

Newsletter from NOWPAP CEARAC

Northwest Pacific Action Plan
Special Monitoring & Coastal Environmental Assessment
Regional Activity Centre

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Greetings from CEARAC

Michitaka YOKOI, CEARAC Director

Special Monitoring and Coastal Environmental Assessment Regional Activity Centre (CEARAC) is one of the four Regional Activity Centres (RACs) established in the four member states (China, Japan, Korea and Russia) of the Northwest Pacific Action Plan (NOWPAP) which was adopted in 1994 as part of the Regional Sea Programme of the United Nations Environment Programme (UNEP). Since its inception in 2002, CEARAC has mainly worked on monitoring and assessment of the marine and coastal environment by using remote sensing (RS) technique in cooperation with the Northwest Pacific Region Environmental Cooperation Center (NPEC), host organization of CEARAC.



In a conventional way for monitoring and/or assessment of the environment, we need to go to target areas to directly collect target species or measure values of the environment. However, with RS technique, we can obtain data away from targets. CEARAC uses high resolution images taken by sensors on satellites which go around the earth. The obtained images are processed to understand the state and/or the trend of the marine and coastal environment in the NOWPAP region. Covering a much wider area by one shot is definitely a big advantage of satellite images. With RS technique, CEARAC has developed the Common Procedure for Eutrophication Assessment and NOWPAP Eutrophication Assessment Tool (NEAT) which was introduced in the UNEP website in May 2019.

Another, but not last outputs of CEARAC in the 2018-2019 biennium is a new tool for mapping seagrass distribution in the NOWPAP region. In recent years, seagrasses was recognized as one of the important habitats, and CEARAC developed a tool to spot seagrass beds using GIS. We expect that the general public will get involved in spotting seagrass beds to increase info./data of them.

Through our activities, CEARAC hopes to contribute to the marine and coastal environment conservation in the NOWPAP region as well as achievement of relevant global processes such as Sustainable Development Goals (SDGs). Actually, CEARAC and its activities have been highly-evaluated and introduced in some important regional and global meetings and other events.

CEARAC Newsletter Vol.16 introduces our activities implemented in the 2018-2019 biennium, focusing on the ones in 2019. We hope this newsletter helps its readers get more interested in the marine and coastal environment in Toyama Bay and the wider northwest Pacific region, and step forward toward conservation of the precious marine and coastal environment as well.



Activities in 2019

1. Organization of Meeting

➤ **Second CEARAC Expert Meeting on Eutrophication Assessment in the NOWPAP Region**

The second CEARAC Expert Meeting on Eutrophication Assessment in the NOWPAP Region was held on 22 March 2019 in Vladivostok, Russia. As “Index of coastal eutrophication” became one of the sub-indicators of the Sustainable Development Goal (SDG) 14.1, the meeting participants recognized the importance of continuing eutrophication assessment in the NOWPAP region. CEARAC has been processing a regionally tuned remotely sensed chlorophyll-a concentration (satellite Chl-a) data in the Northwest Pacific region and regularly provide such data on the Marine Environment Watch System website. Using level and trend of these regionally tuned time series data, CEARAC developed NOWPAP Eutrophication Assessment Tool (NEAT) to identify potential eutrophic zones in the NOWPAP Region. The NEAT was introduced at the meeting and the meeting participants endorsed its effectiveness and encouraged CEARAC its further development with new ocean color satellite sensor data by inter calibration of sensors and cross validation with in situ chlorophyll-a concentration data. Successfully story of the NEAT was also introduced in [a webstory of the UNEP website](#).



➤ The 17th CEARAC Focal Points Meeting

The 17th NOWPAP CEARAC Focal Points Meeting (FPM) was held on 9-10 September 2019 in Toyama, Japan with the participation of CEARAC Focal Points and alternates from the four NOWPAP member states, representatives of Regional Coordinating Unit (RCU) and other Regional Activity Centres (RACs) of NOWPAP, the IOC Sub-Commission for the Western Pacific (IOC/WESTPAC), and one Japanese researcher.

