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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 Seas Programme of the UN Environment Programme (UNEP). Since Northwest Pacific Region Environmental Cooperation Center (NPEC) located in Toyama, Japan was designated as a RAC of Japan by UNEP in 2002, CEARAC has implemented various activities, focusing on monitoring

and assessment of the marine and coastal environment in the NOWPAP region while applying useful monitoring tools/techniques such as remote sensing.

Starting at the beginning of 2020, global outbreak of Coronavirus (COVID-19) has heavily influenced activities of NOWPAP and CEARAC. The 24th NOWPAP Intergovernmental Meeting (IGM) was planned to be held in Beijing, China in February, but postponed. Programme of Work (PoW) of NOWPAP for the 2020-2021 biennium was one of the major agendas of the meeting, and because of the postponement of the IGM, all RAC activities remained pending for a while.

Then, through e-mail communication among the governments of the NOWPAP member states, PoW was adopted in May 2020; however, all face-to-face meetings/gatherings have still been avoided as much as possible. Instead, the number of virtual meetings and e-mails among RACs, NOWPAP Partner organizations and/or relevant experts has increased, which helped CEARAC cut travelling time and costs incurred for physical organization of events. Even though the same advantage of person-to-person contact cannot be obtained, CEARAC Secretariat found potential of how to conduct our activities effectively with new communication tools.

For the 2020-2021 biennium, CEARAC plans to implement six specific projects including assessment of distribution of tidal flats and salt marshes in the NOWPAP region, case studies of estimating seagrass blue carbon in selected sea areas in the NOWPAP region, improvement of the NOWPAP NEAT (tool) for assessment and monitoring of eutrophication using satellite chlorophyll-a, and organization of the 5th training course on remote sensing data analysis. While COVID-19 continues to spread, CEARAC will do its best to achieve its goals for the 2020-2021 biennium.

This Newsletter Vol 17 introduces on-going 2020 work of CEARAC. We hope readers of this issue can deepen their understanding of CEARAC and its activities as well as get interested in the environment of marine and coastal areas, from their familiar Toyama Bay to wider northwest Pacific region, and, at the same time, get involved in CEARAC and NPEC activities to conserve this precious environment.



Workplan for the 2020-2021 biennium

Activity	Task
Specific Projects	
Activity 1: Assessment of the Distribution of Tidal Flats and Salt Marshes in the NOWPAP Region	<ul style="list-style-type: none"> - Error assessment of Global Intertidal Change (GIC) by comparing it with real distribution - Mapping the distribution of tidal flats and salt marshes in the NOWPAP region
Activity 2: Organization of a Training Course on environmental DNA (eDNA) Analysis	<ul style="list-style-type: none"> - Developing the common manual for eDNA sampling and experiment - Organizing a training course on eDNA analysis
Activity 3: Updating the HAB Database and HAB Reference Database	<ul style="list-style-type: none"> - Collecting and updating information on the latest occurrence of HABs and scientific papers in the NOWPAP region - Discussion on new activity and/or new target species
Activity 4: Case Studies of Estimating Seagrass Blue Carbon in Selected Sea Areas in the NOWPAP Region	<ul style="list-style-type: none"> - Selecting/nominating case study areas and responsible experts - Estimating seagrass blue carbon in selected sea areas - Organizing an expert meeting back-to-back with an international workshop - Publication of a booklet for seagrass conservation in the NOWPAP Region
Activity 5: Organization of the 5 th NOWPAP Training Course on Remote Sensing Data Analysis	<ul style="list-style-type: none"> - Organizing a training course to provide an opportunity to learn latest techniques for analysis and interpretation of satellite data for assessment of the coastal environment
Activity 6: Improvement of the NOWPAP Eutrophication Assessment Tool (NEAT) for Assessment and Monitoring of Eutrophication Using Satellite Chlorophyll-a	<ul style="list-style-type: none"> - Developing a tool for online match-up of in-situ and satellite data - Evaluation of satellite CHL (chlorophyll-a) from new sensors - Updating the sensor independent satellite CHL for the NEAT operational monitoring
Routine Work	
Organization of Meetings	<ul style="list-style-type: none"> - 18th and 19th Focal Points Meeting (FPM) - 3rd Expert Meeting on eutrophication assessment
CEARAC Websites Maintenance	<ul style="list-style-type: none"> - Updating the web contents (data and information) regularly

Activities in 2020

1. Reports of main projects for 2020

Due to the pandemic of COVID-19 in the world, it is difficult to organize a face-to-face Focal Points Meeting, so CEARAC Focal Points (FPs) agreed to approve the implementation plan of each project by e-mail communication. The implementation plans of six specific projects were prepared by the CEARAC Secretariat and shared with CEARAC FPs for review in August and adopted in September. Progress of some main projects for the 2020-2021 biennium is introduced in the following section.

