identify organisms that of high economic value for possible development of alternative livelihood.

Moreover, the stock assessment of such economically important marine and freshwater resources i.e., the glass eel provides present scenario of the carrying capacity of the environment in providing efficient usage of the species most especially for human consumption. Thus, sound and science-based information will provide basis for efficient and effective management of these resources and for possible cultivation purposes.

In the case of marine protected areas (MPAs) in the Philippines, learnings from conservation and management provides insight on baseline information that could be used for

policy formulation in Japan among their protected areas. At the same time, the Philippines could learn efficient conservation and utilization marine resources as observed from the learnings in Japan.

In addition, the eminent need of establishing permanent monitoring sites in the MPAs for monitoring changes on the community structures on coral, mangrove and seaweed/seagrass showed a strategic action to determine the effectiveness of conservation efforts and more so the health of the marine environments.

In conclusion, the dynamic interaction of different components i.e., biological, ecological, human ecosystem, and physicochemical characteristics will provide holistic and fundamental approach towards efficient and effective management and utilization of these resources.

Session 3: Fisheries Socio-economics, Seafood Safety and Processing Technology 1

Moderator: Dr. Teruyuki Shinbo (KU)

Rapporteur: Mr. Antox B. Mendoza (BU)

A total of 5 papers were presented on this session, with two papers that discussed climate resiliency, two on valuation studies and 1 on knowledge and perception study.

The first presenter was Prof. Charlie V. Balagtas from Partido State University – Goa Campus. The title of his paper is “Developing Resiliency Among Resource-dependent Communities Along Maqueda Channel of Caramoan, Philippines”. He talked on the resiliency of local residents along Maqueda Channel of Caramoan Peninsula on the technique developed to deal with problems encountered with regards to climate change in relation to their livelihood. The researcher discussed sources of funds for the livelihood of the coastal residents and the support of LGU on coastal communities and its successes.

Result of his study showed that coastal communities have low level of awareness on climate change due to the low educational level of the coastal communities. Thus, recommending for the LGU to support these communities with respect to climate change resilient livelihood.

Two queries were thrown to the researcher, the first was on the measure of resilience. He suggested to the researcher to use some sort of scale as a measure on the knowledge of climate change. This was also positively accepted by the researcher. The second question was on the percentage of the “shifted fishers” from sea-based livelihood to other land-based livelihoods.

The 2nd presenter (Dr. Emma Ballad of BFAR RO2) talked on the perception of coastal villagers on the non-use

values of mangroves in Cagayan Province. She further discussed government intervention especially on mangrove reforestation and improvement. She analyzed non-use values of mangrove communities as perceived by coastal dwellers. According to the researcher, almost all of the respondents are aware of the benefits that the mangroves can provide, however on the contrary, respondents would not like to engage in “spending their money” in protecting this ecosystem.

Only 1 clarification was asked from the researcher. Dr. Shinbo queried on what is the “highest value” of mangroves to ecosystem or coastal communities.

The third paper was delivered by Prof. Precival Ebron of ParSU-Goa Campus. Their research topic was on the value chain analysis of abalone trading in Caramoan, Philippines. The talk mainly focused on the activities in abalone trading and analyzed these activities from gleaning, pre-processing and selling. Two questions from Dr. Shinbo was addressed to the researcher. First was on who are the importers of abalone from Caramoan and the 2nd was on what processing procedure was done to abalone before it will be exported.

The fourth presentation was given by Miss Gumba of ParSU-Sangay Campus, the researcher discussed on the impacts of hazards to the fishing communities of Nato in Cam. Sur, Phils. utilizing the participatory approach to planning. The talk was mostly on the socio-demographic of the respondents as an input in the formulation of Barangay Disaster Risk Reduction and Management Council.

Two questions were posted and that is on the clarification on the dates or year of implementation of the NDRRMC. The 2nd one was on the explanation self-rated poverty as indicators. All these were properly noted by the researcher.

The last presenter was Dr. Raul G. Bradecina from ParSU, he discussed the willingness of the fishers to adopt technology in green mussel culture using the long line method. The researcher presented fishers’ negative and positive perceptions on environmental impacts, economics and social benefits of the mussel culture methods (both old and new). He also discussed socio-demographics characteristics of the mussel farmers and analyzed costs and profitability of mussel farming based on the prevailing socio-economic condition. In the end, the reporter, offered several recommendations on how to improve mussel farming in the area and specifically mentioned the need to shift to the new method of mussel farming presented.

