THE NIPPON FOUNDATION

Ocean Newsletter

Selected Papers

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OPRI THE OCEAN POLICY RESEARCH INSTITUTE

Director's Message

As mankind moves through the 21st century, integrated policies of ocean governance are increasingly necessary for the sustainable development and use of our oceans and their resources and for the protection of the marine environment.

Towards this end, the Ocean Policy Research Institute (OPRI) of the Sasakawa Peace Foundation orients its research on ocean issues in line with the mission statement "Living in Harmony with the Oceans."

OPRI aims to conduct cross-sectoral research in ocean related issues in order to initiate debate on marine topics and to formulate both domestic and international policy proposals.

We publish a Japanese-language newsletter titled the "Ocean Newsletter" (previously known as "Ship & Ocean Newsletter") twice a month. "Ocean Newsletter Selected Papers No.25" contains English-language versions of papers from the Japanese Newsletter edition, published from No.451 (2019.5.20) to No.470 (2020.3.5). The Ocean Newsletter seeks to provide people of diverse viewpoints and backgrounds with a forum for discussion and to contribute to the formulation of maritime policies conducive to coexistence between mankind and the ocean.

Our Institute believes that the Newsletter can expand effective communication on these issues by introducing timely research abroad to an informed readership. It also welcomes responses from readers, some of which appear in the Newsletter.

It is our sincere hope that these Selected Papers will provide useful insights on policy debate in Japan and help to foster global policy dialogue on various ocean issues.

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President, Sasakawa Peace Foundation
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■Publisher

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Towards the Eradication of IUU Fishing
— Initiatives by research organizations —

[KEYWORDS] IUU Fishing / Satellite Information / Joint International Research

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(Ocean Newsletter No. 452, 5 June 2019)

The existence of IUU fishing is a huge threat to the sustainable use of fish resources in the world's oceans. Given the limits to the activities of countries and RFMOs involved, the Japan Fisheries Research and Education Agency (FRA) is working towards the eradication of IUU fishing by enabling appropriate management of marine resources in waters around Japan through data analysis using cutting-edge technologies such as satellite images, as well as cooperating with other organizations in the analysis and publication of actual conditions.

What is IUU Fishing?

IUU fishing (illegal, unreported and unregulated fishing) is a term that collectively refers to three types of fishing activities: illegal fishing such as poaching or fishing with prohibited fishing gear, unreported fishing that does not report catches or that under-reports catches, and unregulated fishing that does not comply with the regulations of the country to which the fishing vessel belongs or the regulations for the area in which it is operating. The existence of such IUU fishing is a major threat to the sustainable use of resources as it completely undermines current resource management measures designed to conserve resources based on catch information. According to the Food and Agriculture Organization of the United Nations (FAO), the world's marine living resources have been on the continuous decline for a long time, and in 2015, 59.9% of the resources had been exploited to their sustainable maximum, whereas over-fished resources account for 33.1% of the total. Those still having the capacity to allow an increase in production have dropped to just 7%. The eradication of IUU fishing is an important issue for Japan, which makes extensive use of fishery resources amidst the great needs for thorough and sustainable resource management of fishery resources in the world's oceans.

IUU Fishing Around Japan and its Impact

IUU fishing around Japan started attracting a great deal of attention in 2014 when more than 200 Chinese fishing boats gathered in the waters near Okinawa and the Ogasawara Islands and began large-scale, illegal harvesting operations to exploit precious coral resources. In 2016, large-scale collective operations were started by Chinese fishing boats in the northwest Pacific Ocean using a new fishing method (tiger nets)[1)] for chub mackerel. In these cases, in addition to fishing boats that were officially licensed in China, there were many verified instances of illegal conduct, such as of different vessels displaying the same vessel name, of putting different names on the right and left sides of the vessel, and of vessels whose name had been changed frequently, and in all of these cases it is presumed that the vessels were of Chinese origin. Furthermore, in 2017, a collective illegal operation of wooden-hulled squid fishing boats from North Korea became apparent near the Yamatotai area in the Sea of Japan, and it developed into a situation in which the operations of Japanese fishing boats were disrupted.