1-1. Assessment of the distribution of tidal flats and salt marshes in the NOWPAP region

CEARAC started to develop a new coastal habitat map on tidal flats and salt marshes in the NOWPAP region. Tidal flats and salt marshes are quite important habitats for several migrate sea birds. Some of them are selected as endangered species in the NOWPAP member states. However, tidal flats and salt marshes in this region are decreasing for coastal development including reclamation and landfill. To understand the current situation and historical changes of the distribution of tidal flats and salt marshes is necessary to provide scientific input to policy-makers for biodiversity conservation in this northwest Pacific region.

Global Intertidal Change (GIC) was developed by a scientific group of James Cook University, Australia, to map the global distribution of tidal flats using satellite images and Google Earth Engine. Dr. Nicholas Murray is the key person of GIS, and CEARAC asked Dr. Murray to support mapping tidal flats and salt marshes in the NOWPAP region. Using GIC, CEARAC will develop the distribution map of tidal flats and salt marshes in the NOWPAP region. GIC is a very useful tool for a global scale distribution mapping; however, on a regional scale, it is necessary to add local information and modify the tool. CEARAC contracted with James Cook University for revising GIC suitability for the NOWPAP region. CEARAC also asked CEARAC FPs to nominate national experts to collect information on the distribution of tidal flats and salt marshes in each member state. Then, Dr. Jie SU, National Marine Environmental Monitoring Center in China, Dr. Jongseo YIM, Korea Maritime Institute, and Dr. Kiril BAZAROV, Pacific Geographical Institute of Russia were nominated. The collected information will be submitted to CEARAC by the end of 2020, and GIC will be modified based on this input. The first draft map will be developed in Q2 2021.

1-2. Organization of a training course on eDNA analysis

Environmental DNA (eDNA) is a very useful new technique to monitor species from a small volume of water. The methodology is expected to be applied to understand the existence of species in target areas and contribute to biodiversity conservation. Technology evolution in molecular biology is quite fast, but the methodology is not standardized in the world yet, and the level of application of eDNA analysis is different by countries. To promote eDNA technique among the NOWPAP member states, CEARAC will organize a training course in this biennium. However, due to the pandemic of COVID-19, it is difficult to organize a face-to-face training course. In our training course, not only lectures on eDNA but also skill practice sessions using the modern equipment are planned. Therefore, a virtual training course is not preferable. Then, CEARAC plans to organize a training course in spring

2022, if the NOWPAP member states agree.

CEARAC developed an eDNA Sampling and Experiment Manual (written in English) with support of the eDNA Society, Japan. The developed manual was shared with CEARAC FPs to disseminate the technique to relevant experts in each member state, and it will also be used as a text of the training course.

1-3. Case studies of estimating seagrass blue carbon in selected sea areas in the NOWPAP region

CEARAC has carried out activities related to mapping seagrass in the NOWPAP region. In the 2018-2019 biennium, a tool to map seagrass using cloud computing technology, [Seagrass Mapper](#), was developed using Google Earth Engine. We then constructed [Mapseagrass project website](#) to help scientists, researchers, conservationists and policy makers map the distribution of seagrass using satellite images.

In recent years, the potential of blue carbon (carbon sequestration in ocean) for its function to mitigate climate change has gotten attention worldwide. With that, CEARAC is planning to estimate blue carbon in selected sea areas in the NOWPAP member states using the Seagrass Mapper, and is looking forward to working together with national experts to be nominated from the NOWPAP member states.

1-4. Organization of the 5th NOWPAP Training Course on Remote Sensing Data Analysis

Capacity building in the field of ocean remote sensing in the NOWPAP region is one of the mandated tasks of CEARAC. In the past, CEARAC organized four training courses on remote sensing data analysis from 2007 to 2013 (table 1) and provided technical support to 91 trainees in total. According to a questionnaire and a survey by CEARAC, 77% of the trainees are still working on related fields.

