Symposium Summary

Summary of Report of the 11th International Kuroshio Science Symposium: Future Perspective on Cross-border Network for Research and Education of "Kuroshio Science: *Developing Kuroshio University League Network*

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THE SELECTION OF SYMPOSIUM THEME

The concept and organization of the symposium is spearheaded by young Professors and Researchers in Kochi University (KU) in collaboration with partner's institutions in Bicol University, Philippines and National Sun-yat Sen University, Kaohsiong, Taiwan.

The entry of the 4th cycle of the Joint Kuroshio Symposium held at Asakura Campus, KU, Japan that put emphasis on the Cross Border Education. As such, the theme "Future Perspective on Cross-border Network for Research and Education of Kuroshio Science": *Developing Kuroshio University League Network*" is very relevant for several reasons. First, because the symposium is an interactive mode of information, concepts and perspective exchange for further research and development in the Kuroshio Region. Second, the symposium is a way for a meaningful solution to existing and emerging challenges in the aspects of marine protection, management and conservation. Finally, through this symposium, friendship and cooperation among the Kuroshio University League Network is strengthened in various ways possible − a way where people connect and be establish network.

PROGRAM OF THE SYMPOSIUM

The program of the symposium commenced with the "Call for Papers", a formal announcement that the 11th International Kuroshio Science Symposium is a significant event for the key partners: Kochi University, the National Sun Yat-sen University, and Bicol University. This years' symposium features not only the science-based presentations of the representatives from different member universities of the Kuroshio University League Network invited to present papers, posters and panel discussions in various the fields but also the participation of Sakura Science Plan representatives, the Doctoral Dissertation presentations, Keynote Lecture and the excursion and field work to Muroto Area.

The first day of the symposium was allocated to the Doctoral Dissertation Presentations of students under the education program "Program of Nurturing Talented People to Establish a Sustainable Society in the Kuroshio Region". A total of five candidates presented their dissertation, of which two are in the field of Human Health & Medical Science, two from marine Bioresource Science and one for Environmental Science

The second day was devoted to a discussion session on Cross-Border Education which highlights the Opening Ceremony of the 11th International Kuroshio Science Symposium, Introduction of International Exchange Initiative of KU, Introduction of Participants and Symposium Overview, Greetings from various Guest's from the Philippines, Taiwan and Indonesia. The discussion session focused on three keynote lectures such as "Education for Sustainable Development and Sustainable Fisheries" by Dr. Matsuda, H. et al.(YNU), Marine Protected Areas in Bicol: Two Decades of Partnership" by Dr. Victor Soliman (BU) and "Education on ICOM (Integrated Coastal and Ocean Management) for Undergraduate Students-Background, Needs, and Prospects" by Dr. Kimio Fukami (KU).

The concurrent sessions on the other hand, consists of 32 papers presented and was held on the 3rd to 4th day of the symposium and was categorized into: (1) Marine and Coastal Ecosystems with 12 presenters, (2) Fisheries and Marine Resource Management Ecosystem with 4 presenters, (3) Coral Science with 4 presenters, (4) Terrestrial and Freshwater Ecosystems with 5 presenters, (5) Health and Food Science with 3 presenters, and (6) Socio-Economics and Others with 5 presenters.

Apart from the paper presentations, a total of 18 posters from the Sakura Science Plan representatives were featured and reviewed.

SUMMARY OF PAPER PRESENTATIONS

This section provides a summary of the papers presented, details of which are hereto published or copy can be requested from the authors. Moreover, this section will only focus on the

concurrent sessions of the 11th International Kuroshio Science Symposium

Concurrent Session 1: Marine and Coastal Ecosystems

A total of 4 papers were presented in this section, two papers deals on *Ulva, one on bloom-forming microalgae and studies on sea skates*. The paper reported by Hachiya, *et al*., demonstrated an innovated means of using used saline groundwater which can be obtained from usual coastal area using low cost pumping equipment in the operation of a viable land-based tank culture system for *U. prolifera*. The work of Montilla, *et al.*, on *U. reticulate* revealed the occurrence of species replacement in the locality. Nagasaki, *et al.*, on the other hand, found the viral impacts on blooming-algal are assumed to be complicated; not only quantitatively by affecting the change in biomass but also qualitatively that of changing host clonal composition. Finally, on the studies on oceanic skates, results obtained showed that adult *Halovellia. sericeus* are the hardest species to lower and higher temperatures while *H. septentrionalis* was the hardest to lower and higher salinity. Also, Halobates and relatives can respond to environmental conditions like temperature and photoperiods and adapt to their environmental characteristics to survive.