Session 4: Fisheries Biology and Oceanography

Moderator: Dr. Evelyn Ame (BFAR02)

Rapporteur: Dr. Helen Grace P. Bangi (CSU-Aparri)

The session was an important venue to discuss not only the fisheries biology of important fishes but also of the popular black mussels and the Cyclopod Copepods along the Kuroshio region and the NEC Mindanao region. Majority discussed and dealt with exploratory and basic studies about species composition, community structure, seasonal distribution and utilization. One paper however discussed the differences in reproductive capacity of the Bali sardine (*Sardinella lemuru*) stock from different fishing grounds (along northern Zamboanga Peninsula (ZP) and Ticao Pass-San Bernardino (TP-SB) Straight. This was authored by Dr. Wilfredo Campos and his staff at the University of the Philippines (U.P.) at the Visayas. This study looked at factors that contributed to these differences (if environment or fishery-induced). There are indications of reduced reproductive capacity of the sardine stock in ZP based on the differences of the reproductive characteristics of the two stocks. Based on further presentations of data, it was concluded that the observed reproductive capacity between the two stocks is likely induced by fisheries. According to the authors, there are however existing management options to manage the stocks like closed season, catch limits, regulations on catch efforts and natural management options (e.g., seasonal catch based on natural seasonality of the stocks). It was suggested that long term data is needed to look at other possible factors or interactions of climate change and the catch trends.

Another presentation on the “Ichthyofaunal community structure of Magat reservoir in Ramon, Isabela, Philippines” by Paraggua, F.M. of the Bureau of Fisheries and Aquatic Resources (BFAR) Region 02, was discussed. This study was co-authored by some faculty and staff of the U.P. Los Baños College of Arts and Sciences and the School of Environmental Science and Management. It aimed to determine the composition of fish and the physico-chemical characteristics of Magat Reservoir at the upstream, midstream and downstream during dry and wet season. There were two native species (*Leiopotherapon plumbeus* and *Glossogobius* sp.) and five introduced species (*Channa striata*, *Oreochromis niloticus*, *Cyprinus carpio*, *Hypophthalmichthys molitrix*, *Clarias batrachus*) identified. *Leiopotherapon plumbeus* was the most dominant species. Variations were observed with respect to fish abundance between the three sampling stations. Specifically, fish were significantly more abundant at downstream compared to those from the mid- and upstream stations. According to the authors, this could be due to the presence of sanctuary and BFAR fingerling dispersal activities in the area. On the other hand, there were no significant seasonal variation in fish species richness and abundance, meristic counts, likewise in the water quality. However, five species were identified as omnivorous indicating poor habitat quality, while two were carnivores. Multivariate analysis

showed the influence of salinity, temperature and turbidity on the distribution of some freshwater species. While similar fishing gear were observed across sampling sites, fishing gear use in different sampling sites was not accounted for in this study and this was considered a limitation of the study.

A third paper entitled “Seasonal distribution of *Scomber* eggs and larvae in Tosa Bay, Japan” was presented by Donna Guarte, co-authored by Dr. Izumi Kinoshita of the Kochi University. This study has a long term objective of understanding the recruitment dynamics of fish species in the area. The objective of the study was to examine the temporal and spatial distribution of *Scomber* eggs and larvae using a larva net of about 1.3m diameter of mouth with 0.5mm mesh aperture, at five stations (ca. 40, 70, 90, 130, 200m) in central Tosa Bay, southwestern Japan monthly from April 2017 to May 2018). Based on the data presented, there were a total of 1198 eggs and 8840 larvae collected during the study period from December to May, with a peak near summer (March-April). Moreover, some larvae were collected in June, July and September, but there were no eggs. According to the authors, this indicates that there are plural cohort populations of *Scomber* in Tosa Bay, and the observed larvae could have been possibly transported by the Kuroshio current from more southern areas. Data showed that majority of the B-C stage eggs and preflexion larvae dominated in December to May, indicating their spawning, hatching and development in the bay. This occurrence of eggs and larvae appeared to be too long in the limited waters of Tosa Bay, and hence, could have been originated from many species of *Scomber* as suggested by the authors. Dr. Nico Jose Leander suggested to the presenter that they should consider also the abundance and the seasonality of the phytoplankton in the area. The authors confirmed that actually they have data for this but not included in the presentation.