Table 1 Past NOWPAP training courses on remote sensing data analysis.

year	Venue	Number of trainees	Nationality of trainees
2007	Nagasaki, Japan	23	NOWPAP members, India, Indonesia, Thailand, Viet Nam
2008	Jeju, Korea	23	NOWPAP members, France, Thailand
2011	Qingdao, China	22	NOWPAP members, India, Indonesia, the Philippines
2013	Vladivostok, Russia	23	NOWPAP members, Cameroon, Canada, Oman

After the last course in Vladivostok in 2013, CEARAC has been focusing more on developing methodologies and tools for coastal environment assessment using remote sensing techniques. Now that methodologies and tools for monitoring and assessment of coastal environment in the NOWPAP region are getting useful; therefore, CEARAC plans to organize the fifth training course on remote sensing data analysis to help capacity building in the NOWPAP region. The date and the place of the training course will be determined while keeping eye on the situation of Coronavirus pandemic.

1-5. Improvement of the NOWPAP Eutrophication Assessment Tool (NEAT) for assessment and monitoring of eutrophication using satellite chlorophyll-a

The NOWPAP Eutrophication Assessment Tool (NEAT) is part of the Common Procedure for assessment of eutrophication status including evaluation of land-based sources of nutrients for the NOWPAP region (CEARAC 2009, revised in 2013). The NEAT is the first step in the Common Procedure composed of the Screening and Comprehensive Procedures. As the first step of the process, the screening procedure uses a minimum required set of parameters, in this case satellite derived chlorophyll-a (satellite CHL), to detect symptoms of eutrophication. The NEAT is contingent on the availability of long-term consistent CHL data sets. Thus, a constant improvement of the procedure applied in the construction of such long-term satellite CHL is needed to keep the produced CHL updated and useful in eutrophication assessment activities. Particularly, this continued improvement becomes crucial as some satellite sensors have become aged and obsolete, and new ones are launched in replacement.

Securing consistency in satellite CHL data sets requires collection of field data to carry out validation work. To optimize this work, CEARAC is developing an online match-up tool for validation of satellite products against field data. The match-up tool will be a web-based tool that is composed of a data search application tool, a data match-up extractor and a user interface where users can interact with the former two through a web-interface, in a similar way to the Marine Environmental Watch website data search (https://ocean.nowpap3.go.jp/image_search/). Currently, the data search and the online match-up tool are in a testing phase to ensure their functionality is fit for purpose. Their testing is expected to be finalized by December 2020 and this project will proceed to the construction of the web-based user interface. We expect to have the tool ready for use by the first quarter of 2021. The tool will significantly facilitate the evaluation of satellite products by eliminating user's validation activities in a local computer.

1-6. Introducing GEO-GEE project and its progress

Through a license programme launched by the Group on Earth Observation (GEO) in partnership with Google, NPEC was awarded a Google Earth Engine (GEE) license to develop a near real time monitoring system for marine and coastal eutrophication using the GEE in July 2020. The success of this project is contingent on availability of high resolution CHL data within the Earth Engine (EE) data catalogue.

Given that GEE only handles products that have been projected onto one of the many well-known projected coordinate systems, NPEC successfully carried out the initial level-2 data ingestion trials into NPEC's EE asset using the Second-generation Global Imager (SGLI) data. NPEC is now evaluating the best approach to ingest level-2 data obtained from NASA as level-2 NASA products are not projected like the SGLI level-2 from Earth Observation Research Center of JAXA.

2. Cooperation with NOWPAP Partners and other Organizations

2-1. PICES Annual Meeting 2020

PICES is one of the important partners for NOWPAP and CEARAC. CEARAC has participated in the business meetings of some Working Groups and Committees in the past PICES Annual Meetings to share information and discuss future collaboration. In 2020, PICES Annual Meeting was held virtually due to the pandemic of COVID-19, and Dr. Takafumi Yoshida participated in the following business meetings from NOWPAP CEARAC:

Business meeting of S-HAB (9 September)

Business meeting of Advisory Panel of CREAMS (9- 10 September)

Business meeting of MEQ (22 September)

Business meeting of Advisory Panel of NIS (25 September)

At the business meeting of S-HAB (Harmful Algal Bloom), postponement of the workshop “The Expansion of HABs from lower to higher latitude” to 2021 was announced. NOWPAP is expected to be a co-sponsor of this workshop. Then, the progress of publication of one PICES Scientific Report, “GlobalHAB. Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms: A Compendium of Case Studies” was reported. This report is prepared as an output of the workshop held in 2019 which NOWPAP co-sponsored. CEARAC supported development of this report as a co-author. This report is now available through PICES website ([Scientific Reports - PICES - North Pacific Marine Science Organization](#)). Sustainable Development Goals (SDGs) is global common targets now. To achieve SDGs, not only understanding the mechanism of HAB occurrence but also assessment and management of negative impacts of HABs on society and economy is crucial. So, this report is a useful material to understand and evaluate social-economic impacts of HABs in the NOWPAP region.