Even prior to these reports, there had been confirmed cases of large-scale operations in the East China Sea by numerous Chinese fishing vessels, including tiger net fishing boats. Many of these fishing boats operate at night and use fish lamps that attract fish, so the Japan Fisheries Research and Education Agency (National Research and Development Agency) (hereinafter referred to as the FRA) started obtaining image data of the northwest Pacific Ocean in 2014 and, in particular, tried to understand the actual operating conditions of the East China Sea through the use of nighttime illumination photographs. This data was collected by the Suomi NPP polar-orbiting satellite, which is operated by the US NOAA. Later, the FRA expanded sea areas to be put under surveillance to both the northwest Pacific Ocean and the Sea of Japan in an effort to estimate the catch sizes of these foreign fishing boats for the purposes of improving the accuracy of fish stock assessments by comprehensively analyzing water temperature information from satellites and AIS (automatic identification system) information. Since Chinese fishing boats began active mackerel fishing activities in the northern Pacific area in 2016, the FRA has comprehensively estimated chub mackerel catches of Chinese fishing boats through collecting not just nighttime illumination data but also AIS data from transport vessels together with information obtained from interviews on their operations. The FRA found out, among the fishing boats analyzed, many boats considered to be unregistered IUU fishing vessels, and also confirmed that these Chinese fishing boats continued fishing for several months without going back to their home ports by unloading their catches to transport vessels. The FRA estimated that, in the surveyed area, the total catch amount of chub mackerel by Chinese fishing boats had been about

twice the officially reported catch amount, as the amount of fish caught estimated from the fish storage capacities and refrigeration abilities of the transport vessels. The FRA also estimated that the catch by IUU fishing could reach a range from 150,000 to 250,000 tons[2].

The FRA has continued to routinely perform analytical work for the East China Sea, the northwest Pacific Ocean, and the Sea of Japan, mainly using photographic nighttime illumination data. These results are also utilized daily in the Fisheries Agency's enforcement work. Furthermore, a new fishing information analysis section was established in April 2019 to further intensify research activities using satellite image data.

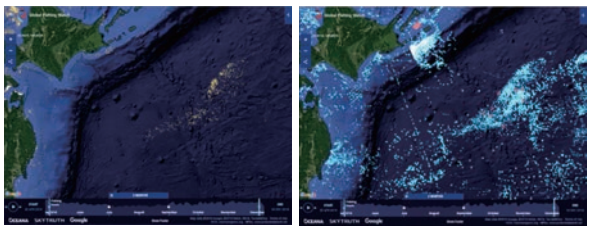
Monitoring System for the Eradication of IUU Fishing

Global Fishing Watch (hereinafter referred to as GFW) [3], an international non-profit organization founded in 2017, should be highlighted as a notable example of global activity helping to eradicate IUU fishing. GFW was established by Google and others with the goal of promoting ocean sustainability through ensuring the transparency of commercial fishing activities, and works to visualize and publicize the actual state not just of commercial fishing activities, but also of offshore transshipment through the utilization of AI to analyze information from satellites, AIS, and VMS (ship monitoring system), etc.

The information from the analyses is made available to the public via the internet so that it can be used for scientific research, for marine and fisheries policy, and appropriate fisheries management, etc., and anyone can obtain the near real-time information free of charge. The published information is for approx. 60,000 commercial fishing vessels, obtained by analyzing the AIS information of more than 300,000 vessels every day, covering the period from January 1, 2012, to the present. The system was set up so that each fishing vessel's route, along with the vessel's name and nationality, can be confirmed on the GFW website. Approx. 85% of fishing vessels cannot be tracked via AIS or VMS, so nighttime illumination data from the Suomi NPP satellite is also used to analyze nighttime fishing operations that use lights, such as fish lamps to attract fish. The identified positions of the operating fishing vessels are displayed on GFW's website. (Figure)

The FRA has promoted exchanges with related organizations including GFW, through international workshops between scientists. Through this process, it was found that there are almost no differences in analysis results for non-cloudy, dark moon conditions when comparing FRA's nighttime illumination data analysis algorithms with NOAA's analysis results, but while the NOAA analysis has excellent noise removal, it is becoming clear that there are differences in the analysis results, such as the fact that information on fishing boats with weak lights, such as wooden-hulled fishing boats, are not being extracted by NOAA even though these vessels were confirmed by the FRA analysis. In addition, data verification through actual visual sightings and radar images, not just through satellite information, is also a major features of FRA's analysis.