CEARAC FPM is a NOWPAP arrangement consisting of representatives of the NOWPAP member states in order to promote smooth and effective implementation of special monitoring and assessment of the marine and coastal environment in the NOWPAP region.

The meeting reviewed current CEARAC activities for the 2018-2019 biennium and discussed planned activities for the 2020-2021 biennium. After discussion, the draft workplan of CEARAC for the 2020-2021 biennium including six projects: assessment of distribution of tidal flats and salt marshes in the NOWPAP region; organization of a training course on environmental DNA (eDNA) analysis; update of HAB database and HAB reference database; implementation of case studies on estimating seagrass blue carbon in selected sea areas in the NOWPAP region; improvement of the NOWPAP Eutrophication Assessment Tool (NEAT) and monitoring of eutrophication using satellite chlorophyll-a; and organization of the 5th NOWPAP training course on remote sensing data analysis was adopted and agreed to be submitted to the 24th NOWPAP IGM to be held in Beijing, China in February 2020.



Report and Documents of CEARAC FPM17 can be found on the following website.

<http://cearac.nowpap.org/meeting-report/the-seventeenth-nowpap-cearac-focal-points-meeting/>

➤ **Workshop on NOWPAP Regional Action Plan on Marine and Coastal Biodiversity Conservation (RAP BIO) and Workshop on CEARAC Medium-term Strategy for Marine Biodiversity Conservation (BIO MTS)**

CEARAC organized two workshops jointly on 28-29 November in Chiba, Japan. Nominated experts for RAP BIO and nominated experts for CEARAC coastal habitat and environmental DNA (eDNA) projects participated in the workshops.

On the first day, 28 November, the workshop on RAP BIO was held. Unfortunately, the international consultant for RAP BIO, Dr. David Coates couldn't participate in the workshop, and Dr. Ning Liu, scientific officer of NOWPAP RCU moderated the workshop instead. After Dr. Liu explained the objective of the workshop and the discussion paper prepared by Dr. Coates, the nominated experts of the NOWPAP member states introduced national actions for marine biodiversity conservation in their respective states. Then, while reviewing the discussion paper, they were asked to provide additional information, if necessary, based on the national biodiversity strategies of each member state. So all participants carefully reviewed the paper and provided their comments. Some major comments from them are as follows:

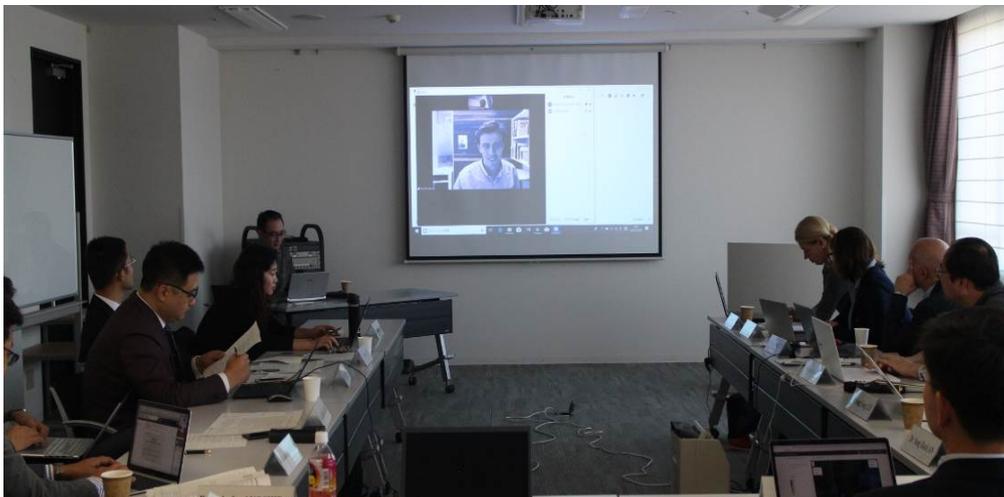
- NOWPAP RAP BIO should be along with national biodiversity strategies of the member states. At the beginning of implementing RAP BIO, existing national strategies should be reviewed and RAP BIO should show the common objectives among the member states;
- Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets will be revised to Post 2020 Targets at the COP15 held in China in 2020. When NOWPAP develops RAP BIO, we should refer to the new global targets;
- Assessment of ecosystem services is an important element for marine biodiversity conservation. However, NOWPAP has not assessed ecosystem services in cooperation with support from economist and/or social scientists, so it is difficult to assess the historical trend of ecosystem services.
- In the past biodiversity activities, we faced the limitation of available data on marine biodiversity, Therefore, it may be difficult to assess the trend on several biodiversity topics in the NOWPAP region.