The fourth paper was about the introduced black mussel *Mytella charruana* and its distribution and utilization in the Philippines, by de los Reyes and others from the U.P. Visayas. The mussel, locally known as “bahong” can grow up to 64.27mm in length, with an average of 40.05 ± 4.56 mm. Fishery-dependent and independent surveys were conducted in different areas to determine the emergence of the species, its habitat, distribution and its socio-economic impact. The paper was discussed and focused on the possible competitive advantages of the species over oysters and green mussels. Based on the presentation, *M. charruana* seem to have a range of tolerance to changes in temperature and salinity compared to the green mussels and oysters. Moreover, the species is capable of growing on any substrate, even in estuaries, and fouling on fish cages and stakes. Based on the presentation, while the gathering of this species provided source of food and livelihood opportunities in non-traditional mussel culture sites,

this has led to the decline in the production of oysters and mussels. Further threats of the emergence of the black mussels are yet to be studied, both on the socio-economic-political and ecological aspects. Total eradication of its population has been suggested, however, this was foreseen to be unrealistic and difficult. Dr. Leander also suggested that the duration of the pelagic larval stage should be considered. Hence, there are many aspects of its ecology and life history strategies that we need to study to understand further the dynamics of its occurrence and dominance in many areas.

Another study was on the “Community structure of cyclopoid copepods and distribution of genus *Oncaea* along a transect traversing the upwelling zone of northern Zamboanga Peninsula, Philippines”, by Jaspe and Campos of the University of the Philippines in the Visayas. This was conducted with the long term objective of understanding better the significance of cyclopoid copepods to the production of sardines along an upwelling area in the Zamboanga Peninsula. Forty two (42) species of cyclopoid copepod species were identified in Dipolog Bay, dominated by *Oncaea clevei* (25.4%). Multivariate nonparametric analysis showed the clustering of surface to midlayers of cyclopoid copepods in inshore stations, which was assumed to be influenced by terrestrial runoff, and middle stations, believed to be influenced by upwelling. Across stations, adult female oncaeids dominated over adult males and juveniles. Juveniles were more abundant offshore. Ominivorous *Oithona* was more abundant in inshore stations, and the *Corycaeus*, a known carnivorous species, dominated the offshore stations (the non-upwelling zone). The initial pattern of abundance and distribution of cyclopoid copepods is related to their feeding ecology and some physico-chemical factors. Some questions were raised and one of which was the copepod density and composition variations with respect to depth. It was explained by the authors that data are available but were not presented during the conference.

The last study presented was on the “Species composition of freshwater eels from tributaries along Lagonoy Gulf, Philippines, using RFLP Analysis”, by Canon, Dr. Kubota, and company of the Bicol University Tabaco campus, Kochi University and Partido State University in Camarines Sur. The study was conducted to further confirm species identification based on morphological characteristics, specifically on the three species initially identified: *Anguila japonica*, *A. bicolor pacifica* and *A. marmorata*. This was addressed by using a fast and cost-effective method, PCR-RFLP or Polymerase chain reaction – restriction fragment length polymorphism. Results showed that all individuals collected from all sampling sites in April 2019 are *A. marmorata*. This is consistent however with previous identification using morphological features, with the existence of *A. bicolor Pacifica* and *A. japonica*. All samples

showed *A. marmorata*, which is a low-value species. Hence, further sampling is being conducted to look for possible existence of other species with high value. Dr. Nico Jose Leander of BFAR region 3 raised a suggestion that the authors should consider too, looking in details the different developmental stages of eel samples.

SESSION 5: Ecological Habitats and Climate Sciences

Moderator: Dr. Victor Soliman (BU)

Rapporteur: Glycinea M. de Peralta (CSU)

This session mostly dealt with climate induced stresses (e. g. bleaching, eutrophication, heat, physico-chemical parameters) on corals, seaweeds, zooplankton, and fishes. It also dealt on community based sea ranching of sea cucumbers, Autonomous Reef Monitoring Structure (ARMS), and intertidal seagrass as foraging grounds for fishes.