■ Figure



Analysis by Global Fishing Watch for the two months from July to August 2018. It can be seen from the analysis of nighttime illumination images that fishing operations using a fishing lamp are actively conducted outside the boundaries of Japan's EEZ (yellow dots in the left figure). Analysis based on AIS information can also confirm fishing activities that do not use a fishing lamp (light blue dots in the right figure), and the status of offshore transfers can also be estimated (red circles in the right figure).

Because this kind of research exchange offers great advantages for each institution, on September 3, 2018, the FRA signed a memorandum of understanding for research cooperation on elucidating IUU fishing with GFW and the Australian National Centre for Ocean Resources & Security at the University of Wollongong Australia. This research cooperation aims to clarify the actual state of IUU fishing and evaluate its impact on resources, the results will be widely disclosed, and issues identified from the results will be raised. As a first step, preparations are currently being made to publish a report on IUU fishing in the waters near Japan. In addition, June 5 is the "International Day for the Fight against Illegal, Unreported, and Unregulated Fishing," and before it, the three parties are planning an opportunity to widely disseminate information to governments and media personnel on the activities of the research collaboration. ■

1) Tiger nets: A fishing method that uses powerful fish lanterns to attract fish (lamped purse seine) similar to Japan's round haul net fishery method.
2) Y. Oozeki et al. (2018) Reliable estimation of IUU fishing catch amounts in the northwestern Pacific adjacent to the Japanese EEZ: Potential for usage of satellite remote sensing images. Marine Policy 88, 64-74
3) GFW: Refer to Ocean Newsletter No. 431

Cleaning of the Ocean Surface by Marine Environment Maintenance Vessels

[KEYWORDS] Marine Pollution / Drifting Debris / Oil Collection

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(Ocean Newsletter No. 452, 5 June 2019)

The increasing scale of typhoons and the difficulty in predicting local downpours result in the flooding of rivers and sediment disasters, carrying massive quantities of debris, including driftwood, into the ocean. When such flows enter bays and seas largely encircled by land, debris can accumulate over long periods, which not only causes deterioration of the marine environment, but can have serious consequences for navigation. In this article I would like to introduce the marine environment maintenance vessels responsible for removal of drifting debris and floating oil and their various activities.

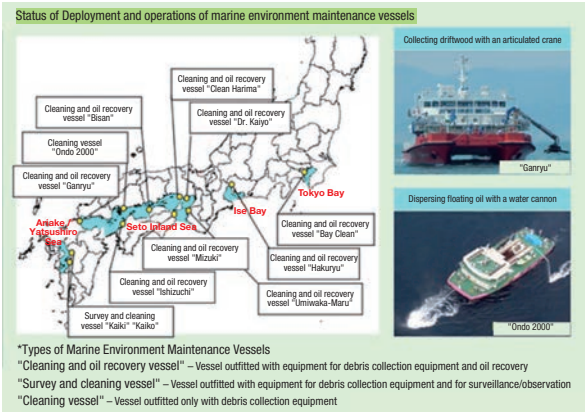
Deployment of Marine Environment Maintenance Vessels

Marine pollution problems, caused by drifting debris and floating oil, arose during the period of remarkable economic growth from approx. 1965 to 1975, particularly in inner bays and inner seas whose water tends to stay as it is with small chances of being exchanged with cleaner water from outside sources, and as a result, the living environments and natural environments for marine organisms deteriorated. As impacts from these marine pollution problems on marine organisms and sailing vessels began to appear frequently, the Japanese government decided to embark on efforts to clean up the country's general marine areas (marine areas excluding port areas and fishing port areas) through making amendments to the Port and Harbor Act in 1973.