After a long discussion, the participants of the workshop agreed to revise the CEARAC workplan (development of the roadmap for RAP BIO) including the schedule of the activity. Based on the comments provided from the RAP BIO experts, the discussion paper will also be revised and submitted to the 24th NOWPAP IGM to be held in February 2020. CEARAC has spent only 15,000 USD for this project and still has 15,000 USD. With the leftover money, an additional workshop will be held in summer 2020 with representatives of NOWPAP RCU and RACs, the international consultant and the experts of the member states in order to prepare a draft RAP BIO. The draft RAP BIO will be submitted to the member states by the end of 2020 to be reviewed in 2021 and expected to be approved by the end of 2021.

On 29 November, another workshop on CEARAC BIO MTS was held. After introduction of the workshop, the participants reviewed the final draft of CEARAC BIO MTS. They agreed to submit the BIO MTS to CEARAC FPs for their approval for submission to the 24th IGM.

In the morning session, the participants discussed a new project for the 2020-2021 biennium: assessment of distribution of tidal flats and salt marshes in the NOWPAP region. As a keynote speaker, CEARAC Secretariat invited Dr. Nicholas Murray, James Cook University, Australia. Dr. Murray developed a tidal flat distribution mapping tool and the manager of the Global Intertidal Change. So, support from Dr. Murray is highly expected in order to map the distribution of tidal flats and salt marshes in the NOWPAP region with satellite images. Dr. Murray introduced the history of development of the global tidal flats mapping tool and provided ideas of how to collaborate with CEARAC project. The workshop participants recognized Dr. Murray's mapping tool is very useful for the NOWPAP region and asked for his support to the CEARAC project.



Then, the experts on tidal flats and salt marshes of the NOWPAP member states shared information on the distribution of these habitats in each member state. In the NOWPAP region, wide tidal flat areas are distributed in the Chinese and Korean coastal areas of the Yellow Sea. In Japan, most tidal flats are located in the Seto Inland Sea and the Ariake Sea. In Russia, tides are very weak and the distribution of tidal flats in the Russian coastal area is very limited. Only in the northern part of the NOWPAP region, Strait of Tartary, intertidal areas, there are some tidal flats detected. After the presentations, it was recognized that each member state has available data and information on the distribution of tidal flats and salt marshes. The participants discussed the CEARAC's workplan for assessment of distribution of tidal flats and salt marshes in the 2020-2021 biennium, and agreed as follows:

- In 2020, CEARAC Secretariat with support by Dr. Murray will develop a draft tidal flats and salt marshes distribution map using satellite images. National experts will review the draft map and revise it based on available data and information in each member state.

- In 2021, CEARAC Secretariat will prepare a historical distribution map from 1980s. Using some information, such as reports on reclamation in the NOWPAP region which has been developed by DINRAC in 2018-2019, anthropogenic impacts on tidal flats and salt marshes will be assessed.

The expected outputs of this project will be a distribution map of tidal flats and salt marshes in the NOWPAP region and a regional report on the distribution assessment of tidal flats and salt marshes in the NOWPAP region.

