

Component 9 (Ishigaki and Mikawa)

Research Activities in Ishigaki Island and Mikawa Bay Area, Japan

Yoshihiko Yamada¹, Satoshi Ishikawa^{1,2}, Ipei Kawasaki¹, Masato Niki¹,
Takashi Yoshikawa¹, Hiroyuki Matsuura¹, Norimitsu Sakagami¹,
Rintaro Ono¹, Kenji Nohara¹, Yinji Li¹,
Takahiro Kobayashi¹, Wataru Doi, Kazumi Wakita¹

¹Tokai University, ²RIHN



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 tried 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 Islands: Research 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, Sila Tripathi, 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 : February 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 Mikawa 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 Mikawa 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 : February 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 : February 22nd, 2014
Place: Hazu ikiiki-center of Nishio city