There are currently 12 marine environment maintenance vessels deployed in semi-enclosed sea areas of Tokyo Bay, Ise Bay, the Seto Inland Sea, and the Ariake / Yatsushiro Sea, collecting oil discharged from vessels and driftwood debris on the sea's surface in order to protect the marine environment and ensure the safety of sailing vessels.

These cleaning vessels are normally engaged throughout the year in collecting debris drifting on the sea surface, but when a disaster or oil spill occurs, they will quickly go to that location to remove floating debris and collect discharged oil that impedes navigation.

■ Status of Deployment and operations of marine environment maintenance vessels



Structure and Features of Marine Environment Maintenance Vessels

The most notable feature of these marine environment maintenance vessels is their unique hull shape; regular vessels have a single hull whereas marine environment maintenance vessels have two hulls connected by a deck, similar to a catamaran. The reason for this design is that the large deck area is needed to store debris collection equipment, an articulated crane, and oil collection equipment in place. This design also allows drifting debris and floating oil to be guided into the space between the two hulls where it is then collected. For debris collection, a debris-collecting basket is positioned on the sea surface between the two hulls, and then the vessel sails towards the debris to collect it. Long objects, such as floating logs or bamboo, which cannot be guided into the space between the vessel's dual hulls, are grabbed from the sea surface by the crane and directly collected onto the deck. Oil is collected in the same way as debris, with oil recovery equipment on the sea surface between the two hulls. Highly volatile oil that spreads thinly over a wide area is diffused by agitating the water via sailing or by spraying water from a water cannon.

Responses to the Torrential Rains of July 2018

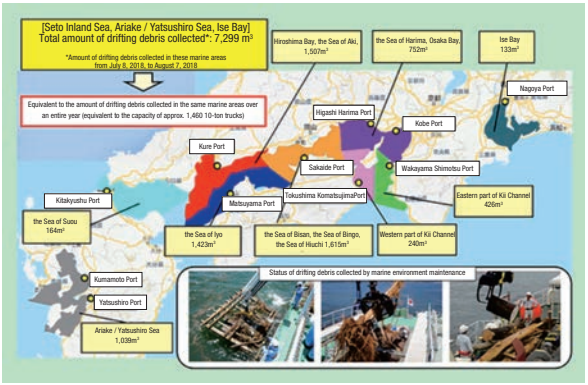
The heavy rains that began on July 6, 2018, recorded the highest rainfall amount observed in history at many locations in western and eastern Japan. They inundated rivers and caused landslides in several areas, and a large volume of driftwood and reeds flowed into marine areas from the rivers. Within the areas under the Chugoku Regional Development Bureau's jurisdiction, a large volume of driftwood flowed into the sea in many areas including Hiroshima Bay and the Sea of Aki area, which seriously disturbed the navigation of vessels.

A sailing vessel's hull or propeller may become seriously damaged when the vessel comes into contact or collides with driftwood. In addition, floating reeds may block the engine's intake of cooling water, resulting in an inability

to navigate and the possibility of causing serious marine accidents. After the heavy rains, there was a high possibility that an accident could occur, especially at night when visibility is poor, so there was a suspension of all regularly scheduled marine routes, including night routes, connecting eastern parts of Hiroshima Prefecture and the surrounding islands. As such, it was necessary to remove the drifting debris as soon as possible to ensure the safety of sailing vessels, to minimize disruption to the lives of those affected, and to limit the economic impact. The marine environment maintenance vessel "Ondo 2000" belongs to the Chugoku Regional Development Bureau and normally takes care of these areas, but additional marine environment maintenance vessels from other regions were called in to help with the response -- the "Ganryu" from the Kyushu Regional Development Bureau and the "Clean Harima," "Dr. Marine," and "Umiwaka-Maru" from the Kinki Regional Development Bureau. Each day there were up to three marine environment maintenance vessels engaged in collection and cleanup operations.