Concurrent Session 2: Fisheries and Marine Resource Management Ecosystem

Four papers were presented in this session. The first paper is about the *use of organic phytoandrogen (pine pollen) for sex inversion of tilapia* which resulted to 88% male conversion under farmer's condition. The paper of Ermeje, *et al*., examines the *FAD use and distribution in municipal water or waters less than 15km from the shoreline of southern Panay Island, Philippines.* Result showed that there were three types of FADs used (i.e. bamboo, polystyrene and tie buoys), owned by commercial fishers but artisanal fishers are allowed to fish using simple fishing gears. *An assessment of the habitat of freshwater eels in Cagayan Valley, Philippines* as input for the formulation of policies and plans for sustainable eel fishery was reported by Morales, *et al*. The last paper is about the programs, projects and activities of Catanduanes State University in response to climate change, habitat degradation and the need to linked with the Kuroshio University League Network. Special mention was given to the Philippine Rise (Benham Rise) as the new area of interest for Catanduanes State University.

Concurrent Session 3: Coral Science

The coral science session highlight four (4) presentations focusing on corals. Mendoza, *et al*., discussed the *Trophic structure of reef fishes in the West Coast of Albay, Bicol, Philippines* with the findings that the reef fishes are associated with reef structure, status, and ecological role of reef fishes. This explains the abundance of Pomacentridae, Labridae, Chitodontidae, and Scaridae as major component of the reef fish population. Observations also indicate a fair living coral cover condition at 27% with reef fishes considered of "high diversity". This is in agreement of the studies showing that status of living coral cover may not directly affect species richness and density depending on the degree of association of the reef fishes to coral reefs (Beldade, *et al*., 2014, Friedlander, *et al*., 2014, Bell and Galzin, 1984). MPAs were also in the area which indicates the LGU's are aware of the importance of conservation of critical marine resources particularly the coral reefs. Moreover, finding also showed that habitat conditions (i. e. habitat sie, status, number of habitats, etc.) are important determinants of reef fish community structure in the west coast of Albay. Finally, for active resource restoration on coral, mangroves and the improvement of upland solid and waste management through strict law enforcement is recommended.

The work of Camaya, *et al*., on the *Regeneration in coral Pocillopora demicornis and the effect of monochromatic lights on tissue growth and density of the in-situ symbiotic zooxanthellae* reveals that growth of regenerated tissues and the population of symbiotic zooxanthellae changed dramatically depending on the wave lengths and light intensity. These findings contribute a significant input for mass production of the clone samples that could be utilized as viable sources of explants for reef coral transplantation, husbandry and number of microscale analysis.

The chromosome study on scleractinian (stony) coral by Taguchi, *et al*., provided an important method for suitable chromosomes preparations made from coral embryos for FISH and made an advance in molecular cytogenetic study of stony corals. These information is deemed very important for the on-going study of stony coral chromosomes evolution, classification, genetics and genome projects.

A paper on the *Research opportunities at Dongsa Atoll* was presented by Chen, *et al*. Dongsa Atoll is the 7th National Park of Taiwan located 400km southwest of Kaohsiung City. It also features the Dongsa Atoll Research Station which was built to serve as a marine protected area and facilitate scientific researches on global climate change, degradation of marine ecosystem and depletion of marine fishery resources. The advantages of the conducting research at Dongsa Atoll were articulated from the isolation from human disturbance and unique natural environment to the logistics and state-of-the-art facilities.

Concurrent Session 4: Terrestrial and Freshwater Ecosystems

The terrestrial and freshwater ecosystem session features five (5) papers, most of which are from Japanese setting. The first paper focused on the question which has higher fish diversity, mangrove-rich rivers or mangrove-free rivers. To find answer to the question, sampling was conducted in mangrove-rich and mangrove-free rivers in Ishigaki Island and Okinawa Island in 2015 and 2016 using seine net. In summary, findings demonstrated that mangrove-rich river have greater fish diversity and could function as nursery habitats for commercially important fish species.

