Research Institute for Humanity and Nature Workshop on

"Trans-disciplinary research on Asia"

&

Coastal Area-Capability Enhancement in Southeast Asia Project Joint Seminar 2014

24-26 October 2014, Iloilo and Aklan, Philippines

Preface

This is my great honor to hold the workshop on trans-disciplinary research on Asia and the joint seminar of "Coastal area-capability enhancement in Southeast Asia" project with University of Philippines Visayas (UPV), Kasetsart University (KU), Southeast Fisheries Development Center (SEAFDEC). And on behalf of Research Institute for Humanity and Nature (RIHN), I would like to express my grateful to participants from Eastern Marine Fisheries Research and Development Center (EMDEC), Aklan State University (ASU) and all citizens who have much interesting on the linkages between researches and social developments.

RIHN has been emphasized the importance of trans-disciplinary science, in other words "science for society" in recent years. This movement occurred not only in RIHN but also in many academic institutes and universities of the world, especially in environmental and food sciences. As "Area-capability project" originally targeted the harmonization between rural development and conservation ecosystems, our outcomes and experiences could be good examples for the science for society. This year is the third year of the Area-Capability Project. Each project members have to start the compilation of final outcomes of project activities. The well understanding of the sense of "science for society" will be a good help for all members of the AC project to re-examine the values of each scientific achievement for harmonization between rural development and ecosystem conservation.

I hope this workshop and joint seminar will be good opportunities for all participants to think of "science for society" from multiple senses based on the exchange ideas and experiences each other. And I hope this proceeding can help to facilitate the discussions and communications among participants.

Satoshi ISHIKAWA
Project Leader of "Area-Capability Project"
Research Institute for Humanity and Nature

PROGRAM
Research Institute for Humanity and Nature Workshop on "Trans-disciplinary research on Asia"
&
Coastal Area-Capability Enhancement in Southeast Asia Project Joint Seminar 2014

24-26 October 2014, Iloilo and Aklan, Philippines

Day 1 (24 Oct.)

Venue: SmallVille 21 Hotel, Iloilo

8:30 - 9:00 **Registration**

Session 1: Workshop on Trans-disciplinary Research on Asia Chair: Kazuo WATANABE (RIHN)	
9:00 - 9:10	*Opening Address* Dr. Satoshi ISHIKAWA (Project leader of Area Capability Project, RIHN)
9:10 - 9:20	*Opening remarks and introduction of AQD*
9:20 - 9:30	*Opening remarks and introduction of UPV*
9:30 - 10:00	*Introduction of RIHN and Project* Prof. Takeshi NAKATSUKA (Project leader of Historical Climate Adaptation Project, RIHN)
10:00 - 10:20	**Break**
10:20 - 10:40	*Introduction of RIHN project* Dr. Ueru TANAKA (Project leader of Desertification Project, RIHN)
10:40 - 11:00	*Introduction of Future Earth in Asia* Dr. Hein MALEE (Program Director, RIHN)
11:00 - 11:50	*Discussion*
11:50 - 12:10	*Wrap-up of discussion*
12:10 - 12:20	*Closing remarks* Dr. Hein MALEE (Program Director, RIHN)
12:20 - 13:20	**Lunch time**

Session 2: Area Capability Project Seminar for Progress Reports Chair: Satoshi ISHIKAWA (RIHN)	
13:20 - 13:30	*Opening remarks* Dr. Satoshi ISHIKAWA (Project leader of Area Capability Project, RIHN)
13:30 - 13:50	Progress report of Component 1 of Philippines Dr. Harold MONTECKARO (University of Philippine Visaya)
13:50 - 14:10	*Progress report of Component 1 of Thailand* Dr. Keigo EBATA (Kagoshima University)
14:10 - 14:30	Progress report of Component 2 of Philippines Dr. Rex TRAIFALGAR (University of Philippine Visaya)
14:30 - 14:50	*Progress report of Component 2 of Thailand* Dr. Nozomu Muto (Research Institute for Humanity and Nature)
14:50 - 15:10	Progress report of Component 3 of Philippines Dr. Nathaniel AÑASCO (University of Philippine Visaya)
15:10 - 15:30	*Progress report of Component 3 of Thailand* Dr. Takashi YOSHIKAWA (Tokai University)
15:30 - 15:40	**Break**
15:40 - 16:00	Progress report of Component 4 of Philippines Dr. Tsutomu MIYATA (Fisheries Research Agency Japan) and Dr. Alice FERRER (University of Philippine Visaya)
16:00 - 16:20	*Progress report of Component 4 of Thailand* Dr. Tsutomu MIYATA (Fisheries Research Agency Japan) and Ms. Sumitra RUANGSIVAKUL (Southeast Asia Fisheries Development Center, Thailand)
16:20 - 16:40	*Progress report of Component 5* Dr. Yuttana THEPAROONRAT (Southeast Asia Fisheries Development Center, Thailand)
16:40 - 17:00	*Progress report of Component 6* Dr. Taweekiet AMORNPIYAKRIT and (Southeast Asia Fisheries Development Center, Thailand) and Mr. Nantapoul SUKSAMRAN (Easten Marine Resource Development Center, Thailand)
17:00 - 17:10	**Break**
17:10 - 17:30	*Progress report of Component 7* Dr. Jon ALTAMIRANO (Aquaculture Department, Southeast Asian Fisheries Development Center) and Prof. Hisashi

	KUROKURA (University of Tokyo)
17:30 - 17:50	*Progress report of Component 9* Dr. Ginki RI (Tokai University)
17:50 - 18:00	*Progress report of Component 8* Dr. Satoshi ISHIKAWA (Research Institute for Humanity and Nature)
18:00 - 18:30	*Discussion of English Publications and their schedules by each component*

*Stay at Hotels in Iloilo city

Day 2 (25 Oct.)

Venue: SmallVille 21 Hotel, Iloilo

Session 3: Area Capability Project Seminar for Wrap-up Chair: Yuki OKAMOTO (RIHN)	
9:00 - 9:30	*Preparation work for Wrap-up presentation*
9:30 - 9:40	*Wrap-up Presentation of C-1 Thailand* Dr. Keigo EBATA (Kagoshima University)
9:40 - 9:50	Wrap-up Presentation of C-1 Philippines Dr. Harold MONTECKARO (University of Philippine Visaya)
9:50 - 10:00	*Wrap-up Presentation of C-2 Thailand* Dr. Fumihito MUTO (Tokai Univesity)
10:00 - 10:10	*Wrap-up Presentation of C-2 Philippines* Dr. Fumihito MUTO (Tokai Univesity)
10:10 - 10:20	*Wrap-up Presentation of C-3 Thailand* Dr. Takashi YOSHIKAWA (Tokai University)
10:20 - 10:30	Wrap-up Presentation of C-3 Philippines Dr. Nathaniel AÑASCO (University of Philippine Visaya)
10:30 - 10:40	*Wrap-up Presentation of C-4 Thailand* Ms. Thanyalak SUASI (Southeast Asia Fisheries Development Center, Thailand)
10:40 - 10:50	Wrap-up Presentation of C-4 Philippines Dr. Alice FERRER (University of Philippine Visaya)
10:50 - 11:00	**Break**

11:00 - 11:10	*Wrap-up Presentation of C-5* Dr. Yuttana THEPAROONRAT (Southeast Asia Fisheries Development Center, Thailand)
11:10 - 11:20	*Wrap-up Presentation of C-6* Dr. Taweekiet AMORNPIYAKRIT (Southeast Asia Fisheries Development Center, Thailand)
11:20 - 11:30	*Wrap-up Presentation of C-7* Dr. Jon ALTAMIRANO (Aquaculture Department, Southeast Asian Fisheries Development Center) and Prof. Hisashi KUROKURA (University of Tokyo)
11:30 - 11:40	*Wrap-up Presentation of C-8* Dr. Satoshi ISHIKAWA (Research Institute for Humanity and Nature)
11:40 - 11:50	*Wrap-up Presentation of C-9* Dr. Ginki RI (Tokai University)
11:50 - 12:00	*Closing Address* Dr. Satoshi ISHIKAWA (Research Institute for Humanity and Nature)
12:00 - 13:00	**Lunch**
13:00	**Move from Iloilo to Kalibo**
17:30	**Arrive at Kalibo**

*Stay at Hotels in Kalibo city or New Washington

Day 3 (26 Oct.)

Field Trip of New Washington and Discussion with ASU	
8:30	**Bus will pick up all participants at each Hotels**
9:00 - 11:00	*Boat Trip to project site in Batan Bay*
11:00 - 13:00	*Lunch in a mangrove rest area*
13:00 - 16:00	*Visiting four specific sites by separate group* *Group1: Observation fishery activity (e.g. fishing gears and catch)* *Group2: Observation environmental issue (e.g. water quality and mangrove damage)* *Group3: Observation stock enhancement activity and interview to fisherman group* *Group4: Meeting with local fishers at Pinamucan*

16:30	**Move to ASU**
17:00 - 19:00	*Discussion and Wrap Up meeting for TD research evaluations at ASU cafeteria*
19:00 - 19:20	*Closing*

*Stay at Hotels in Kalibo city or New Washington

[Memo]

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Progress Report

Component 1 (Fishing Gear): Philippines

The capture fisheries of Batan Bay and New Washington Estuary: Year 3 progress report

Harold Monteclaro[1], Ruby Napata[1], Liberty Espectato[1], Gerald Quinitio[1], Alan Dino Moscoso[1], Ramon Cruz[1], John Rheo dela Cruz[1], Kazuhiko Anraku[2], Merlina Andalecio[1], and Takaaki Nishi[2]

[1] College of Fisheries and Ocean Sciences, University of the Philippines Visayas, Miagao, Iloilo 5023, Philippines
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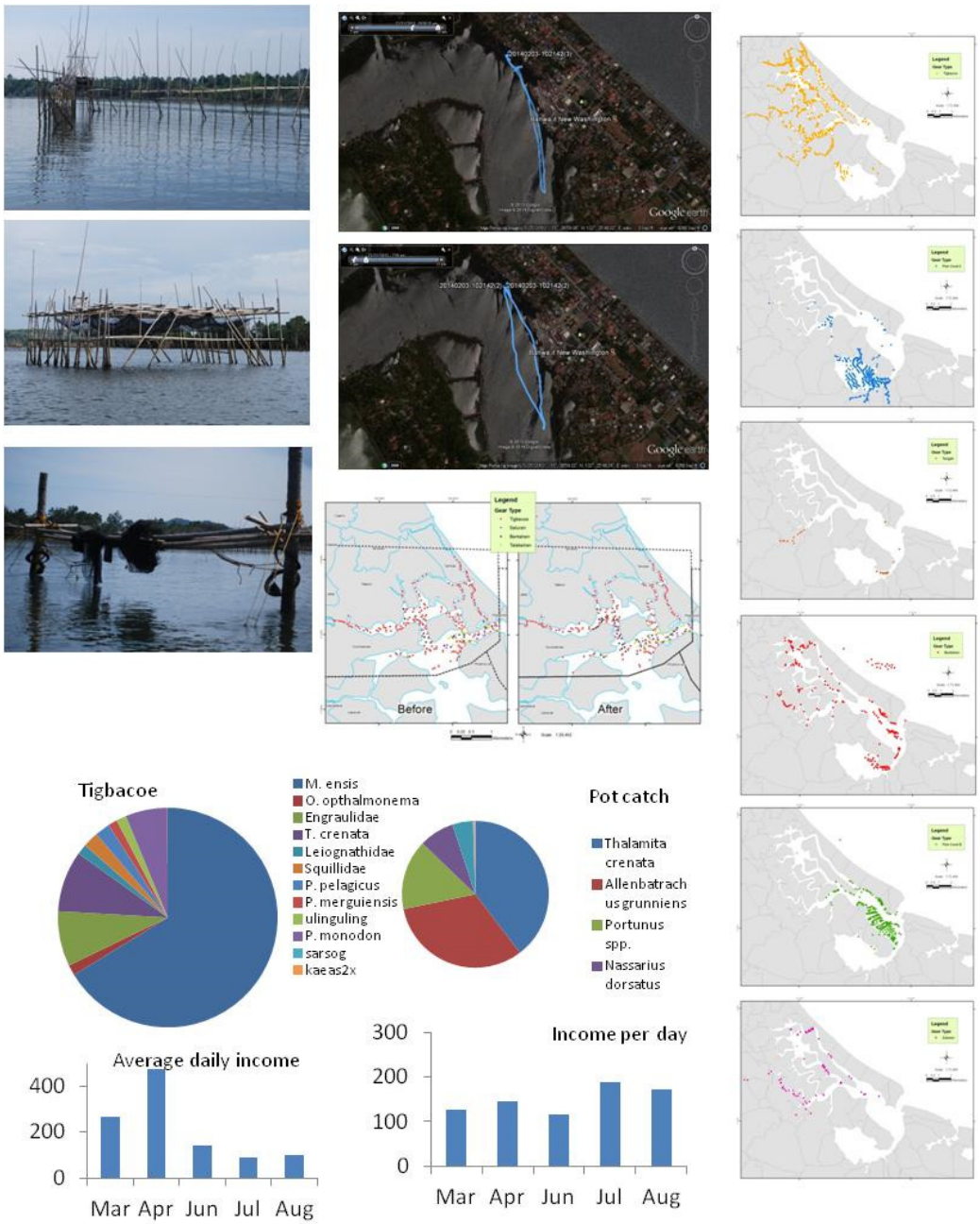
Abstract

Component 1 of the CACE Project aims to examine the capture fisheries of Batan Bay and New Washington Estuary in Aklan Province, Philippines. The foremost objective is to produce an inventory database and a reference book on the coastal fishery of the said fishing ground. To accomplish this, the following were performed:

A census of fishing gears and methods used in Batan Bay involving more than 2,000 respondents;
Recording of catch information of selected fishing gears to monitor catch composition and daily income;
Identification of areas where fishing operations are conducted, GIS of stationary fishing gears, GPS tracking of selected gears, and;
Monitoring and correlation of weather information and other parameters to fishing.