In the month since the start of collection operations on July 8, 2018, the amount of floating objects collected in the Seto Inland Sea, the Ariake / Yatsushiro Sea, and in Ise Bay totaled more than 7,299m^3, which is approx. four times the average amount that is usually collected in these areas.

■ State of debris collected from the July 2018 torrential rains



Examples of Operations During a Disaster

March 2011: Great East Japan Earthquake

The tsunami on March 11, 2011, created a large amount of debris that widely covered the coastal areas of Japan's northern Tohoku region, so the marine environment maintenance vessels "Bay Clean" and "Hakuryu", from the Kanto Regional Development Bureau and the Chubu Regional Development Bureau, respectively, were dispatched based on requests for cooperation from the 2nd Regional Japan Coast Guard Headquarters, and collected drifting debris in the marine areas around Sendai Bay for about a month from April 23 to May 20, 2011. Afterwards, the marine environment maintenance vessel "Umiwaka-Maru" from the Kinki Regional Development Bureau collected debris in the marine areas off Sanriku Coast from May 22 - June 20, and the marine environment maintenance vessel "Mizuki" from the Shikoku Regional Development Bureau collected debris in the waters around Sendai Bay from May 21 to June 21. These four vessels collected a total of 6,722 m^3 of drifting debris (equivalent to the capacity of approx. 1,340 10-ton trucks), including parts of houses and fishing nets. This amount is equivalent to the amount collected over an entire year by marine environment maintenance vessels nationwide.

July 2017: Torrential Rains in Northern Kyushu

The heavy rainfalls that hit Kyushu from July 5 to 6, 2017, mainly in its northern regions, brought total precipitation in excess of 500 mm in the hardest-hit areas, and as a result, a large amount of driftwood flowed via rivers into widespread areas of the Sea of Suou and the Ariake Sea.

This increased the danger of vessels' navigation, particularly in the Kanmon Straits where many vessels cross paths.

So, the Kyushu Regional Development Bureau in charge of marine areas around the straits dispatched the marine environmental maintenance vessel "Ganryu" to clean up the areas and also requested assistance from other bureaus. In response to this request, the marine environment maintenance vessels "Ondo 2000" from the Chugoku Regional Development Bureau, and the "Ishizuchi" from the Shikoku Regional Development Bureau came and joined the cleanup operations. The three vessels collected driftwood from the areas around the straits. This wide area cooperation between marine environment assistance vessels led to the collection of 2,033 m^3 of drifting debris, including 2,690 logs, from July 6 to August 24, 2017, in the Sea of Suou and Ariake Sea, helping to secure the safety of sailing vessels.

Typhoons have grown in size in recent years, and there has been an increase in the number of typhoons making landfall and in heavy, localized rains with an hourly rainfall of more than 50 mm. Marine environment maintenance vessels will play an ever more important role in the future, such as by responding to drifting debris and oil spill accidents caused by natural disasters. ■

● Chugoku Regional Development Bureau Port and Airport Department > Seto Inland Sea Comprehensive Water Quality Survey Homepage > Beautifying the Sea > Collecting and Disposing of Floating Debris http://www.pa.cgr.mlit.go.jp/chiki/suishitu/kaisyu.htm (Japanese site)

UNESCO Convention on the Protection of the Underwater Cultural Heritage and Buried Cultural Property Protection Administration in Japan

[KEYWORDS] Sunken Ship Ownership / Coordinating Country System / Act on Protection of Cultural Properties

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(Ocean Newsletter No. 453, 20 June 2019)

The report by the Agency for Cultural Affairs' Investigation Review Committee for Underwater Sites, "On Protection of Underwater Sites," was released on October 31, 2017. Designation of the Takashima Kozaki site as the first National Historic Site found at sea means that Japan is finally beginning to legally perceive the importance of our underwater cultural heritage. There are no doubt still many examples of undiscovered underwater cultural heritage in Japanese territory and in the surrounding ocean areas. The positive assessment of these sites by local government authorities and efforts towards their protection and utilization will to some extent contribute to the effective implementation of the Coordinating States' System provided in Convention on the Protection of the Underwater Cultural Heritage in the future.