In the afternoon, a session for another new project on environmental DNA (eDNA) was held. The experts of the member states reported the status on application of eDNA technique in their respective states. Japan is a pioneering country and has a long history on studies using eDNA. A Japanese expert group developed a database of fish metabarcoding (MiFish) and assessed the distribution of fishes along all Japanese coasts. In China, eDNA is used for conservation of Chinese egrets. By using eDNA, the number of Chinese egrets and their sex are monitored. In Korea, distribution of phyto- and zoo-plankton is monitored using eDNA. Korean experts have tried to assess the relationship between fish distribution and plankton distribution using eDNA. In Russia, application of eDNA has just been started in monitoring of phytoplankton species using eDNA and development of a database of fish metabarcoding. It was understood that in all NOWPAP member states, eDNA technique has been applied in some researches, but the degree of its application is different among the member states. The experts agreed to organize a training course to share the methodology of eDNA analysis among the member states and develop a common manual on eDNA analysis. The first training course will be held in spring 2021 in Kobe University, Japan.

The experts reviewed two draft workplans of CEARAC activities for 2020-2021: assessment of distribution of tidal flats and salt marshes in the NOWPAP region, and a training course of eDNA analysis during the workshop and they agreed on both of them. More detailed workplans will be prepared by CEARAC Secretariat and the activities will be proposed at the next CEARAC FPM (18th FPM) to be held in early summer in 2020.

The meeting also discussed the future CEARAC activities after 2022, and agreed to continue discussion in the next biennium.



2. Reports of main projects for 2018-2019

➤ **CEARAC activities for marine biodiversity conservation in the 2018-2019 biennium**

In the 2018-2019 biennium, CEARAC has been implementing two activities for marine biodiversity conservation. The first is “Development of a CEARAC Medium-term Strategy for Marine Biodiversity Conservation (CEARAC BIO MTS)”.

In the past 10 years, CEARAC implemented activities on marine biodiversity conservation through publication of a report on monitoring and management in marine protected areas (MPAs) in the NOWPAP region, assessment of major pressures on marine biodiversity in the NOWPAP region, and so on. However, CEARAC FPs requested CEARAC Secretariat to show a clear future vision of CEARAC’s activities for marine biodiversity conservation in the NOWPAP region. Based on the request from them, CEARAC Secretariat proposed to develop a CEARAC Medium-term Strategy for Marine Biodiversity Conservation (CEARAC BIO MTS) in the current biennium.

At first, CEARAC FPs selected six potential topics for marine biodiversity conservation for future CEARAC activities as 1) Assessment of marine biodiversity, 2) Harmful invasive species, 3) Specific migratory species, 4) Conservation of biological habitats, 5) Plankton species related to aquaculture and fisheries and 6) environmental DNA (eDNA). The nominated experts by CEARAC FPs assessed the data availability and feasibility of the potential topics in each member state. Then, three topics were selected as high priorities based on their assessments, namely, conservation of biological habitat, plankton species and eDNA.

In addition to the future priority topics, CEARAC developed the basic policies of CEARAC BIO MTS. Our basic policies for marine biodiversity conservation are:

- A) CEARAC focuses on activities which are related to coastal environmental assessment and development of assessment tools for special monitoring programmes, as shown in the Memorandum of Understandings (MoU) with United Nations Environment Programme (UNEP);
- B) CEARAC contributes to the development of NOWPAP Regional Action Plan on Marine and Coastal Biodiversity Conservation (RAP BIO), and implements our tasks shown in RAP BIO and conserves marine biodiversity in the NOWPAP region after RAP BIO is approved; and
- C) Through the monitoring and assessment programmes of marine biodiversity, CEARAC contributes to NOWPAP Ecological Quality Objectives (EcoQOs) and their achievements.

Based on these basic policies and priority topics, in CEARAC BIO MTS,

- CEARAC tries to develop coastal habitat monitoring tools for marine biodiversity conservation and to assess the current situation and anthropogenic impacts on important habitats in the NOWPAP region;
- CEARAC tries to develop monitoring tools using new techniques such as remote sensing and eDNA, and assesses the current status of marine biodiversity including non-indigenous species in the NOWPAP region; and
- CEARAC tries to promote the developed monitoring and assessment tools in the NOWPAP member states and to enhance capacity building including human resource development and expert network development.