As an added objective, the impacts of Typhoon Yolanda on the capture fisheries in Batan Bay were also documented.

Results of these research topics have been presented at international seminars and will be submitted for publications. Data shall also be shared with other project components for discussion and published in collaboration with other teams. In March 2015, Component 1 aims to finish a camera-ready version of a guidebook on the capture fisheries of Batan Bay. A digital library on the fishing operations in Batan Bay is also being prepared.



Top left: Dominant fishing gears in Batan Bay

Top, center: GPS tracking of selected fishing gears

Right: Mapping of stationary fishing gears in Batan Bay

Center: Impacts of Typhoon Yolanda on stationary gears

Bottom, left: Catch information of selected fishing gear

Component 1 (Fishing Gear): Thailand

Keigo EBATA (Kagoshima University, Japan), Anukorn Boutson (Kasetsart University, Thailand), Nakaret Yasook (SEAFDEC, Thailand), Tanut Srikun (EMDEC, Thailand), Takafumi Arimoto (Tokyo University of Marine Science and Technology, Japan)

1. Activities of component 1 in Thailand

Small-scale fishery is one of the most important industries in Rayong, Thailand. Many different small-scale fishing methods can be seen in this region, including gill-net, trammel-net, trap, hook and line, and trolling. Fishing operations are conducted by using small fishing boats (boat length is from 6.5 to 8.0 m); therefore, weather conditions can affect fishing operations, including whether fishermen will go to sea at all or not on a specific day. The purpose of this study is to provide details on fishing operations and understand the relationship between fishing operations and weather conditions.

2. Field survey in Rayong, Thailand

Six local fishing villages were chosen for the field survey. Thirteen fishermen were selected from the chosen fishing villages; 3 of them usually conducted small-scale fishery and participated in set-net operations. During the field survey, an interview-based survey was conducted, to gather general and basic data on fishing operations, including size of fishing boat, type of engine and fishing gear used by the fishermen, and data on annual and daily pattern of activities associated with fishing operations.

All fishermen involved were provided logbooks to record details of their daily fishing operations. The items included in the logbook were date, fishing gear used, number of operations conducted, number of fishermen on board to conduct the fishing operation, catch species and weight, landing fish price for each species, time of departure and return to the pier, and amount and price of fuel purchased. In addition, the logbooks included a remarks column, to record whether the fisherman did not go to sea on a particular day and the reason behind it.

Portable GPS's were installed onto the all of fishing boats involved in the study, to record the position of each fishing boat at 3-min intervals. The GPS data provides the exact location of each fishing operation conducted each day.

Daily weather data, including wind speed and direction and sea conditions, were also collected every 3 h from meteorological observatory in Rayong.

3. Seasonal variation in small-scale fishing operations in Rayong

There are three main seasons in Rayong: a non-monsoon or summer season (from February

until April), a Southwest monsoon or rainy season (from May until October) and a Northeast monsoon season or cool season (from November until January). Seasonal variation in weather conditions such as wind speed, wind direction and sea conditions were analyzed using the meteorological data. The recorded average wind speeds were 1.7, 4.0 and 1.5 for the non-monsoon seasons, the Southeast monsoon seasons, and the Northwest monsoon seasons in 2013, respectively. Wind speed varied dramatically between seasons. Thus, the weather data suggests that wind speed is most likely to be the main variable affecting fishing operations.

We compared crab gill net, fish trap and squid trap operations between the non-monsoon season and the southeast and northwest monsoon seasons.

The location of the main fishing grounds for the crab gill net fishing is affected by the monsoon season, when the sea is rough due to the predominant winds hitting the west side of the Samet Island. Crab gill net fishing mainly occurs in the west side of the Samet Island in non-monsoon season. Some fishermen of crab gill-net moved operation sites to the east side in monsoon season. Therefore, crab gill-net fishing operations are then moved to the calm sea on the east side of the Samet Island during the monsoon season. The operation site of fish trap was not changed on monsoon and non-monsoon season. The fisherman of squid trap conduct the fishing operation near the coast in monsoon season, and offshore in non-monsoon season. The travelling time of squid trap between the pier and the operation site in non-monsoon season was longer than in monsoon season, and the weight of the catch in non-monsoon season was higher than in monsoon season.

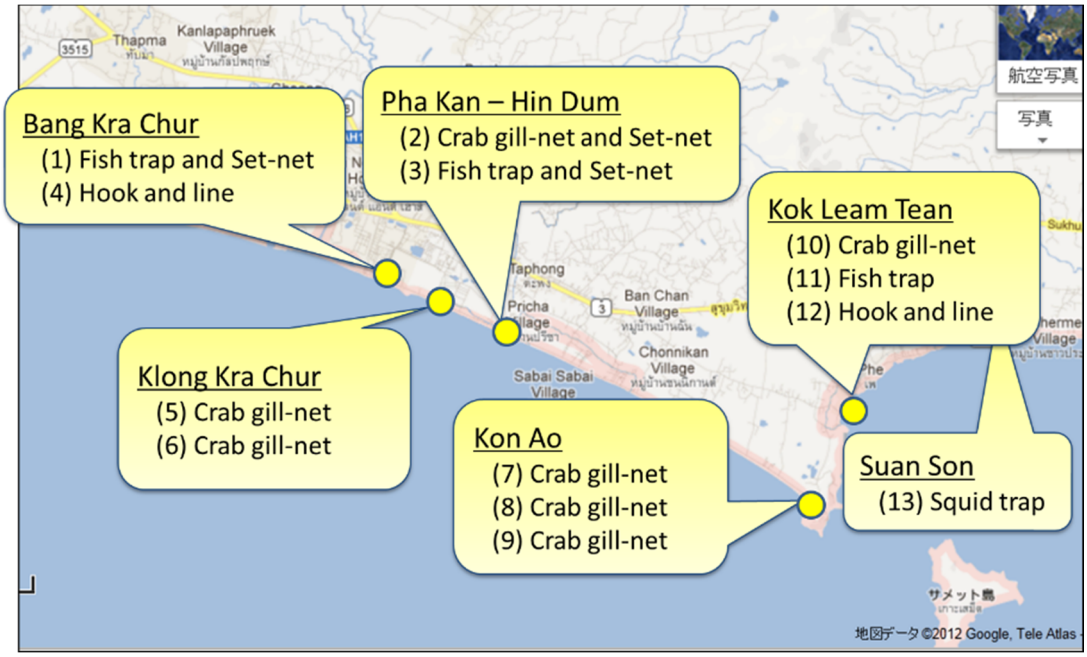


Fig. 1 Research site and fishermen in Rayong, Thailand

Component 2 (Biodiversity): Philippines

Report on the activities of the Component 2 (Biodiversity team) in the Philippines

Rex TRAIFALGAR[1], Arnold GAJE[1], Ramon CRUZ[1], Armi Mae GUZMAN[1], Ulysses ALAMA[1], Nozomu MUTO[2], Ryo KAKIOKA[2], Hiroyuki MOTOMURA[3], Fumihito MUTO[4], Ricardo BABARAN[1], Satoshi ISHIKAWA[2]

[1]University of the Philippines Visayas, [2]RIHN, [3]Kagoshima University, [4]Tokai University

The coast of Southeast Asia is home to a tremendous biodiversity based on high primary production, which in turn provides an important basis to local livelihoods in various ways. The goal of the Component 2 (Biodiversity team) is to clarify the species- and within-species-level diversity of coastal organisms in Southeast Asia, thereby offering key information for evaluating the ecosystem health in the area. For this purpose, we have been working on the following topics in the Philippines.

Field guide. A field guide to commercial fishes in the Panay Island, the Philippines is now under preparation. We have so far collected over 1300 specimens including at least 300 species. These specimens have been deposited in the Ichthyological Collection of the UPV Museum of Natural Sciences (UPVMI) after being photographed, tagged and tissues being taken for genetic analysis. We are going to incorporate DNA barcoding information in the field guide as noted below.

DNA Barcoding. DNA barcoding utilizes a Cytochrome Oxidase I gene (COI) sequence of mitochondrial DNA (mtDNA) as a barcode to identify species, facilitating fast and accurate species identification for all potential users. Our goal is to construct a reliable database of DNA barcode of the commercial fishes of the Panay Island for species identification. A prerequisite for such a database is that the specimens on which the database is made are correctly identified on the basis of morphological characters prior to barcoding. Therefore, we use those specimens collected for the field guide, being identified by experienced taxonomists and deposited in the museum as voucher. This in turn provide a cross-reference between the DNA barcode database and the field guide mediated by the voucher specimens, which, to our knowledge, is unprecedented for fishes.

As of Sep. 2014, about 200 fish specimens have been subjected to DNA sequencing, generating CO1 sequences of 107 species representing 50 families. Part of these sequences have been submitted to Barcode of Life Database (BOLD), forming a project "Market fishes of the Panay Island, Philippines". All other sequences shall eventually be submitted to the project associated with voucher numbers of specimens and associated information.

The Philippines team conducted four fish diversity collection in Batan Bay. At least 90 species belonging 40 families were recorded, documented and deposited at the UPV Museum of Natural Sciences.

Genetic population structure. It is widely accepted that deciphering intraspecific genetic diversity and its geographical distribution pattern is the most important aspect of biodiversity study, because each population represents a fundamental conservation unit that needs to be managed separately for sustainable use. In addition, based on these information we can infer the historical process in which the present diversity of the species has been shaped, which is central to evolutionary biology.

We selected ca. 20 commercially important coastal fish species to be subjected to such a study. Specimens are collected from four localities facing the South China Sea. Genetic differentiation among localities and several other aspect of intraspecific genetic diversity were examined using the sequences of mtDNA COI and Cytochrome b (Cytb) genes for each species. In addition, for a subset of target species we have obtained a source data to be used to develop novel primers for microsatellite markers using Next Generation Sequencing. For details, please see "Report on the activities of the Component 2 (Biodiversity team) in Thailand".

Other activities. We are trying to describe the morphology of juvenile *Thunnus* spp. from the Panay Island, and thereby find effective keys to the species for accurate identification. Several tens of specimens have been so far collected and their morphology examined.

Initial discussions with fisheries scientists at Aklan State University were made to conduct a training activity on fish collection, preparation, and preservation. This training, which shall be conducted by Philippine RIHN Biodiversity group, seeks to transfer capability to local scientists. This is part of the overall objectives of the RIHN's CACE Project.

The Philippines team has also started looking at the freshwater biodiversity of Antique, located near the northwest portion of the Panay Island. Preliminary results will soon be presented as a form of two posters. In addition, an effort is currently being made to get additional funds from UPV, which shall be dedicated to further study in that area.

Expected final outcomes. The final outcome of our activity in the Philippines shall include 1) a series of individual papers of genetic or taxonomic studies (see Appendix below), 2) a review

paper on the origin of coastal marine fish diversity in the South China Sea, synthesizing the results of individual papers, 3) DNA barcode database of commercial fishes of Panay Island, utilizing the BOLD system, 4) the field guide of the fishes of Panay Island, and 5) enhanced capability of local scientists in Batan area on biodiversity research and conservation activities.

Appendix : Expected papers from genetic, morphological or taxonomic studies.

- Population structure of *Atule mate*
- Population structure of *Megalaspis cordyla*
- Population structure of *Gerres filamentosus*
- Population structure of *Terapon jarbua*
- Population structure of *Selar crumenophthalmus*
- Population structure of *Gerres oyena*
- Population structure of *Lutjanus vitta*
- Population structure of *Scolopsis taenioptera*
- Population structure of *Decapterus macrosoma*
- Population structure of *Decapterus macarrelus*
- Population structure of *Scolopsis monogramma*
- Population structure of *Priacanthus tayenus*
- Population structure of *Upeneus guttatus*
- Population structure of *Priacanthus macracanthus*
- Population structure of *Stolephorus indicus*
- Population structure of *Sphyraena putnamae*
- Genetic and morphological differentiation within genus *Rastrelliger*
- Species composition and relative abundance of *Thunnus* spp. in the waters of the Philippines.
- Identification of *Thunnus* spp. using multiplex species specific PCR
- Identification of commercial canned tuna (tribe Thunnini) using molecular technique.
- Taxonomic review of the genus *Rastrelliger*
- Morphological description of juvenile *Thunnus* spp.