In terms of the physiological response of bleaching to *Acropora hyacinthus* and *Pocillopora damicornis*, decreasing the rate of thermal stress to 1°C every 3 days did not cause bleaching and more than half were still alive at 30°C. The coral nubbins were able to recover by cooling the temperature for acclimation. In terms of seaweeds, topography, substrates and coastal scenarios might greatly affected the species composition. The assessment showed that *Padina* sp. dominated in areas that were noted to have poor sewage system and domesticated wastes from backyard piggery that were discharged directly to the coastal water. The decrease of such species from summer to southwest monsoon suggests that it may be an bioindicator of eutrophication. However, further study on nutrient loading and species composition will still be conducted. The study on zooplankton in Lake Buhi showed a19 species from 3 groups: Rotifers, Cladocerans, and Copepods. The lake is considered highly eutrophic due to the presence of eutrophic tolerant species of zooplankton such as *Brachionus calyciflorus*. When Tilapias are thermally stressed, a study by Dela Cruz and Vera Cruz showed that adding 5g/L salt was most effective in reducing the stress brought about by an increase in water temperature. Adding 40% aquashade in ponds showed a decrease in water temperature by 3-5°C, increasing the spawning rate and subsequently the seed production of the fish. A Climate Risk Vulnerability Assessment (CRVA) conducted in Isabelita showed that except for San Mateo and Ilagan City, the rest have high vulnerability to climate change as they have less adaptive capacity index. Farmers and fisherfolks are encouraged to grow their tilapia in areas with moderate to high suitability. The fish kill occurrence in Lake Buhi showed us that the fish kill were based on natural (typhoons and monsoon) and anthropogenic

(uncontrolled number of cages and unsustainable practices) were the major determinants of fish kill. Monitoring the critical levels of temperature and DO are useful in predicting fish kills. As the lake is a common property with multiple use, multi-sectoral management approach in lake management and institutionalization of the lake monitoring activities was recommended. Another area, the Padre Burgos Mariculture Zone (PBMZ) from Quezon province, showed that significant changes in ammonia and lower DO were seen in areas where aquaculture activities are being undertaken. There was also a significantly higher fecal coliform counts near human settlement, decrease in both temperature and DO with increasing depth was also observed. These significant changes may be attributed to natural phenomenon as well as anthropogenic (agriculture, aquaculture, human settlement).

On the other hand, the study of Ms. Espaderoa showed that many fishes occurred in intertidal seagrass habitats immediately after inundated. The smaller juveniles (< 10cm TL) dominated the area especially during the incoming tide, increasing in number and species as the tide rises. Larger fishes (piscivorous species) tended to occur at higher tide levels. The Autonomous Reef Monitoring Structure (ARMS) deployed in the Malabugot Protected Landscape and Seascape (MPLS) showed that different species of macroinvertebrates thrives within the ARMS and that it was a nursery site for fish larvae. The study on sea ranching of sea cucumbers showed that it is an effective enhancement strategy in the rehabilitation of *Holothuria scabra* sites and able to provide supplemental income for fisherfolks. The importance of community participation coupled by LGU, DENR-PAMB, BFAR and SUC partnership is needed for a project to be successful.

SESSION 6: Fisheries Socio-Economic, Seafood Safety and Processing Technology 2

Moderator: Mr. Ritchie A. Rivera (BFAR R02)

Rapporteur: Mr. Aeron D. Mayor (BFAR R02)

The researches presented were focused on post-harvest and processing technologies of fishes and seaweeds found along the Kuroshio Region. The 1st presenter, Ms. Glenda S. Sales of Partido State University Sagñay Campus, Nato, Sagñay Camarines Sur discussed the “Standardization and Sensory Evaluation of Thermal Processed Smoked Sardines”. The study assessed the influence of canning method on the quality of smoked bottled sardines, taking into consideration the possibility of its introduction as a new product into the market for canned goods. Best product was achieved through smoking in 45 minutes at 100°C temperature. The author concluded that while all products formulated at different

processing time (60, 75, and 90 minutes) at 250°C have a good taste and therefore acceptable, it should be subjected to shelf life analysis because storage time can affect the keeping quality of the products. Also, small scale bottled smoked sardines showed a high return of investment of 71% ROI and a short payback period of 1 month.