Inoue, M and M. Genkai-Kato, presented the three dimension analysis of benthic invertebrate communities in headwater streams in Choja Stream and Yoshihara Stream with the longitudinal axis as the first dimension, current velocity as the second and depth as the third dimension. Benthic invertebrates were collected together with the measurement of current velocity, depth and algal density. Results obtained showed a positive correlation between elevation and algal density, abundance of invertebrates increased with increasing discharged (greater in riffle than in pool), no significant correlation between depth and abundance of benthic invertebrate and a positive correlation between current velocity and invertebrate abundance.

Soils and its use for homegarden practices on the beach ridges interspersed with swales in the east coast region of peninsular Malaysia was presented by Yusoff, K.H.M and S. Tanaka for the purpose of evaluating the influence of homegarden practices on beach ridges interspersed with swales (BRIS). The homegraden was divided into groups: inland-ward are (HG-l), mostly farmers and made use of homemade-manure as fertilizer: whereas, the shoreline area (HG-S) which are fishermen and used seafood waste from fish processing as fertilizer. The use of ash and charcoal with few amounts of chemical fertilizers were also applied to both areas. Finding reveals that the level of organic matter in the soil and cation exchange capacity (CEC) was significantly higher in HG-l than in HG-S. But in terms of level of available P and exchangeable Ca and K is higher in HG-S. On this basis, management practices in the homegarden were considered appropriate on BRIS to sustain soil fertility with nutrient recycling and efficiency.

Higa, *et al*. work on the scale dependency of tow endangered charismatic species as biodiversity surrogates and suggested that the agreement of functional scales between surrogate species and broader biodiversity is essential for successful surrogacy and that habitat conservation and restoration targeting multiple charismatic species with different specialities can complement biodiversity conservation.

Shingo Ishikawa on the other hand, made a comprehensive description of the vegetation in Shikoku, Southwestern Japan based on the altitudinal vegetation zones which include evergreen broad-leaved forest, deciduous broad-leaved forest, and evergreen needle-leaved forest from lowland to upper montane zone with a large transitional vegetation zone between warm and cool temperature zones.

Concurrent Session 5: Marine and Coastal Ecosystem − 2

The second set of marine and coastal ecosystems presentation started with a paper focusing on the *Linking bifurcation shifts and eddy propagation to changes at two trophic levels in the Philippines* which was presented by Aletta T. Yñiguez of Marine Science Institute, UP, Diliman, Q.C., Philippines. The paper presents the strong influence of Pacific Western Boundary current system in the north-eastern side of the Philippines. The North Equatorial Current bifurcates offshore feeding into the Mindanao Current flowing south and the Kuroshio Current that begins to consolidate in water off of Luzon. The author describe the two cruises conducted in May/June 2011 and April/May 2012 which showed distinctly different circulation patterns; in particular, the bifurcation latitude was more southern in 2012. 2012 also yielded an order of magnitude lower abundance for both phytoplankton and zooplankton from oceanic to coastal stations. This hypothesized to be due to the more southern bifurcation latitude increasing the input of oligotrophic tropical waters from the NEC feeding a stronger nascent Kuroshio. However, distinct sites with relatively higher abundance in offshore waters northwest of the Benham Rise area were observed in both 2011 and 2012; this could be due to the rich eddy field in this area associate with the Subtropical Counter Current. Result from an initial NZPD model on the Benham Rise area points to this connection as well. These shifts in the base of the food web in oceanic to coastal sites as influenced by large oceanographic features have important implications in this key fishing area.

A paper on the *Sea cucumber of Palawan, Philippines: vital source of living but is now dwindling* buy Jontila, *et al*., provides a typical resource extraction scenario during abundance and the eventual resources decline in the absence of management interventions. The study investigated the sea cucumber fishery in the island of Roxas, Palawan. Findings showed two major gathering practices; (1) gleaning in sea grass beds involving women and their siblings and (2) diving I shallow reef by men. Comparatively, while gleaners' CPUE is higher, divers also collect high-value species, however, in terms of monthly income, gleaners get 70% compared to 30% from the divers. Unfortunately, the sad story is the declining sea cucumber population, hence, the need for immediate

management interventions to sustain the fishery.