Component 2 (Biodiversity): Thailand

Report on the activities of the Component 2 (Biodiversity team) in Thailand

Nozomu MUTO[1], Ryo KAKIOKA[1], Hiroyuki MOTOMURA[2], Sukchai ARNUPAPBOON[3], Bandit Yangphonkhan[4], Kamolrat PHUTTHARAKSA[4], Vilasri VEERA[5],Fumihito MUTO[6], Satoshi ISHIKAWA[1]

[1]RIHN, [2]Kagoshima University, [3]SEAFDEC / TD, [4]EMDEC, [5]National Science Museum (Thailand), [6]Tokai University

The coast of Southeast Asia is home to a tremendous biodiversity based on high primary production, which in turn provides an important basis to local livelihoods in various ways. The goal of the Component 2 (Biodiversity team) is to clarify the species-level and within-species-level diversity of coastal organisms in Southeast Asia, thereby offering key information for evaluating the ecosystem health in the area. For this purpose, we have been working on the following topics in Thailand.

Field guide. "Fishes of Northern Gulf of Thailand" was recently published as a product of a collaborative work among National Museum of Nature and Science of Japan, Kagoshima University and RIHN. Photographs, morphological descriptions and distributions of 372 commercial fishes belonging to 109 families are given based on the specimens collected during a period between 2009 and 2012.

Collection building. As of Sep. 2014, we have collected 790 fish specimens from off Rayong. These specimens were fixed in formalin at EMDEC, subsequently transferred to National Science Museum, Thailand. Under the curation of Dr. Veera Vilasri, these specimens have been given individual catalog numbers.

Genetic population structure. It is widely accepted that deciphering intraspecific genetic diversity and its geographical distribution pattern is the most important aspect of biodiversity study, because each population represents a fundamental conservation unit that needs to be managed separately for sustainable use. In addition, based on these information we can infer the historical processes by which the present diversity of the species has been shaped, which is central to evolutionary biology.

We selected ca. 20 commercially important coastal fish species to be subjected to genetic

analysis. Specimens are collected from four localities facing the South China Sea including Rayong, Thailand (Table 1). Several aspects of intraspecific genetic diversity, including genetic differentiation among localities, were examined using the sequences of mitochondrial DNA (mtDNA) Cytochrome Oxidase I (COI) and Cytochrome b (Cytb) genes for each species. In addition, for a subset of target species we have obtained a source data to be used to develop novel primers for microsatellite markers using Next Generation Sequencing. Below we show some of these results for selected species.

Atule mate. A neighbor joining tree was constructed on the basis of Cytb sequences of 80 specimens from Thailand, Philippines and Malaysia. The tree showed two distinct clades, one clade composed of only a single specimen from the Philippines and the other of all the remaining specimens. The latter clade was highly diverse, suggesting its large effective population size, but showed no notable structuring according to sampling localities. Genetic differentiation among three sampling localities was not statistically significant, possibly reflecting its highly migratory nature. On the other hand, we have developed 12 novel microsatellite makers for the species using Next Generation Sequencing, which will be used to clarify the genetic variation in the nuclear genome.

Megalaspis cordyla. A neighbor joining tree was constructed on the basis of Cytb sequences of 79 specimens from Thailand, Philippines and Malaysia. The tree showed two distinct clades just like in *Atule mate*. However, the branching pattern in relation to sampling locations were strikingly different between the two species. In *M. cordyla*, one of the two clades composed of all specimens from the Philippines, while the other clade composed of all specimens from Thailand and Malaysia. Both clades were extremely deficient of diversity, suggesting their small effective population sizes. Genetic differentiation between the Philippines and the other two localities were statistically significant, while that between the latter two was not. We have also developed 12 novel microsatellite makers for the species to be used for further analysis focusing on their nuclear genome.

Sillago sihama For this species, only specimens from Thailand have been analyzed, nevertheless showing remarkable result. Neighbor joining tree of COI sequences of *S. sihama* revealed three distinct clades. A Discriminant Analysis of Principal Component based on microsatellite markers separated the specimens into three distinct clusters, in such a way that the pattern was consistent with the branching pattern of the mtDNA tree. Because all specimens were collected from a single locality (Thailand), these three groups are regarded as separate species.

Expected final outcomes. The final outcome of our activity in Thailand include 1) a series of individual papers of genetic or taxonomic studies (see Appendix below), 2) a review paper on

the origin of coastal marine fish diversity in the South China Sea, synthesizing the results of individual papers.

Table 1 Number of specimens collected from four localities to be subjected to population genetic analysis.

Scientific name	**Rayong (Thailand)**	**Panay (Philippines)**	**Terengganu (Malaysia)**	**Ha long (Vietnam)**
Selar crumenophthalmus	24	49	30	0
Atule mate	35	32	34	0
Gerres filamentosus	22	45	0	0
Lutjanus vitta	27	26	16	0
Priacanthus tayenus	18	42	0	0
Rastelliger kanagurta	54	22	30	0
Megalaspis cordyla	33	22	30	0
Terapon jarbua	15	34	0	0
Sillago aeolus	37	20	0	0
Sillago sihama	40	26	0	0
Rastelliger brachysoma	44	55	0	0
Decapterus macrosoma	0	29	0	0
Decapterus macarellus	0	28	0	0
Gerres oyena	12	30	0	0
Scolopsis monogramma	10	0	0	0
S*colopsis taenioptera*	28	19	16	0
Priacanthus macracanthus	0	26	0	0
Sphyraena putnamae	8	0	30	0
Gerres erythrourus	22	35	0	0
Stolephorus indicus	0		30	0
Rastrelliger faughni	0	27	0	0
Upeneus guttatus	0	29	0	0

Appendix : Expected papers from genetic, morphological or taxonomic studies.

- Population structure of *Atule mate*
- Population structure of *Megalaspis cordyla*
- Population structure of *Gerres filamentosus*
- Population structure of *Terapon jarbua*
- Population structure of *Selar crumenophthalmus*
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- Population structure of *Scolopsis taenioptera*
- Population structure of *Decapterus macrosoma*
- Population structure of *Decapterus macarrelus*
- Population structure of *Scolopsis monogramma*
- Genetic and morphological differentiation within genus *Rastrelliger*
- Cryptic speciation within *Sillago sihama* inferred from genetic analysis.

Component 3 (Environmental): Philippines

Coastal environment and human activity in Batan Bay, Philippines

Yoshikawa T[*1], Kanzaki M[2], Okamoto Y[3], Ogawa Y[2], Koyama J[4], Ikejima K[5], Kon K[6], Kawabata Z[3], Nakano T[3], Añasco N[7], Nillos MG[7], Taberna H Jr[7], Sadaba R[7], Pahila I[7], Moscoso AD[7]

[1]Tokai University, [2]Kyoto University, [3]Research Institute for Humanity and Nature (RIHN), [4]Kagoshima University, [5]Kochi University, [6]Tsukuba University, [7]University of the Philippines Visayas (UPV), *presenting author

For the last 2.5 years, the Coastal Area Capability Enhancement Project has been conducting comprehensive environmental studies in four coastal areas with different environmental and social conditions namely, Batan Bay Estuary (Philippines), Rayong Bay and Bandon Bay (Thailand), and Hue Bay (Vietnam). The main goal is to describe patterns of material flows in these areas with the specific objectives to investigate the following: (1) water and bottom conditions; (2) marine food-web structures; (3) water circulation patterns using ICP-MS data; (4) land utilization profiles, (5) chemical pollution; and (6) productivity of mangrove areas. Interactions of these environmental factors to human activities will be correlated and discussed. Expected outputs at the final fiscal year of the project include but will not be limited to an edited book on compilation of research achievements or a series of articles from international symposium proceedings and a practical handbook for researchers who are interested in trans-disciplinary environmental research in coastal areas of Southeast Asia.

In Batan Bay Estuary, the specific research objectives are the following: (1) preparation of a land utilization map by GIS; (2) determination of the origins of water and minerals by ICP-MS & Sr in water and sediments; (3) estimation of mangrove production; (4) determination of iso-scape in mangrove areas; (5) estimation of litter production by mangrove forests; (6) assessment of material flows in the sea (food-web structure); (7) investigation on the role of microhabitats as shrimp nursery; (8) assessment of chemical pollution (heavy metals, agricultural chemicals, etc.); (9) determination of water and bottom conditions including AVS levels; and (10) assessment of temporal changes in hydrographic conditions.

The activities (both completed and upcoming) and preliminary results are as follows: **(1)** A GIS map showing land-use profile is currently being finalized. **(2)** To understand the current physico-chemical state and the key factors that contribute to water quality, spatial variations in

elemental and isotopic Sr compositions were determined in water samples collected from 36 sites surrounding the bay area. In general, dissolved concentrations of the elements of concern in coastal waters (e.g. Pb, Cd, Ni, Sn, Cu) were within the current regulatory limits set by the Department of Environment and Natural Resources (DENR) of the Philippines. The spatial distribution of Sr isotope ratios ($^{87}Sr/^{86}Sr$) suggests that the estuary water is mostly ocean influenced ($^{87}Sr/^{86}Sr \approx 0.70916$; Sr concentration 51.40-80.87 μmole/l). However, a number of stations within the estuary exhibited very different $^{87}Sr/^{86}Sr$, suggesting possible anthropogenic influences in the local scale. Inland water bodies including river tributaries of the bay generally exhibited lower Sr concentration (0.71-5.50 μmole/l) and $^{87}Sr/^{86}Sr$ ratios (0.707-0.708), which correlates well with the lower salinity levels (0-2.3 ppt). **[(3) (4) (5)]** To clarify the contribution of mangrove plants as a producer in the ecosystem, $\delta^{13}C$ was measured for 202 mangrove plants and for surface sediment organic matter collected at 157 points. Sampling was conducted from June 2012 to September 2013 (just before Typhoon Haiyan). The $\delta^{13}C$ of mangrove plants varied from -31.6 to -27.9‰ reflecting that all of mangrove plants were C_3 plants. Back mangrove plants tend to showed higher $\delta^{13}C$ reflecting higher osmotic stress for these plants comparing to true mangrove plants which evolutionally developed mechanisms against salinity. As $\delta^{13}C$ of mangrove plants (-30.3±1.6‰) was far lower than $\delta^{13}C$ of phytoplankton (-25.2±1.6‰), the relative contribution of mangrove origin organic matter could be estimated by determining $\delta^{13}C$. Samples from the rivers connected to the bay and the inner part of the bay showed lower $\delta^{13}C$ reflecting the importance of terrestrial and mangrove origin organic matter in these points. Microspatial scale variation of $\delta^{13}C$ of sediment organic matter also observed along the gradient from remnant mangrove stands (-27.5‰) to open water (-24.8‰) located within a hundred m distance. As a conclusion, the spatial pattern of sediment $\delta^{13}C$ in the bay well explained by the distribution of mangrove forest and two entrances of the bay in 1953, even the most of the mangrove was lost during the 1990s and one of two entrances was closed 20 years ago. It suggests that the long lifespan of sediment organic matter and the relative stability of sediment in the bay. **(6)** To grasp the food web structure of marine products and relationship with the characteristics of fishing gears in small scale, marine products were collected at 7 sites by different fishing gears in March and June 2014. In total, 1,181 individuals (include formalin samples and same species in different sites) in 7 sites in March; and 2,036 individuals in 7 sites in June has collected for CN isotope analysis. CN analysis is still on-going and food web structures from $\delta^{13}C$ and $\delta^{15}N$ will be examined through seasonal and spatial differences including features of various fishing gears. **(7)** To assess role of abandoned ponds as shrimp nursery areas, shrimp and fish assemblage structure with different ages and conditions were surveyed at 8 sampling stations (established during the initial sampling in Sep 2013) and at 2 additional stations during the second sampling in March 2014. Small shrimp and fish were collected by towing a small seine net in the middle