During the Open Forum, it was clarified that sardines were soaked in a concentrated salt solution using tamarind juice prior to smoking in order to enhance the taste of the product. It was suggested to enhance labelling and branding of the product, to subject the product to nutrition analysis, shelf life analysis and profitability analysis.

The 2nd presenter was Nessella Marie N. Mortega who presented the Utilization of Seaweeds Puree (*Kappaphycus alvarezii*) into bath soap. The researchers used dried *Kappaphycus alvarezii* which were washed, rehydrated, drained, homogenized, pureed, processed, molded and aged into seaweeds bath soap using 20 grams, 25 grams and 30 grams of seaweeds puree. A 30 gram seaweeds puree was generally accepted as to its physical and effectiveness attributes. The author recommended that a high number of respondents for quality improvement and development be further evaluated, saponification value should also be determined and the packaging of the product must be undertaken for product's quality shelf life.

Ms. Mortega was asked during the open forum on the advantage of the product among existing products in the market and its market demand since there are already several bath soap products existing in the markets. She replied that her product has a seaweed puree with a lower price as compared to other commercialized bath soaps and also *K. alvarezii* is abundant in their area. Dr. Gaerlan of BFAR R01 stated that there were already several works on health and wellness to include the bath soap which were already patented and commercialized. It was suggested to focus on food processing technology to make it profitable for fisherfolk.

Dr. Plutomeo M. Nieves presented the Post-Harvest Handling Practices for Glass Eel along Rivers and Tributaries in Lagonoy Gulf, Philippines to satisfy the lack of information on the eel fishery in the Gulf. Post-harvest handling practices along the rivers and tributaries along Lagonoy Gulf appear to have evolved from the techniques brought by consolidators and other buyers in the eel industry outside Bicol region. Most of the existing knowledge of local eel gatherers was based on experiences from milkfish (*Chanos chanos*) which was abundant in Bicol. The author concluded that in view of the economic importance of the species as a potential aquaculture species and export commodity, further studies along improvement of post-harvest handling is recommended.

Dr. Evelyn Ame, National Eel Focal Person suggested to conduct comparative study on post-harvest handling practices

for glass eel along rivers and tributaries in the country (e.g from Aparri to Jolo) because different areas have unique practices. The use of methylene blue in packaging of elvers is also being discouraged.

Dr. Nico Jose Leander of BFAR R03, suggested not to transfer anymore the glass eels in freshwater to eliminate pathogens and parasites because there is no *Anguilla* parasite yet for glass eels in the Philippines. This will just shock the glass eels that could lead to stress. Other suggestions include securing Local Transport Permit to authorities in compliance to FAO 233.

Lastly, Prof. Myrna C. Bigueja presented the Development of Bottled Tuna Nut. Tuna fillet and Pili nut added with coconut sauce packaged in 8 ounce or 240 ml bottles was processed to commercial sterility. Process lethality was determined by temperature measurements. Samples with pili nut were rated extremely like and samples without pili nut was moderately like by the taste panel. Cold point of food products was affected by the formula of recipes. The product with higher ratio of tuna meat and higher consistency of coco sauce formula exhibited lower heat penetration rate. Microbiological analysis indicated that thermal processing achieved commercial sterility. The author concluded that results of the study could provide parameter in designing appropriate thermal process condition to extend the safety margin of the bottled Tuna nut or any bottled fish products.

The author emphasized that the product was submitted to DOST for shelf life analysis. 1 year or 2 years shelf life of the product would be appropriate. Also, the author was asked by Mr. Ritchie Rivera of BFAR R02 on the use of coconut sauce which is highly perishable that could lead to oxidation. The author answered that they used new harvested coconut and have a secret formula to prevent oxidation.