The first draft of CEARAC BIO MTS was proposed at the 17th CEARAC FPM (9-10 September 2019). CEARAC FPs approved the draft in principle with inputs from all NOWPAP member states. Based on the request from CEARAC FPs, CEARAC organized a workshop in order to finalize the BIO MTS on 29 November 2019 in Chiba, Japan. Details of the workshop are introduced in another article, “the organization of workshop” in this newsletter. The participants of the workshop agreed to submit the final version of CEARAC BIO MTS prepared by the Secretariat to the CEARAC FPs and the NOWPAP IGM for its final approval.

The second activity is “development of a roadmap for NOWPAP Regional Action Plan on Marine and Coastal Biodiversity Conservation (RAP BIO)”. RAP BIO is future visions and goals for marine and coastal biodiversity conservation in the NOWPAP region. It is closely related to CEARAC BIO MTS: therefore, CEARAC has been implementing this activity in the 2018-2019 biennium. As for national experts of this project, Dr. Jing-feng Fan is nominated from China, with Dr. Yong-Rock An from Korea and Dr. Tatiana Orlova from Russia. An international consultant, Dr. David Coates was also hired by NOWPAP RCU for this project.

The discussion paper was prepared by Dr. Coates and circulated among the nominated experts. In order to review and improve the discussion paper, a workshop on RAP BIO was held on 28 November back-to-back with the workshop for CEARAC BIO MTS. Unfortunately, Dr. Coates was absent from the workshop, but three nominated experts and representatives of NOWPAP RCU, CEARAC, DINRAC and POMRAC joined and reviewed the discussion paper.

During the workshop, the experts introduced actions on marine biodiversity conservation implemented in their states. It was agreed that the experts will provide additional information to the discussion paper based on the information included in their presentations. Representatives of RACs also shared past and current activities of theirs which are related to marine biodiversity conservation.

After a long discussion, the participants agreed to revise the discussion paper with inputs from the experts. The participants also discussed and agreed the future workplan of CEARAC for development of a roadmap for RAP BIO. This project will be extended to the end of October 2020 and an additional workshop will be held in summer 2020 in order to prepare the draft RAP BIO. Expected participants for the next workshop are representatives of NOWPAP RCU and all RACs, nominated experts and the international consultant. It was also suggested that when NOWPAP RAP BIO is developed, global processes such as National Biodiversity Strategy and Global Biodiversity Strategy, Aichi Biodiversity Targets and Post 2020 Strategy should be reviewed to make RAP BIO to conform with them.

The discussion paper will be submitted to the coming 24th NOWPAP IGM to be held in February 2020.

➤ **Development for a tool for mapping seagrass distribution in the NOWPAP region**

Feasibility study towards assessment of seagrass distribution in the NOWPAP region carried out 2016-2017 biennium suggested use of cloud computing technologies to analyze freely available multispectral satellite images with a standardized analysis procedure.

Based on the decision at the 17th FPM, CEARAC started development of a mapping tool using Google Earth Engine, a planetary-scale platform for Earth science data & analysis. The tool is under development and to be completed by the end of 2019.

3. Cooperation with NOWPAP Partners and Organizations

➤ 2019 PICES Annual Meeting

2019 PICES Annual Meeting was held on 16-27 October in Victoria, Canada, and several thematic meetings or workshops which closely related to the NOWPAP's and CEARAC's activities were organized. Dr. Takafumi Yoshida in CEARAC Secretariat participated in the several meetings and shared information with PICES experts.

Section on Ecology of Harmful Algal Blooms in the North Pacific (S-HAB) organized a workshop "Global HAB: Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms: a Compendium of Case Studies". NOWPAP was one of co-sponsor of the workshop, so Dr. Yoshida participated in it.