tide during the daytime, 3 times over 10 m tow at each station over the bare substrate in ponds and fringe of mangroves, or over vegetation at a seagrass station. Tentative results obtained suggest that fish diversity decreased with culture pond constructions but abandoned ponds still provide habitat for particular shrimp and fish species. Although detail analysis of samples taken in March 2014 (after the super typhoon in 2013) was not yet finished, preliminary analysis suggested reduced diversity and abundance of shrimp and fish implying an impact of the natural disaster. Sampling for stable isotope analysis and gut contents also will be taken during the next survey. **(8)** To ascertain the degree of metal contamination in water, sediments, finfishes and shellfishes, 51 water samples, 32 sediment samples and 27 finfishes were collected in June 2012. Shellfishes (9, 4 and 7 species of crustaceans, gastropods and bivalves, respectively) were also collected in October 2013. Samples were processed and measured for heavy metals using ICP-MS for water and FAAS for sediments and fishes. Metal concentrations in sediments ranged from ND – 1.38 μg/g for Cd; 16.57 – 143.02 μg/g for Cu and 3.18 – 28.53 μg/g for Pb. Generally, finfishes are safe for human consumption based on their heavy metals (Cd, Cu and Pb) contents. Twelve samples consisting of 4 crustaceans, 4 gastropods and 4 bivalves have Cd concentrations higher than the FAO/WHO standard (5 μg/100 g). Among the shellfish samples, only gastropods exhibited Pb concentrations beyond the standard of 150 μg/100 g. These gastropods species also accumulated Cu metal and exhibited 2 – 14x greater than the standard (1000 μg/100 g). Most of the shellfishes are good accumulators of Cd, Cu or Pb or combinations of these metals and are generally unsafe for human consumption based on the FAO/WHO standards. **(9)** The sediment acid volatile sulfide (AVS) concentrations were measured for samples collected at 0-1 cm, 1-2 cm, 5-6 cm from the sediment-water interface for two sampling periods (February and June 2013). Sediment mean AVS ranged from 0 to 0.6601 mg S/g dry sediment in February 2013 and a relatively higher range of 0.183 to 1.198 mg S/g dry sediment in June 2013. It was noted that the critical level of (AVS >0.2 mg/g) were mostly monitored in fishpond sediments in contrast to the lower AVS found in river sediments. Sediment mean organic matter ranged from 3.5 to 24.6% dw with higher level of OM found upstream of rivers and areas with mangrove and a strong correlation was observed between AVS and OM (r^2>0.9). On the other hand, dissolved oxygen in water (near the sediment-water interface) ranged from 1.9 to 9.9 mg/L. Most sites have DO concentration below optimum level for fish (4 mg/L) especially near ports and mangroves while some areas with DO level higher than 4 mg/L were monitored in the mouth and middle of rivers. This result conforms to the observations that higher AVS concentrations are associated with organically rich and anoxic sediments and lower concentrations are found in oxic sediments with lower organic matter. **(10)** Together with local counterparts from CFMS-ASU, nutrient levels (P, N, etc…) and plankton composition and abundance were determined from March to July 2014. Results are currently being processed and proposal is being prepared for the CFMS-ASU to

conduct independently the second set of field and laboratory activities.

Finally, the destruction of mangrove, abandonment of shrimp ponds, overfishing, and stock enhancement of tiger prawn are considered to be human activities that have substantial impacts on natural environments on Batan Bay Estuary.

Component 3 (Environmental): Thailand

Coastal environment and human activity in Thailand

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In Thailand, we have been conducting environmental research in coastal area of Rayong and Bandon Bay. In coastal area of Rayong, in order to evaluate possible impacts of the set-net operation (1) Status of the seawater and bottom sediment conditions in and around the set nets and (2) trophic levels and feeding habits of the set net catch and other gears (2) have been investigated as collaborative activities with C6 (Set-net component) and other components. In Bandon Bay, in order to describe interactions between shellfish culture and environments conditions, (1) Seawater conditions and primary productivity, (2) Bottom sediment conditions, and (3) Food web structure have been investigated being supported by C4 (Social component) and other components.

[Coastal area of Rayong]

In coastal area of Rayong, potential impacts of the set-net operation and other fishery activities on natural biological resources and environments have been investigated. The survey on the seawater and bottom conditions were conducted within and around the set-nets just beginning of set-net installation (October, 2013), midterm of installation (January, 2014) and end of set-net installations (April, 2014). Transparency measurement, CTD cast, water sampling for analysis of suspended solids (SS), chlorophyll *a* and nutrients, and bottom sediment sampling by a grab sampler for acid volatile sulfide (AVS), ignition loss (IL) and water content were conducted. Until now no significant influences of the set-net installations were observed. However, in order to make concluding remarks, it is better to conduct one more year monitoring for checking year to year variation.

The survey on the trophic levels of the set-net catch and other gears was conducted mainly by the set-net groups during n Dec 2012-Mar 2013, Oct-Nov 2013 and March 2014, in total of

379 samples from 36 fish species were collected for later analysis of carbon and nitrogen stable isotope ratios by a mass spectrometer fitted with an elemental analyzer (Delta V advantage and Flash EA 1112, Thermo Fisher Scientific Inc.) at RIHN. Several environmental samples including mangrove leaves and particulate organic matter (POM) and sedimentary organic matter (SOM) were also collected. Stomach contents of the fish were sorted into taxonomic groups at the EMDEC and some of them were used for analysis of stable isotopes. Analysis of the interpretation of the set-net catch samples has been almost completed. Sampling of the catch by other gears will be completed in this month, October, 2014, and analysis of those samples will be completed by the end of this fiscal year.

[Bandon Bay]

In Bandon Bay, interactions between shellfish culture, environments, and local society are ones of the main research interests. Phytoplankton samples were collected in rainy season (August 2013) and summer (March 2014) at 12 stations along the coast in Bandon Bay. Stations 1, 2and 3represented the east coast of the Tapi river (Kanchanadit district), stations 4, 5and 6set at the Tapi estuary (Mueang Surat District) and station 7, 8, 9, 10, 11and 12were located on the west coast (Chaiya and Tha Chang District). The water salinity in the west coast was higher than in the east during the rainy season, whereas, the east coast salinity showed the higher than the west side in summer. Water salinity around the mouth of the Tapi River was quite low (less than 13 ppt) due to the flow from the rivers into the Bay. Dissolved oxygen of the water in the west side of the bay was higher than the east coast and estuaries both in summer and rainy seasons. Phytoplankton samples were collected by towing vertically a plankton net of mesh size 20 *u*m dragged. The results showed a total of 79 phytoplankton species in three divisions; Cyanophyta (3 species), Chlorophyta (4 species) and Chromophyta (72 species). Richness index, Evenness index and Diversity index of phytoplankton were in the range of 1.416 -1.718, 0.415- 0.591 and 0.849-1.928 in rainy season and 0.780-2.509, 0.229-0.760 and 1.585-3.185 in summer, respectively. Photosynthetic rate was measured by *in situ* incubation for 24 hrs and uptake of ^{13}C labeled HCO_3^- at three vertical layers (surface, middle, and near bottom) at 8 stations in August-September 2012 (rainy season) and at 9 stations in March 2013 (dry season). In rainy season, values of chlorophyll *a* and primary production at the surface (0.8–19.1 μ g L^{-1} and 411–2732 mgC m^{-3} d^{-1}) were comparable to those reported from Hiroshima Bay and Oginohama Bay in Japan, where intensive oyster culture was conducted.

The study of organic matter content and dehydrogenase activity of the sediment in cockle farm during rainy season (June 2013 and August 2013) and summer (March 2014) was investigated in Bandon Bay. In Kanchanadit district (the east coast), the sediment was shown as loamy soil, sandy loam soil and loamy sand, while at Chaiya district (west coast) consisted of

sandy soil and sandy loam crumbly. The amount of organic matter accumulated in each layer of the depth (depth 1-7 cm) was not significantly different in summer and rainy seasons. Sediment organic matter in the east coast where the cockles has been cultured for a long time, showed distinctively high amount comparing to the west coast during the rainy season. Dehydrogenase activity on the surface layer (epipelagic) was quite lower than the deep layer, hence physical, chemical and biological processes seemed contribute to nutrient cycling in sediments.

The basic features of Bandon bay related to the bivalves production, and its food-web were investigated based on carbon and nitrogen stable isotope analysis. Bivalves were collected in 6 sites in 3 seasons, March 2013, September 2013, and February 2014. Particular organic matter (POM), and sediment organic matter (SOM) were also collected. The result of the analysis of variance shows clear differences by bivalve species. This result suggests the difference of food habit by species. There is a difference in size of shell with $\delta^{13}C$ and $\delta^{15}N$ on *Geloina* sp. at station 21. However, correlation between the size of shell and$\delta^{15}N$ are commonly seen in bivalves such as *Ostrea* sp. and *Perna viridis*. The results suggest $\delta^{13}C$ has not caused the differed by except *Geloina* sp.. Bivalves in Bandon bay were mostly nonselective filter feeder, and each bivalve tends to be preying on different foods. In the ordinary concept, single species in the same bay is regarded as same food habit to share, or not to be considered carefully about the differences of food source in the same bay. However, there is diversity on food source in different area in the same bay due to the characteristics/environment of each area.

Component 4 (Social): Philippines

SOCIAL ANALYSIS OF COASTAL COMMUNITIES IN PANAY, PHILIPPINES

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Component 4 is an integral part of the whole collaborative project between UP Visayas, RIHN and several universities and agencies in Japan, and SEAFDEC and Kasetsart University in Thailand to develop the concept of Coastal Area Capability Enhancement The approach is holistic in order to give a full understanding of the relationship between the coastal resources and the people dependent on these resources.

The main contribution of Component 4 is to provide a social analysis of the coastal communities and the people, specifically in Batan Bay area and in selected three coastal communities in the provinces of Iloilo and Guimaras. Specifically, Component 4 aims to describe the socio-economic, cultural and demographic characteristics of the coastal fishing households; assess the households in terms of social indicators; and, assess economic activities and resource users in the study areas.

In Year 1 (1 April 2012 to 30 March 2013), the locale of the study are the municipalities (Altavas, Batan, and New Washington) surrounding Batan Bay in Aklan province. In Year 2 (1 April 2013 to 30 March 2014), the locale of the study includes the municipalities of Concepcion (in northern Iloilo province), Miagao (in southern Iloilo Province), and Jordan (in Guimaras province). In Year 3 (1 April 2014 to 30 March 2015), Component 4 returned to the three municipalities surrounding Batan Bay for another survey integrating impacts of Typhoon Haiyan.

The methods of data collection include individual and household surveys, focus group discussion (FGD), key informant interviews (KII), assessment of secondary data, and participant observation. The data collection instruments include the interview schedule, FGD guide and interview guide. The interview schedule used in Year 1 is in Akeanon and in Year 2 is in

Hiligaynon. The interview schedule in Year 3 is in Akeanon but it is a revised version of the interview schedule in Year 1 with some parts or questions of Year 1 version deleted and the addition of the parts on the impacts of Typhoon Haiyan. All these versions of the interview schedule were pilot tested. Data collectors were hired and trained on data collection.

In Year 1 and Year 3 surveys, the same 467 fishing households in Batan Bay area were covered with the following distribution:

Municipality	**Barangay**	**No.**
New Washington	Tambak, Pinamuc-an, Mabilo	240
Altavas	Odiong, Cabugao, Linayasan, Poblacion	104
Batan	Tabon, Songcolan, Camaligan and Cabugao	123

For Year 2, the study covered 300 fishing households with the following distribution:

Municipality	**Barangay**	**No.**
Jordan (Guimaras)	Lawi and Sinapsapan	100
Miagao (southern Iloilo)	Damilisan, Kirayan Norte, and Baybay Norte	100
Concepcion (northern Iloilo)	Nipa and Loong	100

The UPV Team has already identified topics for manuscript and book writing for publication. In Year 4, the UPV team plans to focus on publication and sharing of results to the study areas, particularly in Batan Bay and in conferences (local and international). The UPV Team also proposes to conduct another field work in Batan Bay in Year 4 with focus on the importance of small-scale fishing in Batan Bay.

Progress situation regarding fishing household survey in Batan Bay in Panay Island (Component 4)

Tsutom Miyata (Fisheries Research Agency)

The collected number of household survey was 474 in 2012 fiscal year and we had conducted analysis regarding Problems of fishing ground, Fisheries Management, Social Capital, welfare etc. We already present at academic meeting and will contribute to academic society in near future.

The first plan was to conduct above same survey in 2014 for comparison with the difference of fishers' consciousness before and after releasing black tiger prawn, but it was difficult to release it by hitting hyper typhoon etc. Therefore, we changed the purpose of survey in 2014 to the purpose of resilience from the disaster.

The additional question items of the origin were 1. Information about typhoon, 2. Preparation for typhoon, 3. Evacuation, 4. Damage as the following.

The second survey had been conducted from mid-July to early in September. We will input the original answer sheets in this fiscal year. And we will analyze the data set by comparative analysis.

1. Information about typhoon *When was the first time you heard about Typhoon Yolanda? *What was the first information you heard about Typhoon Yolanda? *Where did the information come from? *Did you believe the information?	2. Preparation for typhoon *Did you prepare for the coming of Typhoon Yolanda? *If yes, what kind of preparations did you do in relation to your *Where did you learn what to prepare?
3. Evacuation *Did you evacuate during Typhoon Yolanda? *Who told you to evacuate? *When did you evacuate? *Where did you evacuate? *Did the whole members of the family evacuate? *What are the sources of information? *How long did you stay in the evacuation center?	*What did you bring with you in the evacuation center? *Did you receive any support while in the evacuation center? *What kind of support did you receive in the evacuation center? *From whom did the support come form? *In general, how would you describe the evacuation center? *What kind of information did you receive?
4.Damage *Was the___ damaged during typhoon Yolanda? *How would you describe the extent of damage? *How would you describe the status of _____now? *Are you staying in the same house prior to Typhoon Yolanda? *If no, where are you staying now?	*Did you receive the following as relief assistance? * Can you rank the relief assistance you received in terms of their usefulness to you and to your family? *From whom were the assistance? *Did you satisfy them?