No Ownership Provisions in the UNESCO Convention on the Protection of the Underwater Cultural Heritage

As of March 2019, 10 years after it entered into force, 60 countries are now party to the UNESCO Convention on the Protection of the Underwater Cultural Heritage [1] (hereinafter "the UNESCO Convention"), and the Netherlands and Australia will soon join. According to data published by UNESCO, there are at least more than 3 million sunken vessels amongst the underwater cultural heritage in the ocean, including artifacts of various types and from various ages, ranging from prehistoric artifacts and ship hulls to warships to government vessels. Warships and government vessels were excluded from discussions during the drafting process of the UNESCO Convention because some countries insisted that the ownership of any warship or government vessel should, unless explicitly abandoned by its home country, continue to belong to its home country, no matter which country's waters the ship or vessel is physically in. In fact, some countries have enacted laws specifying this ownership definition. The UNESCO Convention, on the other hand, defined warships and government vessels as those vessels for which more than 100 years have passed and which were used for non-commercial purposes at the time of sinking (Article 1, Paragraph 8). However, the determining criteria are unclear for ships from the Mongolian invasion of Japan, which was long before World War I, as well as for earlier ships. As such, there is currently no established international law regarding this issue [2].

Sunken vessels are often laden with cargo from different countries due to the nature of trade, and if the origin country of each shipment claimed ownership then any international cooperation to protect the sunken vessel, cargo, artifacts and their surrounding areas would fall apart. In order to avoid such a situation, the UNESCO Convention treats the party in whose waters the vessel is found as the coordinating country, and the coordinating country will share information amongst parties that have indicated a verifiable link to an underwater cultural heritage and will discuss ways to protect the site (Article 9, 10). The implementation of this system necessarily required shelving the issue of ownership of underwater cultural heritage.

The presumed site of the *Iroha* Maru ship (belonging to the Ozu Domain of the former Iyo Province), which sank off the coast of Fukuyama City in Hiroshima Prefecture in 1867 (Keio 3), was registered as an area containing buried cultural property on February 26, 1990. (*Iroha* Maru Exhibition Hall, photographed by the author on January 16, 2015)

Introduction of New Coastal Jurisdiction for Coastal Countries and the Current Situation in Japan

Japan has not signed or ratified the UNESCO Convention, but applies relevant domestic laws and regulations within its territorial waters to protect and preserve underwater cultural heritage. In fact, even though they are not of Japanese origin, the ruins of the Mongol invasion at the Takashima Kouzaki Site were designated as the first underwater National Historic Site in March 2012, with Japan granting legal protections to the site due to its global significance and value. On the other hand, the UNESCO Convention started to deal with exclusive economic zones and continental shelves through the afore-mentioned coordinating country system in order to prevent imminent

danger, including looting, to underwater cultural heritage. Importantly, the Convention made the coordinating country to act "on behalf of the States Parties as a whole" and not in its own interest (Article 10 Paragraph 6). As such, the UNESCO Convention grants coastal countries jurisdiction over the sanction and seizure of treasure hunters (Articles 17 and 18). In order for the coordinating country system to function universally, the UNESCO Convention is required to receive ratification from more countries, including advanced maritime nations, to regulate activities that target underwater cultural heritage (Article 1 Paragraph 6) while putting on hold the issue of owner attribution.

Japan first used the term "underwater cultural heritage research project" in August 2012 in the summary for an Agency for Cultural Affairs provisional budget request. The Basic Policy on the Promotion of Culture and the Arts (4th Policy) in May 2015 promoted research and study on how to preserve and utilize underwater cultural heritage and encouraged efforts by local governments (Priority Strategy 3). Additionally, with respect to the cultural heritage of underwater archeological sites, which are important for understanding the history and culture of Japan as a maritime nation, the second part of The Third Basic Plan on Ocean Policy in May 2018 listed the Ministry of Education, Culture, Sports, Science and Technology as a body to promote studies on the preservation and utilization of archeological sites.