As a new attempt, not only experts on HAB but also experts on economic and society joined the workshop, and participants shared good practices and discussed the collaboration between nature science and economical/social science. Three sea areas were selected as study sites: North America (west coast of USA), South America (Chile) and East Asia (Korea), and best practices on evaluating, reducing and mitigating the cost of HAB were reported. From the NOWPAP region, Dr. Weol-Ae Lim, National Institute of Fisheries Science of Korea, reported the new system for forecasting the HAB occurrence along the Korean coast.

Sustainable Development Goals (SDGs), global targets, were adopted in 2015, and SDG 14 aims sustainable use of fishery resources. NOWPAP region is one of the sea areas where fishery and aquaculture are very active. For sustainable fisheries and aquaculture in our region, this PICES workshop provided useful information. The workshop plans to publish a scientific report, and it is expected that NOWPAP will use it for the future assessment in the NOWPAP region.

Advisory Panel for CREAMS/PICES Program in East Asian Marginal Seas (AP-CREAMS) organized a workshop, "Circulation, biogeochemistry, ecosystem, and fisheries of the western North Pacific marginal seas: Past and future of CREAMS (Circulation Research of East Asian Marginal Seas)". Target sea area of AP-CREAMS and NOWPAP is same, and AP-CREAMS expects collaboration with NOWPAP in the future. So, Dr. Yoshida also participated in the workshop and shared information on NOWPAP's activities with other participants. AP-CREAMS is interested in climate change issues and interaction between marginal seas. Such topics are also important issues for NOWPAP. It is expected AP-CREAMS and NOWPAP develop strong collaboration in the future.

PICES established a new Working Group (WG42) on Indicators of Marine Plastic Pollution. WG42 focuses on marine plastic pollution including microplastics. The first business meeting was held and Terms of Reference of the Working Group was discussed. Members of WG42 discussed potential indicator species to assess marine plastic pollution and goals of the group. Then, WG42 organized a topic session, "Environmental indicators of plastic pollution in the North Pacific". Since NOWPAP was a co-sponsor of the topic session, Dr. Yoshida joined the session. Many interesting studies on marine plastic pollution were introduced from scientists, and in the presentations, especially researches on microplastic in air and source of micro fibers provided useful information for prevention of microplastic input from new sources. NOWPAP plans to establish a new project on marine microplastics, so it is expected to collaborate with PICES on this topic.

Marine Environmental Quality Committee (MEQ) is one of the most important partners for NOWPAP. MEQ is a parent committee of S-HAB, WG42 and Advisory Panel on Marine Non-indigenous Species (AP-NIS). NOWPAP was invited to the business meeting of MEQ and introduced NOWPAP activities and future collaboration. AP-NIS plans to organize a workshop on Environment DNA (eDNA) for monitoring of Non Indigenous Species (NIS) in the next PICES Annual Meeting. CEARAC Medium-term Strategy for Marine Biodiversity Conservation (CEARAC BIO MTS) selected eDNA as a future high priority topic in the NOWPAP region. Because of the mutual interest on eDNA, AP-NIS and MEQ may be a co-organizer of CEARAC's eDNA training course to be planned in 2021. S-HAB and WG42 also plan to hold a workshop and a topic session which related to NOWPAP activities. PICES Annual Meeting 2020 will be held in Qingdao, China, and it is expected that many NOWPAP experts will participate in the meeting. CEARAC would like to join the meeting and continue collaboration with relevant committee, section, advisory panel and working group of PICES in the future.