Component 4 (Social): Thailand

Household livelihood survey in coastal area in Thailand

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Household livelihood survey in coastal area in Thailand is one part of Coastal Area Capability Enhancements in Southeast Asia Project. The purpose of this part is to identify the status and structure of household livelihood in coastal area in Thailand. Two coastal area of Southern and Eastern part of Thailand are the main on household survey, Rayong, Prachuap Kiri Khan and Chumphon Provinces. In 2012, pre-test questionnaire, and the final questionnaire have completed and agreed by social team of SEAFDEC and RIHN. From 2013 to 2014, social team finished social survey at Rayong Provinces with 297 samples (1,458 of total small-scale fishermen) and will be finished on household survey at Prachuap Kiri Khan and Chumphon Provinces in this fiscal year with 274 samples.

From the result of Rayong Province, there were three zones of coastal area based on area

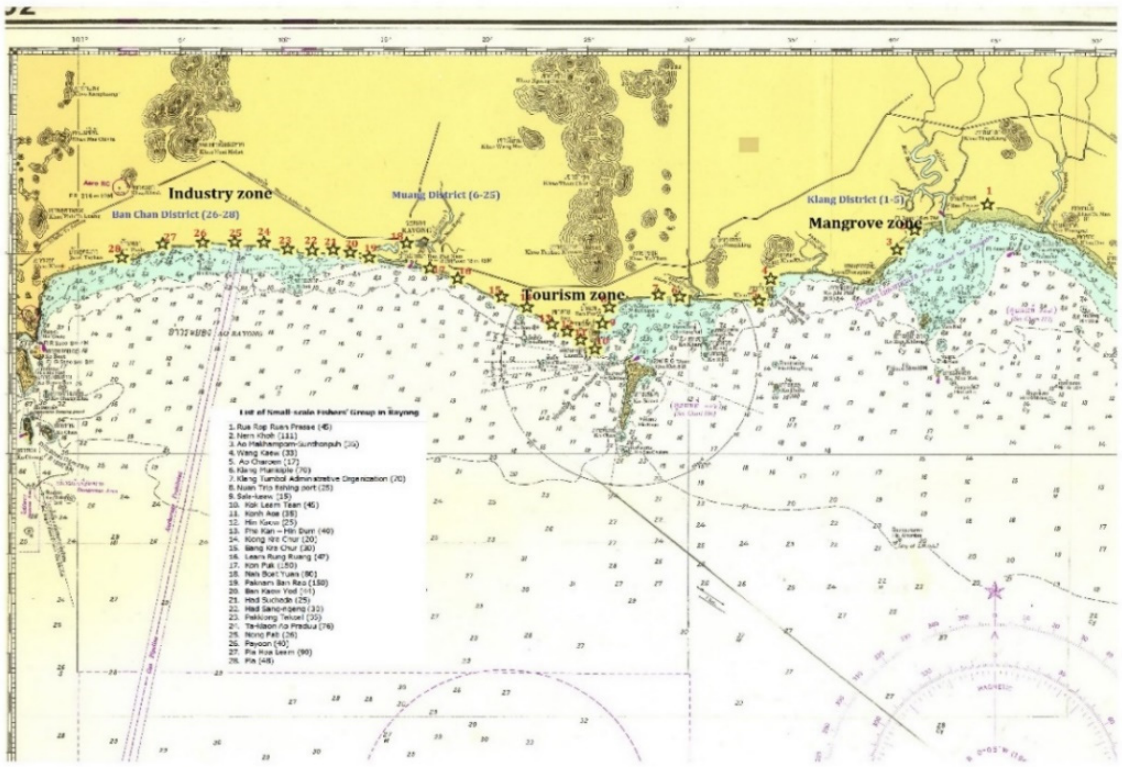

Fig. 1 Location of small-scale fishers group at Rayong Province

situation, industry zone, tourism zone and natural zone (mangrove area), as shown at Fig. 1. The coastal distance each zone is almost same. The number of fisher in industry and natural zone were approximately 3 hundred and tourism zone was 8 hundred. The industry zone has been bigger pollution problem than others because of releasing organic matter from a factory complex in the zone. However, the average fishing income of each zone was different, Industry zone was highest, natural zone was lowest in Rayong and the income difference of Industry and natural zone was double. This case showed that the abundant nature did not equal the fishing resource abundance.

In 2015/next fiscal year, social team plan to collecting data more on pollution at industry zone, fish distribution system at tourism zone and fisheries management approach in natural zone after analyzing fishing household datasets.

Household livelihood survey in coastal area in Surat Thani

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The extraction number is 327 in five districts in Surat Thani, three districts of five districts already finished, and we will finish the household survey in this fiscal year. The sub-districts names are1.Kanchanadit, 2.Thachang, 3.Meang, 4.Donsak, 5.Chaiya and the sub-districts of 1, 3, 5 were done.

The main fisheries in this province are Oyster farm and Bloody clam/Blood-coco farm and catch. Some fishers in mangrove forest depended on wild fish in mangrove and some fishers near costal area and island depended on swimming crab etc. We need to analyze the household survey data in detail, but we could see a difference among the fishing villages in Surat Thani, where fishing villages in mangrove were generally poor and fishing villages near aquaculture ground were richer than the former.

Don Sak sub-district in the eastern Surat Thani had successful Community Based Fisheries Management. Originally, the community had kicked against a constriction of ferry port because of silt problem. After that, they have kept the organization and kicked against an operation of trawl fisheries near costal line. After that, they made the protect area and regulation in this area (Fig.1), which the inside of red line was protect area and prohibited to use traps in the area. We conducted face-to-face surveys for the leaders in fishing villages and the leaders said that their fish resources have increased. We understood this case was success story in four fishing villages.

Recently, almost all fishing village in Don Sak try to make regulation of Fisheries Management with Don Sak officers, namely, these are Co Fisheries Management. This shows that the success story has strong power to install new Fisheries Management and the officer have the role of extension.

In next fiscal year, we will analyze the household datasets and conduct surveys regarding additional survey on fishing household, Fisheries Management and fish distribution system.

Fig. 1 Success case of Community Based Fisheries Management

Component 5 (Acoustic)

REPORT

Coastal Area Capability Enhancement in Southeast Asia

Research Institute for Humanity and Nature (RIHN)

Development and improvement of acoustic equipments and systems for shallow area

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Kritsada Thongsila, DOF Thailand

Component 5 Activities:

Activity 1: Developing the new data collection equipments and analysis systems of acoustic survey at coastal area

Activity 2: Field test of the developed equipments and system

Activity 3: On-site-Training of new acoustic survey equipments and systems

Activity 4: Publication of the research protocol guideline of acoustic survey for coastal area

Development and improvement of acoustic equipments and systems for shallow area

This study has been started as part of the RIHN project that is "Coastal area capability enhancement in Southeast Asia". This project aims at investigating the linkage between livelihoods and ecosystem health in the Southeast Asian coastal area are investigated to fully understand its complexity and consequent vulnerability, particularly from the human-related viewpoints through collaborative holistic researches with local peoples. The acoustic data collection system including equipment modification were conducted for coastal area survey around set-net fishing ground in Rayong province, Thailand. An analysis methodology is also developed and will be using as a tool for acoustic survey methodology education for young scientist. Since, depth of the target research area is about 15 meters. A searching range is too narrow for using the scientific echo sounder with available in the market. The project modified acoustic device with composed of GPS Plotter Fish-Finder (FURUNO GP1670F), Interface box and personal computer (PC) for using as acoustic data collection equipment. The objectives of program are 1) to develop new acoustic data collection system for shallow water, 2) to study on the fisheries resources distribution around set-net fishing ground in Rayong province, Thailand, 3) to estimate the amount of fisheries resources by using acoustic data

and fish catch data of set-net fishing operation, and 4) HRD on new acoustic survey equipment and system through on-site training and publication of guideline of acoustic survey for coastal area.

Activity 1 : Developing the new data collection equipments and analysis systems of acoustic survey at coastal area.

Acoustic data collection system including equipment modification were conducted for coastal area survey in Rayong province. The hardware and software system for data collection were developed at Tokyo University of Marine Science and Technology, Tokyo Japan. The testing of hydro-acoustic equipments and systems for shallow area were conducted at Tateyama Bay, Chiba Prefectures, Japan on October 2012.

Modification of GPS and echo-sounder system for hydro-acoustic data collection

The hydro-acoustic system for data collection was modified by using FURUNO GPS Plotter model GP-1670F. The GP-1670F was equipped with GPS receiver and chart plotter system. The machine was also equipped with echo-sounder with operated on 50 kHz and 200 kHz simultaneously. The GP-1670F provide a total integrated GPS receiver, color video plotter and color fish finder. The built-in GPS receiver provides highly accurate position, courses and speed information. The fish finder presents vivid underwater images on a high quality LCD. The equipment modification was performed by importing the echo-sounder transmitting and receiving signal from transducer cable to newly designed data collection system. The data collection system were composed of Pre-Amplifier and Band Pass Filter, Interface unit, Analog to Digital Converter, and PC computer system. The digital hydro-acoustic data were collected to PC hard disc by using "FishFinder Version 1" software program. The GPS position data was transfer from GP 1670F to PC Computer pass through NMEA to USB port. The GPS position data were recorded to PC by using Windows Hyper-terminal program. The data collection system was design to record the echo-sounder signal of 50 kHz. only.

The equipment test were conducted at Tateyama Training Station of TUMSAT in Chiba prefecture during 23-25 October 2012. The survey echo-sounder data collection system was assembly and conduct the sea trial running test on board TUMSAT training boat number 36. A standard target Tungsten Carbine spear ball diameter 38.1 mm. is used for system calibration.

Activity2: Field test of the developed equipments and system

Several hydro-acoustic equipments and system for shallow waters areas were tested at set-net fishing ground in Rayong province. The series of field test of the developed equipments and system as followings;

March 11-12, 2013

In order to investigated on the effect of ship avoidance behavior of fish school during acoustic cruising survey in shallow waters, the tested cruising survey by using small scale fishing boat and auto-pilot kayak boat were conducted in the set net fishing ground at Rayong province. The tested acoustic cruising survey were conducted on board small squid cast-net fishing boat and self auto-pilot kayak boat with running on the same cruising tract in the same day. Program "FishFinder Version 1", for Windows XP was used for echo data recorded. Data of return echo signal from fish school of both survey were compared for the appearance of fish school. The result showed that no effect by ship avoidance behavior of fish school during acoustic cruising survey in shallow waters by small squid cast-net fishing boat and self auto-pilot kayak boat.

September 11-13, 2013

The calibration of hydro-acoustic equipments and system for shallow waters areas by using standard target ball, (tungsten carbine, 38.1 mm), as well as target strength (TS) of bigeye scad were conducted at concrete water pond of EMDEC Rayong province, Thailand. The return echo signal from operating frequency of 50 kHz were recorded into PC hard disc for data analyzing. Since, concrete water pond depth is 1.5 m., then interference of refection of echo signal were contaminated to return echo signal of target ball and fish.

October 1-4, 2013

The cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The program "FishFinder Version 2" for Windows XP was using for test running cruise survey. The setting depth range at echo sounder at 20 m. can show more return echo signal detail of echo-gram. The result of survey shows that the "FishFinder Version 2" is working well during the survey, but the recorded acoustic survey data are not completed. The GPS interface unit is not working properly. It need for further improve the software program as well as adjustment and modification of GPS interface unit.

December 17-20, 2013

The cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The program "FishFinder Version 3" for Windows 7 was using for test running cruise survey. The result of survey shows that the "FishFinder Version 3" is working well. The setting depth range at echo sounder at 20 m. can show more return echo signal detail of echo-gram. However, the pre-setting receiver gain at Low and High level are not suitable for shallow waters areas survey. It need for further system adjustment and modification.

April 21-23, 2014

The cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The program "FishFinder Version 3" for Windows 7 and new design receiver gain circuit for 3 step were using for the survey. Total survey area covering for 16.25 km^2 with running distant of 38.5 km. The hydro-acoustic survey was conducted one day ahead of set-net fishing operation performed. Recorded hydro-acoustic survey data into PC hard disc and set-net catch data are analyzed at Faculty of Marine Science, Kasetsart University.

September 23-25, 2014

In order to investigated on the comparison of abundance of fisheries resources during set-net fishing operation season and off season. Then, the second survey cruise was conducted during no set-net fishing operation performed. The second cruising survey using hydro-acoustic equipments and system for shallow waters areas was conducted at set-net fishing ground in Rayong province, Thailand. The survey cruising tract was repeated as survey cruise on April 2014. Total survey area covering for 16.25 km^2 with running distant of 38.5 km. Recorded hydro-acoustic survey data into PC hard disc ware analyzed at Faculty of Marine Science, Kasetsart University.