At the business meeting of AP-CREAMS (Advisory Panel for Circulation Research of East Asian Marginal Seas), CEARAC asked for support to organization of the 5th training course on remote sensing data analysis. In the past training courses, PICES was a co-sponsor, and CEARAC hopes PICES to be a co-sponsor in the next training course again. This proposal was agreed by the members of AP-CREAMS and submitted to the Science Board and the Government Council for their approvals.

Tasks of MEQ (Marine Environmental Quality Committee) is closely related with NOWPAP CEARAC activities, and NOWPAP CEARAC was invited to the business meeting and asked to introduce our activities. MEQ is a parent committee of S-HAB, AP-NIS (marine Non-Indigenous Species) and WG42 (Indicators of Marine Plastic Pollution). Dr. Yoshida reported CEARAC activities on biodiversity conservation and eutrophication, and asked to strengthen the cooperation between CEARAC and PICES. He also proposed to discuss the future collaboration between NOWPAP and PICES. PICES established the joint Study Group: SG-SCOOP (Joint PICES-NOWPAP Study Group on Scientific Cooperation in the North Pacific Ocean) in 2014. At the SG meeting, PICES and NOWPAP selected high priority common topics for future collaboration. This SG was disbanded in 2015, and since then, global and/or regional marine environmental issues to be dealt with have been changed. Therefore, further discussion on the collaboration for coming years is expected.

AP-NIS is interested in eDNA for monitoring and early detection of NIS, and organized the topic session “Using eDNA to assess and manage non-indigenous species in the North Pacific” on 28 October. NOWPAP supported this

topic session and Dr. Hitoshi Araki was an invited speaker from NOWPAP. CEARAC has launched a new project on eDNA this year, so AP-NIS can be an important partner. CEARAC asked AP-NIS to be a co-sponsor of the training course on eDNA analysis, and AP-NIS accepted our request and kindly proposed some budgetary support from PICES side.

CEARAC would like to continue frequent communication and discussion with PICES to strengthen our collaboration for conservation of the marine and coastal environment in the future.

2-2. The 9th Geo for Good Summit

The 9th Geo for Good Summit was held virtually on 20-21 October 2020, and the current activity of NOWPAP CEARAC on eutrophication assessment was introduced in a video clip of “[Geo for Good Highlights](#)” with other projects/initiatives on environmental and/or social issues around the world.

Dr. Genki Terauchi and Dr. Eligio de Raús Maúre joined this summit from NOWPAP CEARAC. As development of monitoring and/or assessment tools with remote sensing techniques is one of the main goals of NOWPAP CEARAC, staff members of CEARAC have been participating in Geo summit since 2016 to catch up with new developments.



The image shows a screenshot of a YouTube video player. The video is titled "Geo for Good 2020 Highlights: Our Community" and has 1,550 views as of 2020/10/20. The video content is a presentation slide titled "Assessment of eutrophication in the Northwest Pacific Region with satellite Chl-a from 1998 to 2015 using NEAT". The slide features a map of the Northwest Pacific region showing the 3-year (2013-2015) mean chlorophyll-a concentration. A color scale indicates values from 0.1 to 64 mg m⁻³, with 0.1 being blue and 64 being red. The map shows higher concentrations (yellow and red) in the coastal waters of the Northwest Pacific. The video player interface includes a progress bar at 1:50 / 4:05 and a second video player below it showing the same slide at 1:55 / 4:05.

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. Tatsuya ABE	Ministry of the Environment, Japan
	Dr. Joji ISHIZAKA	Nagoya University
	Dr. Nobuyuki YAGI	Tokyo University
Korea	Dr. Bong-Oh KWON	Kunsan National University
	Dr. Jinsoon PARK	Korea Marine and Ocean University
	Dr. Hye Seon KIM	National Marine Biodiversity Institute of Korea
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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Special Monitoring & Coastal Environmental Assessment Regional Activity Centre (CEARAC)

of

Northwest Pacific Action Plan (NOWPAP)

Established at Northwest Pacific Region Environmental Cooperation Center (NPEC)

5-5 Ushijimashin-machi, Toyama City, Toyama, 930-0856, JAPAN

Tel: +81-76-445-1571 Fax: +81-76-445-1581

Website: <http://cearac.nowpap.org/> Email: webmaster@cearac.nowpap.org