The third paper is about the *Difference in burrow utilization by the mud shrimps of the family Upogebia yokoyai burrow associates* by Henmi, *et al*. The study was carried out in a burrow constructed in laboratory aquaria due to difficulty in analyzing burrow utilization under field condition. Burrow used was quantified by the use of gobies and crustaceans. Findings showed that gobies spent one quarter to half the time in the shrimp burrow. Among the free living gobies, *Mugilogobius abei* rarely use the burrow and *Favonigobius gymnauchen* never use the burrow. In contrast, commensal crabs and shrimp (*Sestrostoma toriumi, Athanas japonicas & Stenalpheops anacanthus*) stayed in a much longer time. From these findings, the suggestion that the symbiotic gobies feeds on small-sized crustaceans and other organic matter on the mud surface frequently utilizing shrimp burrow for possible predatory avoidance, whereas, the commensal crabs and shrimps are omnivorous feeders in shrimp burrow.

The last presentation was on the *Enigmatic life history of the Galeommatoid bivalve Peregrinamor ohshimai kleptoparasitic on the burrowing Upogebiid shrimps* by Itani, *et al*. The presentation revolves around four interesting questions; (1) how the bivalve survives host molting? (2) where the bivalves meets the shrimp?, (3) how the bivalves feeds?, and (4) whether there is any parasite effect of the bivalve on the host shrimp?. The presenter showed an very interesting video clips that clearly answered the question posted earlier. First, aquarium observation proved that the bivalve transferred to the newly emerged host body during host molting. Second, the bivalve settles on the shrimp body under sediment surface, possibly in the shrimp burrow. Third, aquarium observation and gut content analysis showed that the bivalve steals food near the shrimp mouth. Finally, on the last question, caging experiment near tidal flats revealed that the bivalve caused significant growth reduction in the host shrimp.

Concurrent Session 6: Marine and Coastal Ecosystem − 3

The last set of coastal and marine ecosystem session includes four presentations. The first paper is on *Comparison of larval growth and development in an estuarine nursery of the sea perch (Lateolabrax japonicas) among the neighboring rivers in Ariake Bay* by Tran, *et al*. The study examine the biodiversity of early life history of sea perch in the bay, early growth and development were compared among neighboring habitats using otolith (sagittae and lapilli) increments. Results indicated that larvae and juveniles from estuaries and surf zone vary significantly in terms of growth and proportional morphology. This differentiation demonstrates a plasticity to make any cohort stocks survive to sustain the unique Ariake population. Another paper done in Ariake Bay is about the *Comparison of tidal changes on the larval and juvenile distribution among endemic gobies in the mouth of the River of Ariake Bay* by Tojima, *et al*. The study was designed to examine the changes in the vertical distribution at the surface, middle, near bottom and bottom with tidal sequence using larval net or beam trawl. Findings showed that larval and juvenile communities were dominated by three endemic species: *Boleophthalmus pectinirostris, Odontamblyopus lacepedii*, and *Tridentiger barbartus* which clearly indicate that endemics use the estuary as their nursery grounds. Specific variations in distribution pattern with tidal changes were noted which suggests that hatching was synchronized with spring tides (new moon and full moon).

Population connectivity of Terapon jarbua (Teleostel, Teraponidae) from South Chian Sea by Te-Yu, *et al*. The study highlights the collection of 180 individuals of *T. jarbua* from 12 locations around South China Sea (SCS). From these, a concatenated sequence (1,752 bp) of mtDNA was obtained from all individuals and discovered three genetically distinct clades (linages A, B. and C). Neutrality test shows negative values for most population and the entire SCS region which imply a recent demographic expansion. Connectivity within SCS is also high based on *Øst values*, but morphological examination of specimens is needed to exclude the possibility of cryptic species. Thus, further wide sampling is recommended.

The last paper presented was on the *Preliminary study on the genetic structure of Mega-mouth shark* (*Megachasma pelagios*) by Yin Vanso Liu, *et al*., The species rarity is the driving force that led to the study focusing on their population genetics. Tissue samples were collected between years 2013-2015 from 34 individuals trapped by gillnet off the Hualien. Twenty seven out of 34 individuals were obtained and preserved in 95% etoh. Two genetic markers were used including mtDNA COI and microsatellite (locus 6); samples were sequenced and analyzed with sequences download from Genbank. Findings showed that there is no genetic structure between east and west Pacific samples. In addition, skyline plot showed the effective population size drop during the past 500 generations.