➤ **Participation in Integrating edge-cutting technologies into Coastal Habitat Mapping in the Western Pacific**

Coastal habitats have important social, economic and ecological value. The Ocean Remote Sensing Project (ORSP) of the UNESCO IOC Sub-Commission for the Western Pacific (IOC/WESTPAC), is trying to help conserve coastal habitats by use of remote sensing through mapping the spatiotemporal distribution of coastal habitats, with an initial focus on seagrass beds. An international workshop, integrating edge-cutting technologies into Coastal Habitat Mapping in the Western Pacific was organized from Dec 9 to 11, 2019 at Oceanography Institute Nha Trang, Vietnam. NOWPAP has been a partner of the IOC/WESTPAC for long time, Genki Terauchi, a senior researcher of NOWPAP CEARAC has attended the workshop to share a case study result of mapping seagrass beds in Nanao Bay using a mapping tool powered by Google Earth Engine (GEE). He also conducted a hand on training on the use of the newly developing GEE based mapping tool with the participants of the ORSP projects. CEARAC is promoting of use of the mapping tool to enhance mapping seagrass in the NOWPAP region and southeast Asia. CEARAC is planning to launch this tool as part of Marine Environmental Watch Project by March 2020.



New Member

Dr. Ryota SHIBANO, Researcher

I joined the Northwest Pacific Region Environmental Cooperation Center (NPEC) in April 2019. At NPEC, I am in charge of the activities on marine litter-related activities of NOWPAP CEARAC. In the 2018-2019 biennium, CEARAC has been developing the regional overview on actions and programs against marine microplastics implemented in the NOWPAP member states. Microplastics were indicated as a serious problem around the world at the G20 Osaka Summit 2019, and my work is to share and disseminate relevant information and to raise public awareness on microplastics among the NOWPAP member states. Besides, I have been studying the estimation of biogeochemical dynamics in the Toyama Bay, as part of NPEC's work, by using a bay scale model which couples ocean circulation with low trophic ecosystem.



Before joining NPEC, I worked as a postdoctoral researcher for three years in the Center for Marine Environmental Studies (CMES) in Ehime University, Japan. The research theme was “Construction of a model to predict environmental changes in the Japan Sea” in one of Environment Research and Technology Development Fund S-13 projects by the Ministry of the Environment, Japan. The research team developed a marginal-sea scale model which couples ocean circulation with low trophic ecosystem and estimated the biogeochemical dynamics in the Yellow Sea, the East China Sea and the Japan Sea. For managing sustainable coastal regions in the Japan Sea, it is needed to estimate the biogeochemical cycles in the entire Japan Sea including the coastal regions. Under cooperation with NPEC and Kyushu University, the research team studied and developed the estimation model. The result in the research is published in *Estuarine, Coastal and Shelf Science* (Shibano *et al.*, 2019: <https://doi.org/10.1016/j.ecss.2019.106386>).

As other works, I studied impacts of global warming on the fishery resources using the outputs of earth system model (Coupled Model Intercomparison Project 5; CMIP5).

I am from Miyazu City in Kyoto Prefecture located on the west coast along *Honshu*, mainland of Japan, same as Toyama City. I studied physical oceanography and remote sensing by Prof. Masahisa Kubota in Tokai University (currently Guest Prof. in the Institute of Oceanic Research and Development, Tokai University). Under Prof. Yasuhiro Yamanaka in Hokkaido University, I obtained a doctoral degree in environmental science, specializing in marine biogeochemical dynamics and ecosystem model researches. I hope my knowledge from the previous studies and current work in NPEC help to realize/maintain the sustainable marine environment which has been received a big impact by climate change.



CEARAC Focal Points

Country	Name	Organization
China	Dr. Liu XIHUI	China National Environmental Monitoring Center
	Dr. Peng WANG	National Marine Environmental Monitoring Center
Japan	Mr. Katsunori YANO (as of Sep. 2019)	Ministry of the Environment, Japan
	Dr. Joji ISHIZAKA	Nagoya University
	Dr. Nobuyuki YAGI	Tokyo University
Korea	Dr. Young Nam KIM	Korea Marine Environment Management Corporation
	Dr. Yong-Rock AN	National Marine Biodiversity Institute of Korea
	Dr. Eun Chan YANG	Korea Institute of Ocean Science & Technology
Russia	Dr. Vladimir SHULKIN	Far Eastern Branch of the Russian Academy of Sciences
	Dr. Tatiana ORLOVA	Far Eastern Branch of the Russian Academy of Sciences



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