Activity 3: On-site Training of new acoustic survey equipments and systems

Several on-site training activities on acoustic survey equipment and system were promoted under project component 5 as following:

First Acoustic Seminar at KU, Brief introduction of RIHN Project, Basic of underwater acoustic, Principle of fish-finder, Acoustic data collection system, Biomass estimation by acoustic system were presented by Dr. Yap MINLEE , Dr. Yoshinori MIYAMOTO, and Dr. Toyoki SASAKURA. There are 30 student were attained the seminar. March 18 2013.

Coursework is "Marine Geology" of undergraduate students in fourth by Dr. Yuttana Theparoonrat at Kasetsart University. September 3, 2014.

Coursework is "General Oceanography" of undergraduate students in third by Dr. Yuttana Theparoonrat at Kasetsart University. September 4, 2014**.**

Coursework is "Acoustic Tech.for Fish.Resources Assessment" at Southeast Asian Fisheries Development Center by Dr. Yuttana Theparoonrat at Kasetsart University. August 29, 2014.

Activity 4: Publication of the research protocol guideline of acoustic survey for coastal area

November 2013

Development of the simple system for measurement of fish distribution in shallow water using GPS fish-finder. Souchi Matsushita, Yoshinori Miyamoto, Keiichi Uchida, Kouhei Hasegawa, and Toshiharu Kakihara. The International Conference on Underwater Acoustic for Sustainable Fisheries in ASIA, The Seventh Annual Meeting of Asian Fisheries Acoustic Society, 5-6 **November 2013**, Tokyo, Japan

AFAS (Asia Fisheries Acoustical Society) Bussan, November 2013

- Educational study of acoustic surveys in coastal shallow area at Southeast Asia, MIYAMOTO Yoshinori, UCHIDA Keiichi, THEPAROONRAT Yuttana・ANONGPONYASKUM Monton, ISHIKAWA Satoshi, YAP Minlee, SASAKURA Toyoki, The 1st International symposium on aquatic products processing, Bogor, Nov., 20013

- Development and improvement of acoustic equipments and system for shallow area, MIYAMOTO Yoshinori, SASAKURA Toyoki, THEPAROONRAT Yuttana, YAP Minlee, ANONGPONYASKUM Monton, K. Thongsila, Coastal Area Capability Enhancement in Southeast Asia Project Joint Seminar in Thailand, Bangkok, Nov., 20013

- Development of the simple system for measurement of fish distribution in shallow water using GPS fish-finder, S. Matsushita・Y.Miyamoto・K.Uchida・K.Hasegawa, and T. Kakihara, The Seventh Annual Meeting of Fisheries Acoustics Society, AFAS2013, Tokyo, Nov., 20013

- Education and research for the acoustic resource survey in Southeast coastal shallow water, Miyamoto, Yoshinori Uchida Keiichi · Yuttana Theparoonrat · Monton Anongponyoskun · Ishikawa Satoshi · Yap Minlee · Sasakura Toyoki , The 2014 spring meeting of the Japanese Society of Fisheries Science, Hakodate, March 2014

February 4 -7, 2014

- The proceedings of 52nd Kasetsart University Annual Conference, Subject : Agricultural Extension and Home Economic at Kasetsart University, Thailand.
- Presentation in Hydro-acoustic Equipments for Application Fishery Resource Survey in Coastal Area.

June 10-12, 2014

- **The 4th Marine Science Conference "Blue Ocean Science" , Prince of Songkla University at Songkla University.**

- Presentation in Acoustic Surveys in Area of Setnet Fishing Ground, Rayong Province.

June 26 – 27, 2014

- The 8th Thailand –Taiwan Bilateral Conference" on "Science Technology and Innovation for Sustainable Tropical Agriculture and Food" at Kasetsart University.
- Presentation in Educational study of acoustic surveys in shallow water area at Rayong bay, Thailand

Component 6 (Set-net)

- Progress Report on Japanese-type set-net, in Thailand

T.Amornpiyakrit, N.Manajit, W.Yingyuad, Jariya Sornkliang(SEAFDEC)

N. Suksamran, U.Khrueniam, K.Phuttharaksa(Eastern Marine Fisheries Research & Development Center), T.Arimoto, S.Takeda, O.Baba (Tokyo Univ. of Marine Sci. and Tech.),

Japanese type set-net was introduced to Rayong Province, Thailand, in 2003, and successfully operated by the fisher's group with full records of catch and market data for 11 years. For aiming the assessment of fishing impact and sustainability of Rayong set-net, the following research activities are on-going since 2009, in collaboration with other component teams under the umbrella of Area Capability Project by Research Institute of Humanity and Nature, Kyoto, Japan.

(i) Monitoring & Evaluation of set-net operation with daily catch/market data, for understanding the accumulation performance of chamber trap according to the hauling intervals.

(ii) Flow logger data analysis for understanding the gear geometry of chamber net, in relation with the catch trend of set-net

(iii) Operation strategy of coastal fishing boats, with the interval video recordings around set-net in collaboration with Fishing Gear team (Component 1)

(iv) Wind logger data analysis for understanding the operation patterns of set-net and other coastal fishing gears, according to the seasonal change of wind direction and speed

(v) Income simulation for set-net fishers, with own fishing activities of other coastal gears such as gill net, trap, and trolling

(vi) Trophic level analysis of set-net catch composition, with the stable isotope analysis of muscle tissues and stomach contents of major catch species, in collaboration with Environment team (Component 3)

(vii) Impact of set-net technology introduction on fish marketing through the distribution channel analysis in Rayong

Analysis results of research topics above have been presented at the annual meetings of Japanese Society of Fisheries Science, as well as other international seminars, since 2012, and will be submitted for publication as the original scientific paper in Fisheries Science for wrap-upping the research activities in Rayong through the discussion meeting among team members of Component 6, in collaboration with other teams.

Component 7 (Stock enhancement)

Community-based shrimp stock enhancement in the New Washington Estuary

J Altamirano, N Salayo, D Baticados, JG Suyo, H Kurokura, H Fushimi

The shrimp stock enhancement component of the RIHN Area Capability Project is being conducted at the New Washington Estuary (NWE) in New Washington, Aklan, central Philippines. The area was known to be very productive for shrimps in 1970s and 80s. The highly-priced tiger shrimp *Penaeus monodon* composed more than 80% of catch until the early 90s. Currently, however, actual catch of tiger shrimps have been considered very rare. Daily shrimp catch only averages half a kilo of small fish and shrimps per gear, selling for less than 100 pesos. To increase daily income of fishers and to re-establish the once abundant tiger shrimps in the area, the community-based shrimp stock enhancement activity is being implemented.

At the start of the project, the local government units (LGU) of the communities or barangays around the NWE were informed about the stock enhancement project. Then, information education and communication (IEC) activities were focused on the project's primary stakeholders in Barangay Pinamucan, an island community most proximate to the project site. A socioeconomics survey was conducted in November 2012 to March 2013 to gather baseline profile of the fisherfolks, their households and their awareness and willingness to participate in the shrimp stock enhancement project. The survey showed their low income from fishing and low volume of catch. In spite of the low level of awareness of stock enhancement, there is high level of interest and willingness to participate in the project. A follow-up survey was also conducted in May 2014 to keep tract of the effects of a major typhoon, Yolanda, on the socioeconomic condition of the project stakeholders.

Being a community-based initiative, the stock enhancement activities are being participated in by fishers, who are members of an existing local organization called Pinamucan Small Fisherfolks Association (PSFA). Active members were successful in the construction and preparation of the culture site within an abandoned pond in a mangrove area in the middle of NWE. Fishers are also involved in monitoring of stocks, as well as maintenance of the culture site. Additionally, other fishers and local traders are engaged in recording actual catch to aid in the assessment of impacts of the project. While the active members of the PSFA participate in the intermediate culture and other shrimp stocking activities, IEC activities are being done in Barangay Pinamucan to improve understanding

about stock enhancement. Organizational enhancement activities are also being done to improve leadership skills among officers and encourage cooperation among members. Strategies for sustaining stock enhancement have been initiated and will be the focus of succeeding IEC activities with all project stakeholders.

So far, three intermediate culture runs were conducted in the New Washington Estuary. The first run was started in June 2013 with 129,000 tiger shrimp fry, purchased from a nearby hatchery. However, various problems like unpredictable weather changes, typhoons, and unstable conditions in the culture site caused very high mortality during the acclimation rearing phase. Learning from the experiences of the first culture trial, modifications were made in the 1200 sq.m. nursery culture site, resulting in a more successful second run. A total of 390,000 shrimp fry were stocked for intermediate culture in February 2014. Typhoons were again experienced during this time, but eventually, a total of 15,000 shrimps were released in April 2014. A total of 100 of the released shrimps were tagged. The third run was conducted in June 2014 using 270,000 shrimp fry cultured in a wider nursery area of 6,000 sq.m. In July 2014, we were successful in releasing an estimated 120,000 shrimps and 240 were tagged.

Catch monitoring with the help of local fishers and the participation of the local university - Aklan State University - is still being conducted to evaluate impacts of release. So far, anecdotal reports from fishers are positive. Many have already noticed some increase in tiger shrimp population in the New Washington Estuary.

Interim report of the baseline survey for stock enhancement of tiger shrimp in Batan Bay

Hisashi Kurokura

Baseline survey of stock condition of tiger shrimp in project area has been performed from September 2013 to July 2014. Gill net, push net and set net fishing were performed separately and catch amounts of each species were recorded. Totally, 89, 77 and 156 operations were performed before second stock release, and 29, 20 and 12 individuals of tiger shrimp were caught by gill net, push net and set net, respectively. Size distribution showed bimodal shape representing evidence of size selection of each fishing gear. Gill net could only catch shrimps larger than 110mm in total length and push net can catch shrimps smaller than 100mm. Appearance of tiger shrimp cannot be explained in the relation with species composition of the catch. Twelve out of 13 individuals of which locality

of the sampling by set net were caught by the set nets located south-east area of the acclimatizing and releasing site, and small tiger shrimp were caught in surrounding area of pond for acclimatizing rearing after first release, and the possibility that caught shrimp had been escaped from the pond for acclimatizing rearing cannot be denied.

In the pushing net operation for the confirmation of normal behavior of released shrimp, the catch amount and catch size increased with time by 10days after release. From this, we can make hypothesis that released shrimp stayed several days in sallower place around the rearing pond and then move to the bottom of deeper area. These results are providing us information for the improvement of the survey methods for the detection of impacts of release.

Component 8 (Coordination)

Area-capability Cycle on stock enhancement

Satoshi ISHIKAWA, Kazuo WATANABE, Yasuyuki KONO, Hiroshi FUSHIMI

Component 8 has responsibility to create conceptual design of Area-Capability based on the achievements of all components and discussion of Area Capability Index seminars. So far, a total of 2 times of ACI seminars have been held in Japan until April to August in this year. We invited 3 presenter at this seminar and discussed about appropriate resource management system by the community and for the community. Professor Yamakawa, who was one of the presenter, talked about how important fisherman's mind for community based resource management by using numerical model. Professor Foshimi and Arimoto made a presentation about stock enhancement activity in the Hamana Lake Japan and Rayon province Thailand based on there long term collaborative activity with local people and government. In addition, we also made a presentations of Area-Capability concept at Japan society for the promotion of science (JSPS) Symposium at University of California, Berkeley, annual meeting of the Japanese Agricultural Systems Society, Sustainability week seminar at Hokkaido University Japan and The Japan Society for International Development, Doshisya University, Kyoto Japan. And a presentation at annual meeting of the Ecological society of Japan is planned at March 2015.

Based on the discussion at the ACI seminars and the presentations, "Area-Capability" is recognized as one set of social conditions and items of human empowerments which enable to local institutional natural resource governance and they should be improvement targets in the rural development plans. The "governance" in the Area-capability concept should involve both effective use of natural resources based on the scientific ecosystem health evaluations for improvement of quality of lives of the members of local institutions and care actions for ecosystem health with monitoring and scientific evaluations by local institutions. These effective use and care for ecosystem health should be done simultaneously. Any rural development actions should touch in both effective use and care of ecosystems.

We propose the Area-Capability Cycle as one filter for evaluation whether each rural development plan considers both effective use of natural resources and care of ecosystem health or not (Fig. 1). And we considered what kinds of conditions and items are required to complete the Area-Capability Cycle on sites based on the case studies of Stock enhancement in Hamana Lake in Japan and set-net installation in Rayong Thailand.