Concurrent Session 7: Health and Food Science

A total of three papers were presented, the first deals on the *Suppression of endoplasmic reticulum function is a new anti-cancer target* by Namba, *et al*., The paper presented deal with the Sorafenib, the first line and only available treatment for Hepatocellular carcinoma (HCC) but only extends patients overall survival by several months with response rate below 10%, therefore, the identification of an agent that enhances the anti-cancer effect of sorafenib is critically important in the

development of therapeutics option for HCC. In the study, Endoplasmic reticulum (ER) stress response was used. The report indicated that questiomycin A suppresses expression of GRP78, a cell-protective ER Chaperone protein. Analysis of molecular mechanism of questiomycin A revealed that the compound stimulated GRP78 protein degradation in an ER stress response-independent manner, thus, co-treatment with sorafenib and questiomycin A suppressed GRP78 protein expression which is essential for the stimulation of sorafenib-induced death. This suggests that the co-treatment is a novel therapeutic strategy for HCC by enhancing sorafenib-dependent ER stress-induced cell death and downregulation of GRP78 is a new target for the stimulation of eh therapeutic effects of sorafenib in HCC.

The second paper is about *Developing food product from indigenous root crop Giant swamp taro (Cyrtosperma merkussi* (Hassk.) Schott) to support coastal community diet and coastal tourism by Avila, T. N. This study is a developmental project designed to find solution to the malnutrition of children in coastal villages in Lagonoy, Camarines Sur by way of utilizing Giant swamp taro (GST) as nutrient-dense cookies. Results obtained showed that the inclusion of GST flour and cookies with other nutrient-dense food can improve the overall nutrition.

The last paper presented speaks on the *Status of rural fisheries and current directions of fish processing industry in the Philippines: with focus on riverine and coastal ecosystem and communities* by Bradecina, R. G. The presentation describes the current status of rural fishers and the emerging directions of fish processing industry in the country with emphasis on the riverine and coastal ecosystem. It also highlights the human, ecological, and technological dimensions of rural fisheries focusing on the most common resources produced in municipal waters. Case studies were used the recent development and challenges to depict and articulate the details of each dimensions. Along fish processing, the strategic direction is towards value addition particularly in mussel processing industry. For tuna, the strategic direction is toward export regime. In the aspect of RD&E, academe support to fish processing industry is necessary. In summary, the paper provided overall insights on the challenges and recent dimensions of the Philippine rural fisheries.

Concurrent Session 8: Socio-Economics and Others

The last concurrent session features four paper. The first presentation was given by Castro, M.A.A.

A study on background and conditions for the establishment of communities' activity center in Kochi Prefecture was presented by Suguru, *et al*.

The third paper is about Disaster risk reduction/climate change adaptation good practice options for rain-fed and upland agro-ecological zones in Bicol Region, Philippines presented by Amano, *et al*. The study provide potential good practice options (GPOs) in disaster-prone areas as a means to reduced risk and improve livelihood and food security of farmers in rain-fed and upland agro-ecological zones. Recommended GPOs are early maturing composite corn variety (*Los Baños Lagkitan*), Golden yellow cassava and coconut leaf pruning. In strip intercropping, crops plant should be grouped based on their growth duration (i.e. long, medium, short duration).

The last presenter in the session was presented by Monteclaro, *et al*. on the Biological and socio-economic characteristics of the fine mesh net fishery in western central Philippines. The study explored the catch composition, catch efficiency, CPUE, and the associated cost and return analysis (CRA)of the four major fine meshed nets used in the study. Finding reveals that filter nets had the highest catch with high percentage of larvae and juveniles caught. Skimming nets has the highest mean CPUE. Beach seine catch rates and composition varies with time and location. Day time catch yielded adults, juveniles and larval fish while night time operation yielded *Acetes*.

Filter net CRA showed a good profit during peak season and economically viable and profitable in the long term. However, their use poses a threat to the environment which may lead to growth-overfishing. The results of the study is hoped to provide useful information in developing management strategies to address ecological and socio-economic issues related to the fishery

Poster Session

The poster session was participated in both by the SAKURA SCIENCE PLAN, representatives from Kuroshio-partners institutions, in-house researchers and Graduate Students in KU. A total of 18 posters were featured focusing on a variety of interesting research topics and fields of expertise. For details, the abstract of the posters are included in a separate section of the journal.