SESSION 7: Fisheries Resource Management 2

Moderator: Dr. Emma L. Ballad (BFAR R02)

Rapporteur: Aeron D. Mayor (BFAR R02)

There were 7 presenters during this session. The 1st presenter was the research assistant/co-author of Dr. Nanola of UP Mindanao who presented their research entitled "In Troubled Waters: Facing Challenges in Fish Taxonomy and Its Implications to Fishery Resource Management". She discussed that practices on species identification in the Philippines that have greatly relied on morphological basis which resulted to mismatches of morphological and molecular ID of some fish under family Holocentridae, Lutjanidae, Haemulidae, and Serranidae. Their preliminary findings on 24 DNA sequences of 105 reef fish species collected from

Maconacon and Divilacan, Isabela and from Santa Ana, Cagayan found mismatch on eight initial species identifications. The author concluded that while DNA barcoding is emphasized as a complementary tool to verify species identification, utilization of traditional and contemporary methods should be made with caution, as it may exhibit discrepancies especially for some high valued species. Misidentification of reef fish species has direct effects in management, as seen in the case of *Sardinella lemuru* previously reported as *S. longiceps*. She stated that while fish taxonomy is underappreciated and does not appear to be either lucrative or attractive field of expertise, their current work provided evidence that it needs special attention.

During open forum, it was emphasized that identification of fish species through morphological characteristics is inconclusive until genetic identification was performed. The authors were asked to publish the result of the study as guide to fishery resource management. They assured the publication of their study. They also emphasized the need for collaborations to institutions as well as plans and proposal to DOST for the establishment of data base on DNA Barcoded fish species in the Philippines.

The 2nd presenter, Dr. Raul Bradecina, President of Partido State University presented the History of Scientific Oceanographical and Botanical Inquiries During Spanish Colonization In Luzon: Precursor of Resource Utilization Supporting Urbanization and Antecedent of Resource Conservation. He talked about the history of Spanish colonization of Luzon particularly on Christianization and how it influenced its culture and the course of its urbanization. The influence of Spanish colonization on practice of religion and urbanization set the backdraft in the trajectory of the evolutionary history of resource utilization and exploitation in Luzon. Culture and religion strongly contributed in shaping mindsets that directs how Filipinos understand, perceive, and behave towards environment and the utilization of its resources.

The 3rd presenter, Dr Helen Grace Bangi of CSU, Aparri presented the Resource Allocation Trade-Offs in the Sea Urchin *Tripneustes Gratilla* under Relative Storminess and Wave Exposure. The author investigated the somatic and reproductive phenotypic traits of adults sea urchin *Tripneustes gratilla* from seagrass-and seaweed-dominated sites during 2 monsoon seasons in frequently disturbed by strong typhoons and northeasterly winds in the northeastern Philippines (NE Phil). These were compared with seagrass sites in a less exposed location in the northwest portion of the islands (NW Phil). Populations from NE Phil had significantly thicker and heavier body walls, but significantly smaller Aristotle's lanterns, guts and gonads regardless of season compared to those from NW Phil. Moreover, the body walls in individuals from the seaweed-dominated sites were thicker and heavier.

She concluded that plasticity in the Aristotle's lantern was not related to food availability. The differences in the Aristotle's lantern, gonad and body wall weights indicate a trade-off in resource allocation for feeding (growth) and reproduction in favor of maintenance.

During the open forum, Mrs Regine of Batangas State University asked the contributory to the differences of two sites in terms of gonads quality of *Tripneustes gratilla*. The author answered that gonads of *T. gratilla* have higher quality in seaweed-dominated areas than in seagrass dominated areas because of the type of food ingested. It was further suggested to conduct genetic analysis to solidify the result of the study.

Dr Alex Camaya of Bicol University was the fourth presenter who discussed their research entitled "From Hard to Soft: The Scallop Fishers and their Shifting Preference for Managing Scallop Fishery in Asid Gulf, Masbate, Philippines". They conducted community-level coastal vulnerability assessment among 50 scallop fishers. They found out that long experience of fishers of Naro Island, Cawayan, Masbate, Philippines on poor law enforcement could lead them to prefer hard and contentious measures for fisheries management particularly in sustaining a declining, highly-exploited scallop fishery. Scallop fishers prefer largely a suite of hard technical measures such as catch quota, fishing effort reduction and coastal zoning, followed by size regulation, close season, and prohibition on gathering of young scallops combined with mangrove reforestation, and establishment of new marine protected area and enhancing management of existing ones. However, comparing this finding with the findings of a recent investigation to similar respondents, data have revealed that fishers now preferred relatively 'soft approaches' where the major components involved utilization of empty shells into shell craft, processing of scallop by-products into scallop sauce, registration of scallop fishers, boat and paraphernalias, upland reforestation, conduct research on scallop ecology and the impact of climate change, mangrove reforestation and participation in the management planning and formulation of fishery ordinance. Some of the reasons why scallop fishers shifted to soft management approaches from hard technical measures were preference of short-term profit over long-term gain and soft measures are reasonably implementable by concerned government agencies.