In both cases of Stock enhancement and Set-net fishery installation, core persons of each activity have many passions and they conducted continued efforts with appropriate technological improvements. In stock enhancement of Hamana Lake, Prof. Fushimi who was a researcher of stock enhancement center of Shizuoka prefecture, conducted environmental survey of whole Hamana Lake in order to decide aquaculture conditions and to fined release points of shrimp larvae. And he improved aquaculture technology in feeding, water controls and handling of shrimps, etc. These technological improvements increased fishermen's shrimp catch in short period of time. The increased catch gave much impact on fishermen mind, and they realized the importance of stock enhancement for their lives. And the importance of environmental conditions for their lives was also recognized by local fishermen. In case of Set-net fishery in Rayong, Mr. Aussanee Mumprasit planed and obtained the permissions of Set-Net fishing in Rayong by himself. And he designed the fishing gear and he organized town seminar for establishment of fishermen community which manage the set-net fishery. In the first year, the set-net fishery did not get good results of fishing but Mr. Aussanee improved the design of fishing gear and fishing operation with consultation from Prof. Inoue, Prof. Arimoto and other professors and the fishermen of Himi City in Japan who have many experience of set-net fishery in Japan. After two years, the set-net fishery obtained big catch of fish including high value fish species which had not been caught by small-scale fishing. The community members of the set-net fishery realized

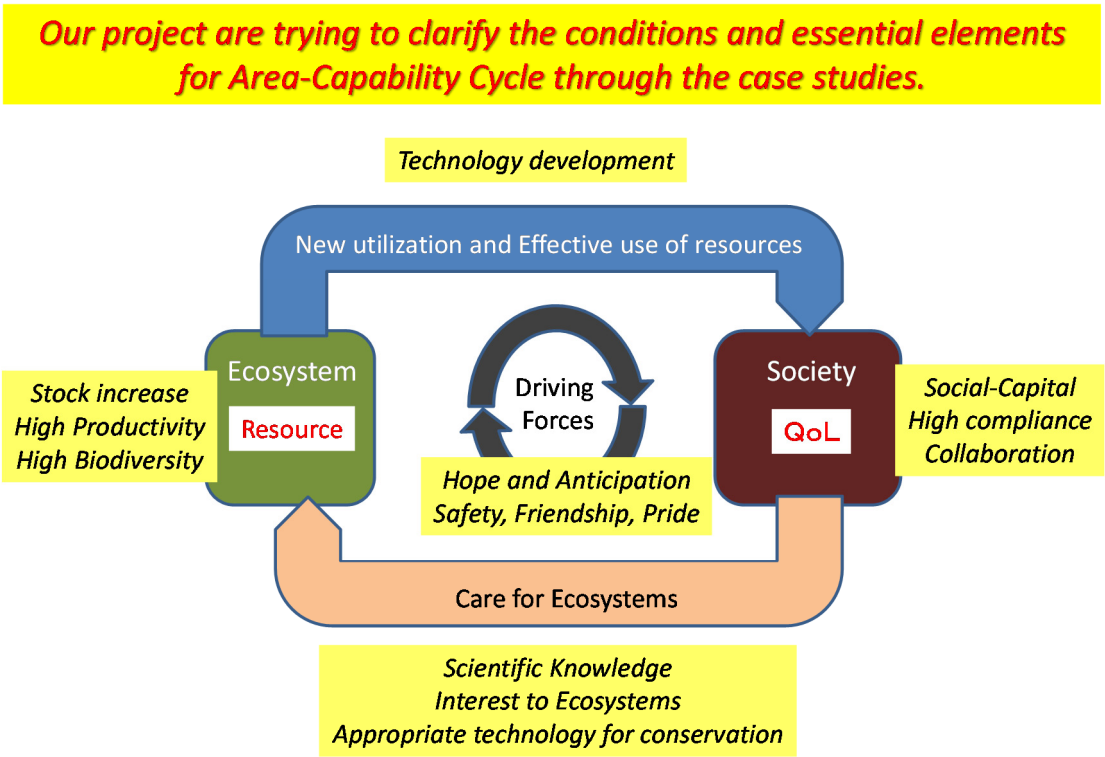


Fig 1. Area-Capability Cycle

and had much hope to this new fishing. The pooling system, in which all fish catch are sold in their own market by themselves, and half of fish income is pooled for management cost and rest half are shared by members according to their contribution. Through this system, all fish catch and incomes have been recorded very precisely. And improvement of management can be done based on the data analysis. So, these case studies indicate 1) continued efforts by skillful leader, 2) improvement appropriate technology, 3) existence of community which have some rights to decide their activity, 4) cultivating future hopes, 5) realization of ecosystem health importance for better life, 6) facilitate care on ecosystem health, are necessary for local institutional natural resource governance.

The two case studies are summarized as Figure 2 and 3 based on the Area-Capability Cycle. The stock enhancement of shrimp in Hamana Lake started the care of natural resources. Then, efficient utilization by fishermen community had started based on the collaboration among fishermen and researchers. The collaboration aquaculture fostered the social capital and high compliance of regulations. And local institutional stock enhancement stated after finish the national project. In this case, all conditions and items were completed. So this activity continued more than 30 years.

In case of set net fishery in Rayong, efficient utilization had been started as a first step using set-net fishing gear. Then, fishermen community had been established. And big catch and income cultivated the pride of fishermen. They started the eco-tourism using set-net fishery, it could be said they find new efficient utilization of ecosystem services. Good statistics data are provided from set net fishery. High monitoring and surveillance are also conducted by set-net fishery. However, the impact of set-net fishing on environment had not been examined. Therefore, to complete Area-Capability Cycle, the experiments on ecosystem impact evaluation should be done. The component 5, 6 and 4 have been conducted food web analysis based on the stable isotope analysis and biomass evaluation using acoustic survey. The results of these experiments can persuade all people to accept the set-net fishery as new tool for local institutional ecosystem governance.

Using the Area-Capability Cycle model, the important items and conditions can be considered by many stakeholders. And this cycle show the weak points of each activity for harmonization between utilization and care of ecosystem services. Therefore, the Area-Capability Cycle has high potential as a tool for evaluation of action plans in many cases of rural developments.

This concept design and Area-Capability Cycle were shown in CJS-JSPS Symposium 2014 “Long-term Sustainability through place-based small-scale economics, at UC Berkeley, September 26-28, 2014, Annual meeting of the Japanese Agricultural system Society in Kyoto University at 17 October 2014, Sustainability week symposium of Hokkaido University at 1st November 2014. And one presentation is expected at symposium named “Global and regional

integration of social-ecological study toward sustainable use of biodiversity and ecosystem services" in the 62th Ecological Study of Japan annual meeting in Kagoshima in March 2015.

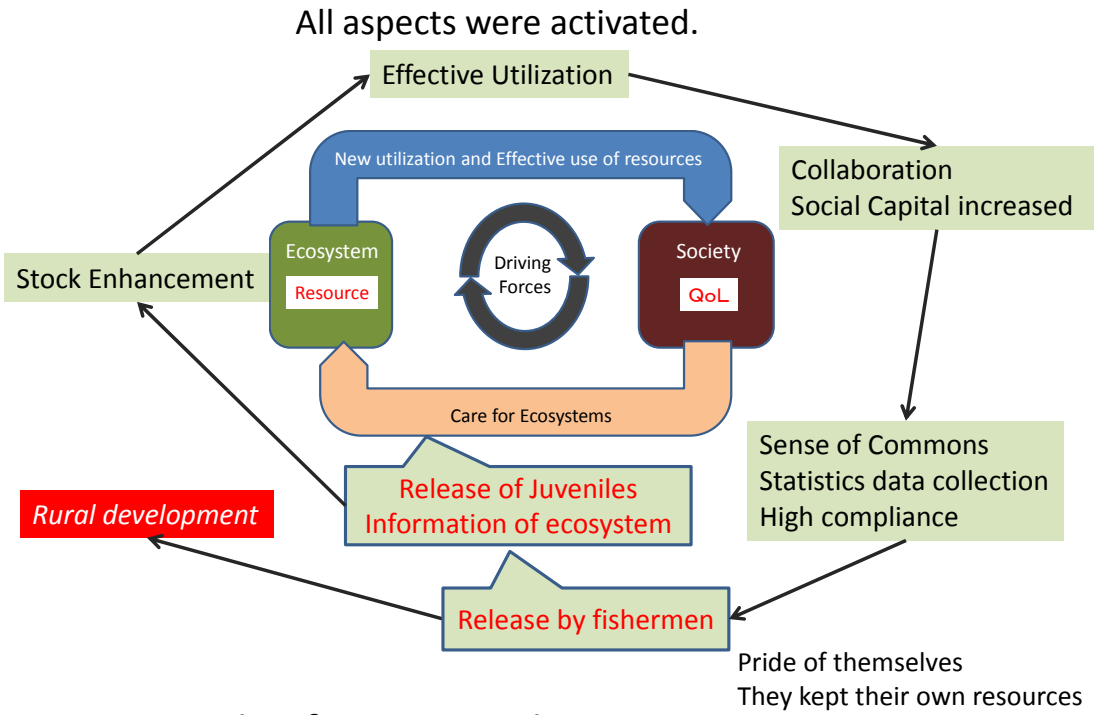
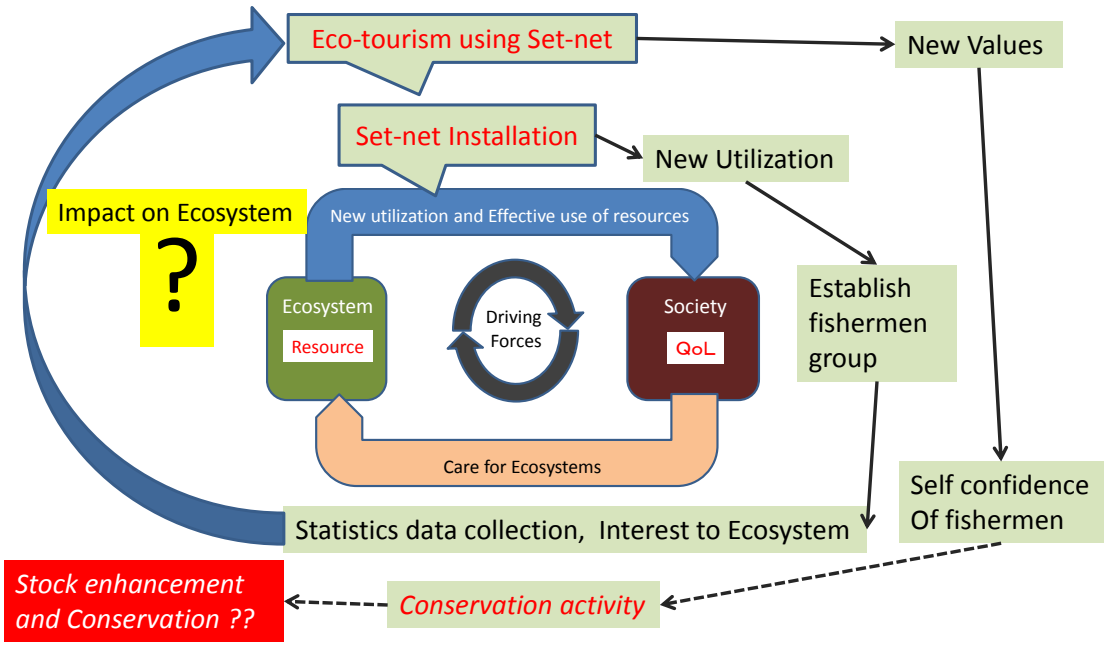


Fig. 2 AC cycle of Hamana Lake



Ecosystem Friendly activity give high value of fish and pride of fishermen.
These self-confidence will act as driving force of AC cycle.

Fig. 3 AC cycle of Set-net Fishery

Component 9 (Ishigaki and Mikawa)

Research Activities in Ishigaki Island and Mikawa Bay Area, Japan

Yoshihiko Yamada[1], Satoshi Ishikawa[1,2], Ippei Kawasaki[1], Masato Niki[1],
Takashi Yoshikawa[1], Hiroyuki Matsuura[1], Norimitsu Sakagami[1],
Rintaro Ono[1], Kenji Nohara[1], Yinji Li[1],
Takahiro Kobayashi[1], Wataru Doi, Kazumi Wakita[1]

[1]Tokai University, [2]RIHN

Towards "Area Capability Enhancement" in Ishigaki Island and Mikawa-bay area of Japan, this component has been focusing on a new way of improving interactions between human and nature through conducting a large number of activities in interdisciplinary perspective. Following are the details of our activities divided into three categories: 1.natural scientific research; 2.social scientific research; and 3.educational activities etc. in each area.

【Ishigaki Island】

1. Natural scientific research

One research topic in Ishigaki Island is the study on the influence of spring water on the biological production processes. Water samples were collected at 15 sites in the island. We are analyzing water samples by ICP-MS (Inductively Coupled Plasma Mass Spectrometry) method and are planning to measure the stable isotope from the samples. We plan to make the water quality distribution map of the Ishigaki Island.

Another research activity is to conduct an underwater archaeological survey around coastal area of Ishigaki, Taketomi, and Kuroshima Island. The underwater surveys have been conducted by divers mainly archaeologists with underwater robots made by our team. The purpose of these

surveys is to make the detailed underwater map and to identify the cultural and historical significance of each underwater site. Our past studies already confirmed the archaeological significance of these sites, hence they are also potential as a marine resource for education and tourism for local communities. With such understanding, we also have tied to provide our archaeological results and information sites to local schools, students, and professional divers by conducting of environmental education, special exhibition at the local museum, and town meeting.