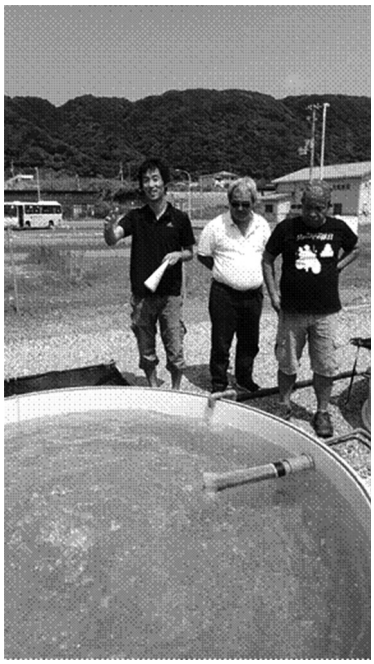
The participants of the 11th International Kuroshio Science Symposium on July 26, 2017.

EXCURSION/FIELD WORK TOUR TO MUROTO AREA (EAST PART OF KOCHI PREFECTURE)

The last part of the 11th Symposium was the planned excursion and field tour to Muroto Area. Starting from Asakura Campus and Monobe Campus of KU, in two buses, the guests were picked-up at Kochi Palace Hotel on the way to Muroto Area. The first stop along the way was done at the Roadside Station Ohyama. From there, the group proceeded to Muroto UNESCO Global Park where a short briefing was given by the Global Park management. Lunch was also in the Geopark Café.

The participants of Excursion/Field Work Tour to Muroto Area (Muroto UNESCO Global GeoPark").

After the lunch, the group proceeded straight to the Seaweed Aquaculture Facility by Underground Seawater: "Sea Vegetable". Again, a short lecture on seaweed aquaculture and facility was given by Mr. Jun Hachiya, the president of this social enterprise. He is the graduate student of Kuroshio Science Program, Kochi University and founded this social enterprise by using the seaweed aquaculture technology which Dr. Hiraoka's labo of Kuroshio Science Unit invented.



Mr. Hachiya explanined the system of this weaweed acuaculture facility.

On the return trip, the group take a tow-hour stop a the "Power Station" (Hundred-yen Store) at Kera for shopping ... then back to hotel.

CONCLUSION

The11th International Kuroshio Science Symposium marks the first run of the rotational symposium as it enters the 4th cycle of the collaboration. It also coincided with the Doctoral Dissertation Presentations of students under the "Nurturing Talented People to Establishing a Sustainable Society in the Kuroshio Region", the Science Plan grantee as well as the benchmarking visit of the five (5) University Presidents from State Universities and Colleges (SUCs) from Bicol Region, Philippines and the Rector of Tanjunpura University, Indonesia. This is in addition to the invited Keynote Speakers and paper presenters in Japan, Taiwan, and Philippines.

This year's symposium was a big group with papers presented covering a wide range of fields of studies namely: (1) Marine and Coastal Ecosystems with 12 presenters, (2) Fisheries and Marine Resource Management Ecosystem with 4 presenters, (3) Coral Science with 4 presenters, (4) Terrestrial and Freshwater Ecosystems with 5 presenters, (5) Health and Food Science with 3 presenters, and (6) Socio-Economics and Other. About 50 percent of the papers presented came from Japan (KU), followed by Philippines (BU, CatSU, UPMSI and UPV), and Taiwan (NSYSU). Majority of the presentation were from marine and coastal ecosystems which deal on many aspects such as aquaculture, biotechnology, eco-physiological studies, oceanography, symbiosis, genetics and growth and development. It is expect in view of the nature and geographical location of Kuroshio Region. It is also interesting to note that only few papers were presented about coral science given the recent threat of climate change. On the other hand, emerging interest in the aspect of terrestrial and freshwater ecosystem was noted and the least was on health and food science. For the posters, 55.55% were from Japan with Taiwan and Philippines sharing the rest of the posters presented, most were on the science posters.

The Keynotes address was great, very relevant to the theme and the Keynote Speakers are respected scientist, academician and administrators. The insights and key pointers presented are worth noting as a reference for our way forward.

There may be some problems or unforeseen inadequacies during the overall organization and implementation of the symposium but in general, the symposium was a success. For this, many thanks to the convenors, KU for sponsoring the symposium, the cooperation of member institutions, guests and participants to the 11th International Kuroshio Science Symposium.