Among the discussions during the open forum were the survey design used and selection of respondents in the study. The author replied that total enumeration was done and 50 respondent fishers were surveyed in 2 barangays. Also asked were the plans about the scallop shells thrown in seashores and how the fisherfolk handle their catch. The author replied that while scallops are being commercialized and empty shells are utilized for shell craft, the shells of some scallops species are being thrown seashore. He added that results of their study

would give avenue for further study on the utilization of thrown shells.

The last three papers presented in the session were focused on assessment of fish and fishery resources in Palawan, Cagayan and Ilocos Norte, presented by Mrs. Herminie Palla of Western Philippines University, Mrs. Wilma Urmeneta of Cagayan State University and Dr. Rosario Segundina Gaerlan of BFAR R01, respectively.

Nine rivers and river mouths and three falls were surveyed on mainland Palawan and found that freshwater reaches of the streams are occupied by gobies and three species of cyprinids, *Barbodes palawanensis*, *Rasbora everetti*, and *Nematabramis everetti*. A 26 species of goby were found in the freshwater reaches of the streams, and most of them are considered to be amphidromous migrating between fresh water and the sea. One new goby species, *Stiphodon palawanensis* was found to be abundant in several streams. Other fish found in the freshwater reaches are eel (*Anguilla sp.*), tilapia (*Oreochromis sp.*), halfbeak (*Dermogenys palawanensis*), guppy (*Poecilia reticulata*), snakehead (*Channa sp.*), pipefishes (*Microphis spp.*), flagtails (*Kuhlia marginata*, *Kuhlia rupestris*), and grunter (*Mesopristes iravi*). In the estuaries, 93 fish species including 56 goby species were found. Also discovered are populations of *Pandaka pygmaea* in an estuary in Puerto Princesa despite its status as Critically Endangered in the IUCN Red List and regarded as “Possibly Extinct” in the Philippines.

In Laguna de Cagayan Lake in Sta. Teresita, Cagayan, there were 1,714 individuals belonging to 14 species from 9 families. The dominant species *Trichopodus pectoralis* consisted 41.94% and the least 0.06% of the population is *Leiopotherapon plumbeus*. Family Osphronemidae dominated the catch followed by Cichlidae and Anguillidae. There were

four (4) Red list species namely *Cyprinus carpio* VU, *Anguilla celebesensis*, *A. bicolor pacifica* and *Clarias macrocephalus* which are Near Threatened fishes.

Lastly, the study of Dr. Gaerlan under National Stock Assessment Program of BFAR R01 reported the Bangui Bay’s fisheries specifically, fishing boat and gear classification; fish catch landings, total boat landings, and catch-per-unit-effort; the catch estimate and relative abundance per gear; catch composition per gear and length of fish species caught.

Their study shows diversity of the Bay’s resources which accounted to the numerous fishing gears employed. In the catch composition, 72 families and 327 species were identified. Among the top families were the *Scombridae* (21.68%), *Carangidae* (19.79%) and *Engraulidae* (13.37%). The most dominant species were *Encrasicholina punctifer* (12.75%), *Katsuwonus pelamis* (10.23%), *Selar crumenophthalmus* and *Decapterus macrosoma* (17.74%). A significant percentage of mixed juveniles (9.66%) of 1-4 cm length were caught by baby ring net and beach seine.

Also, there was a decline in CPUE and decrease also in diversity of catch in recent years coupled with increase in fishing effort from 2000 to 2009 in Bangui Bay, Ilocos Norte.

The author concluded that further studies should be conducted on the exploitation of specific species and the gears impacts. Intensifying fishery enforcement to limit or stop the destruction of fish habitats and growth overfishing by looking closely at the fishing gears used while IEC campaign against illegal fishing must be intensified to assist the local government units in the conservation and management of fishery resources.

These three assessment results of study could serve as scientific baseline data in the formulation of sound based fisheries management strategy.



Group picture of the participants of the parallel session