2. Social scientific research

Study on ocean policy is one of the outputs of this category. Dr.Yamada in this team has conducted a survey on conservation and sustainable use of ecosystems in Ishigaki Island from the viewpoint of ocean policy. He gathered detailed information of the island, analyzed the current situation and ocean policy of neighboring areas, and also successfully drew up the "*Basic Plan on Ocean Policy for Ishigaki Island*" in collaboration with local governmental office and communities.

Another topic is a survey on actual situation of the coastal use in Ishigaki Island. In spite of the fact that there are various types of coastal uses (e.g. fishery use, recreational use, conservational use etc.), there have been no huge conflicts among coastal activities, and a harmonized coastal use has been formed in the area. And this fact has significantly contributed to the regional development as well. This study has clarified above situation and indicated challenges that the area faces towards further development.

3. Educational activities etc.

We have been holding a variety of environmental education classes aiming to improve the perceptions of local residents on natural environment, eventually aiming to improve the human-nature interactions in the area. We are not only aiming to hold the classes, but also aiming to grasp the perception changes of local residents on regional resource conservation and the usage. "Underwater robot class", "Mangrove class", "Underwater heritage class" are the environmental classes we have held for the time being.

In addition, we also hold town meetings with local residents in annual basis with various topics such as "The ways of ocean use in Ishigaki Island" in 2012, "A new appeal point of Ishigaki Island-Underwater robot and heritage" in 2013.

★Selected Contributions

・R. Ono, C. Katagiri, N. Sakagami, etc. "Current situation and future prospect of maritime cultural heritages in Yaeyama Iskands: Researcg report of Yarabu under-water site in Ishigaki Island", *Bulletin of the Ishigaki museum*, Vol. 22 pp. 20-43, 2013. (in Japanese)

- N. Sakagami, A. S. B. A. Rahim, S. Ishikawa, "Preliminary experiments of dynamic buoyancy adjusting device with an assist spring", *Proceedings of International Conference on Intelligent Robotics, automations, telecommunication facilities, and applications* (IRoA), pp. 985-993, 2013.
- A. S. B. A. Rahim, N. Sakagami, S. Ishikawa, "Development and experiments of dynamic buoyancy adjusting device with an assist spring", *Proceedings of Symposium on Motion and Vibration Control* (MoViC), A34, 2013. (in Japanese)
- Y. Yamada, I. Kawasaki, N. Sakagami, Y. Li, M. Niki, R. Ono, S. Ishikawa, "Ocean environmental education using DIY underwater robots", *Proceedings of the Annual Conference of the Robotics Society of Japan*, 2R2-07, 2013. (in Japanese)
- Ono, R, H. Kan, N. Sakagami, M. Nagano and C. Katagiri, "First Discovery and Mapping of Early Modern Grapnel Anchors in Ishigaki Island and Cultural Resource Management of Underwater Cultural Heritage in Okinawa". In Hans Van Tilburg, SilaTripati, Veronica Walker Vadillo, Brian Fahy, and Jun Kimura (eds.) *Proceedings of the 2nd Asia-Pacific Regional Conference on Underwater Cultural Heritage*, pp. 983-697, 2014.
- Y.Li, Y.Yamada, S.Ishikawa, M.Niki, N.Sakagami, "Study on the actual situation of coastal use in Ishigaki Island", *Proceedings of the 2014 meeting of Japanese society for coastal zone studies*, July 25, 2014.(in Japanese)
- N.Sakagami, Y.Li, Y.Yamada, I.Kawasaki, M.Niki, R.Ono, S.Ishikawa, "Ocean Environmental Education through Monozukuri in Ishigaki Island", *Journal of Japanese Society for Engineering Education*, Vol.62,No.3, pp.47-52, 2014.(in Japanese)
- Ono,R, "Underwater Cultural Heritages in Ishigaki Islands and their future perspectives", The 2th Ishigaki Town Meeting, Ishigaki. (Feb, 2014).(in Japanese)
- Ono, R, H. Kan, N. Sakagami, M. Nagano and C. Katagiri, "First Discovery and Mapping of Early Modern Grapnel Anchors in Ishigaki Island and Cultural Resource Management of Underwater Cultural Heritage in Okinawa", The 2nd Asia-Pacific Regional Conference on Underwater Cultural Heritage, Honolulu. (15th May, 2014)
- Ono,R, "Underwater Cultural Heritages in Ishigaki Islands and their possibilities", The 4th Ishigaki Marine Seminar, Ishigaki. (6th June, 2014). (in Japanese)
- Y.Li, Y.Yamada, S.Ishikawa, M.Niki, N.Sakagami, "Study on the actual situation of coastal use in Ishigaki Island", the 2014 meeting of Japanese society for coastal zone studies, July 25, 2014.(in Japanese)
- R.Ono, "Under water cultural heritages in Okinawa and future concept for underwater site museums", *Ocean Newsletter* 333：4-5, 2014. (In Japanese)
- Yamamoto, Y and R. Ono, "Underwater Archaeology 5: Yarabu Underwater site in Ishigaki", *Diver* 398:132-133, 2014. (In Japanese)

★Selected events

・First town meeting in Ishigaki Island

Title: The ways of ocean use in Ishigaki Island

Date : Feb. 24th, 2013. 14:00-16:00

Place : Hotel Granview Ishigaki

・Conservation and Utilization of coral reef “Sekisei-shoko”(Sekisei lagoon)

Date : June 1st, 2013. 14:00-16:00

Place : Shimizu Campus, Tokai University

・First Environmental Education for high school students

Title : Ocean observation using DIY underwater robots

Date : August 30th, 2013. 12:00-18:00

Place : ANA intercontinental Ishigaki resort

・Exhibition in Yaeyama Museum

Title : Sunken history　- Search for the time capsule -

Date : October 1st until November 2nd of 2013

Place : Yaeyama Museum

・Second education class for high school students

Title : Underwater archaeological survey using an underwater robot

Date : November 9th, 2013

Place : Sea area around Ishigaki Island

・Academic and Science fair in Shizuoka

Title : Environmental education & archaeological survey using an underwater robot.

Date : November 25th, 2013. 13:00-16:00

Place : Numazu city in Shizuoka

・Second town meeting in Ishigaki Island

Title : A new appeal point of Ishigaki Island-Underwater robot and heritage

Date : Feberary 16th, 2014

Place: Ishigaki city conference hall

・Third education class for high school students

Title : Underwater archaeological survey using an underwater robot Ⅱ

Date : August 21st, 2014

Place : Sea area around Ishigaki Island

・Fourth education class for high school students

Title : Hukito-river is a natural laboratory-environmental physics of mangrove

Date : August 21st, 2014

Place : Hukito-river area in Ishigaki Island

【Mikawa Bay Area】

1. Natural scientific research

The purpose of the scientific investigation is to understand biogeochemical cycles and ecosystem structure in Mikawa Bay area. We are doing research on marine environment and biological resources including water, ocean bed sediments, benthos, seaweeds, bivalve species, and zooplanktons. We collected water samples at 20 sites, ocean bed sediments at 20 sites, 25 species of benthic animal samples, and three species of macrophyte samples. Water and sediment samples were analyzed by stable strontium isotope analysis. The map as to the distribution of the strontium isotope shows the characteristics of watershed about each Toyo River and Yahagi River which are the largest river in observation area. Thirteen bivalve samples from 7 sites were collected to investigate the genetic variability and population structure of the bivalve species in Mikawa Bay. Among these samples, universal primers (LCO1490 and HCO2198) amplified the CO1 gene (mtDNA) of 8 bivalve species (*Dosinia japonica*, *Moerella rutila*, *Mactra chinensis*, *Ruditapes philippinarum*, *Scapharca subcrenata*, *Solen strictus*, *Mactra veneriformis*). We will investigate the genetic variation of these species based on the DNA analysis. We also study seasonal variations of the zooplankton community in Mikawa Bay to discuss environmental factors to maintain species diversity and interspecific relationships. We have made a database of those marine species and are updating it in regular bases.

2. Social scientific research

On one hand, we focus on the traditional fire festival and seaweed use in Mikawa area. The purpose of the survey on fire festival is to understand the socio-spatial structure and the historical transformation of the local communities. In the survey on the seaweed use, we are trying to clarify the social role of the seaweed use in the community from the viewpoint of minor subsistence.

On the other hand, we focused on ocean education activities, clarified the functions and functional requirements of Fisheries Cooperative Association (FCA), as well as its social significances in ocean education through a case study of Higashihazu FCA in Mikawa area. In the long history of Japanese fishery, the FCA has played an important role not only in fisheries industry, but also in supporting overall fishing communities.

3. Educational activities etc.

We have been holding a series of “Organism observation class” in collaboration with local residents (Higashihazu FCA and local governmental office etc.) in Mikawa bay area as well. And also continue to hold town seminars in annual basis with various topics, such as “The power of the nature and the treasure of the chiyiki(local area)” in 2012, “The people and the ocean of Hazu” in 2013

★Selected Contributions

・Hayase, Tanekura, Matsunaga, Hasegawa, Yamazaki, Noba, Kamitani, Yoshikawa, "Life history and feeding habitat of Lacuna carinifera in macrophyte beds in Mikaw Bay, Japan", Annual Meeting of the Malacological Society of Japan, April 14, 2012. (in Japanese)

・Li, Niki, Yoshikawa, Ishikawa, "Analysis on the role of fisheries cooperative association in ocean education - A Case Study of Hazu Area", The 2013 autumn meeting of the Japanese Society of Fisheries Science , September, 2013. (in Japanese)

・Koga, Sato, Fukamatsu, Miyamoto, Yoshikawa, Matsuura, Niki, Nohara, Hayashizaki, Ishikawa, "Food-web structure of the Higashi-Hazu tidal flat in Mikawa Bay, Japan", The 2013 autumn meeting of the Japanese Society of Fisheries Science, September, 2013. (in Japanese)

・Okamura, Kimura, Yoshikawa, Matsuura, Ishikawa, "Seasonal variations of the phytoplankton community in the Mikawa Bay", The 2013 autumn meeting of the Japanese Society of Fisheries Science , September, 2013. (in Japanese)

・Yoshikawa,Nishijima,Fushimi,Hayase,Tanekura,Ishikawa,Spatio-temporal segregation of two major species in Gastropods communities in three types of macrophyte beds in Mikaw Bay, Japan", The 2013 autumn meeting of the Japanese Society of Fisheries Science, September, 2013. (in Japanese)

・Y.Li, M.Niki, T.Yoshikawa, S.Ishikawa, "Activities and Functions of Fisheries Cooperative Association in Ocean Education-A Case Study of Higashihazu Fisheries Cooperative Association- ", *Journal of the School of Marine Science and Technology, Tokai University*, Vol.12,No.1,pp.12-22,2014.(in Japanese)

★Selected events

・Symposium on Environment
  Title : The power of the nature and the treasure of the chiyiki(local area)
  Date : Feberary 19th, 2012
  Place: Higashihazu FCA

・Symposium on research activities
  Date : March 2nd, 2013
  Place: Higashihazu FCA

・Mikawa Town seminar
  Title : The people and the ocean of Hazu
  Date : Feberary 22nd, 2014
  Place: Hazu ikiiki-center of Nishio city

Trans-disciplinary Research in Ishigaki Island and Mikawa Bay Area, Japan

Yoshihiko Yamada, Masato Niki, Ippei Kawasaki, Takahiro Kobayashi, Hiroyuki Matsuura, Takashi Yoshikawa, Kenji Nohara, Norimitsu Sakagami, Rintaro Ono, Yinji Li
Tokai University

This component focuses on trans-disciplinary research activities on Area Capability enhancement in Ishigaki Island and Mikawa-bay area of Japan, eventually aims to propose an ideal way of trans-disciplinary research in regional development field.

This presentation will indicate what we have done and what we have left undone so far, and will discuss the viewpoints for examining the ideal way of trans-disciplinary research in regional development.

The activities of this component could be divided into three stages as follows. First stage is the scientific research activities on regional resources both in natural and social (cultural) perspectives, such as researches on organisms in tideland (Mikawa), planktons (Mikawa), underwater heritages (Ishigaki), tea cultures and community networks (Mikawa), etc. This is the stage where we put much more efforts on clarifying the unknown or non-well known regional resources while getting cooperation from local residents.

Second stage is educational activities on environment and resources for improving the perception on local resources which as well in collaboration with local societies such as Fisheries Cooperative Association, Junior Chamber International Japan Yaeyama, local governmental offices etc. In this stage, we are not only aiming to hold a variety of environmental classes, but also aiming to grasp the perception changes of local residents on regional resource conservation and the usage. “Underwater robot class” (Ishigaki), “Mangrove class” (Ishigaki), “Underwater heritage class” (Ishigaki), “Organism observation class” (Mikawa) etc. are the environmental education classes we have held for the time being.

Third stage is the activities on finding ways for making best use of regional resources to improve the quality of human society, which as a matter of course in collaboration with local residents as well. We have been working on “Under water museum” (Ishigaki), “Regional economic circle” (Ishigaki), “Field guide book” (Mikawa), “Nakanaka heritage” etc.

Participant List

Participant List

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