UNESCO Convention on the Protection of the Underwater Cultural Heritage and the Administering of Buried Cultural Properties

Taking advantage of the designation of the first underwater National Historic Site, the Advisory Committee on the Research of Underwater Ruins (Agency for Cultural Affairs) was established in March 2013, and issued the final report titled "State of Public Administration Work on the Preservation of Underwater Ruins" (hereinafter "the Report") in October 2017. The Report reconfirmed that underwater ruins shall be subject to public administration of buried cultural properties. Buried cultural properties are those tangible cultural properties that are buried underground, underwater, or otherwise in a state that is not visible to others. Of particular note, the Report confirmed that, when it comes to the question of whether local government officials should apply either the 1899 Sea Casualties Rescue Act or the 1950 Act on Protection of Cultural Properties, as a basic rule the Lost Property Act and the Act on Protection of Cultural Properties shall be applied to determine how to handle excavated artifacts (Explanation 4 of the Report). If the Lost Property Act is applied to underwater ruins, then

The Hatsushima seafloor ruins at Hatsushima. The Hatsushima seafloor ruins, which were found to be the remains of a cargo vessel that sank in the mid-17th century, have not yet been registered as an area containing buried cultural property.
(Provided by the Asian Research Institute of Underwater Archaeology in Atami City, Shizuoka Prefecture)

the reported property will be handed over to the mayor and ownership will be transferred to the finder if the owner does not appear even after it has been publicly announced for six months (Article 24, Article 27 Paragraphs 1, 2). This provision may not be in conformity with the UNESCO Convention's prohibition on commercial transactions (Article 2 Paragraph 7, Annex Rule 2) and the provisions prohibiting maritime law and regulations (Article 4).

Furthermore, while the UNESCO Convention defines underwater cultural heritage as a site/object that has been underwater for at least 100 years, a notice issued by the Agency of Cultural Affairs (Agency's Retained Record No. 75, Notice from Vice Commissioner, Agency for Cultural Affairs) in September 1998 states that the range of ruins covered by the Act on Protection of Cultural Properties shall include, as a general rule, those until the Middle Ages (1192-1573) and may include some from modern times if they are regarded as being of particular importance. This temporal definition by the Agency of Cultural Affairs differs from that of underwater cultural heritage. Additionally, as the Report assumed that the Act on Protection of Cultural Properties shall only be applicable to cultural properties up to the ones in territorial waters, when looking at the UNESCO Convention there are many remaining issues that need to be addressed in seas outside regional waters, such as the designation of a governmental agency responsible (or co-responsible) for the work, the acquisition of a budget, procurement of research vessels, the training of experts, and the maintenance of equipment.

In the future, administrative personnel will be required to follow the guidelines in the Report and to understand the situation regarding the distribution of underwater cultural heritage with an eye toward the registration of areas

containing buried cultural property. The next stage will be possible only after the local governments have successfully accumulated wide-ranging information on the situation of buried cultural properties and secured legal protections for them. It is expected that the experience gained by local governments during the process will serve Japan well in becoming a coordinating country in the future. When Japan does become a coordinating country, the involvement of not only local governments but also of the national government will be required. ■

1) Please refer to issues 98, 301, 333, and 344 of the Ocean Newsletter for more about the UNESCO Convention on the Protection of the Underwater Cultural Heritage.
2) However, UNESCO has published a book from an academic perspective on underwater cultural heritage that sank during World War I, more than 100 years ago, and on underwater cultural heritage that sank during World War II.

Women's Empowerment in Maritime and Ocean Research

[KEYWORDS] World Maritime University / Participation in Gender Equality / SDG 5 and 14

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Women are increasingly playing active roles in maritime fields in Japan like anywhere else, and the number of female leaders has also been increasing, albeit slowly. Women's empowerment in ocean fields is increasing in Japan, including a gradual increase in leadership roles. In April 2019, the Third International Women's Conference on the theme "Empowering Women in the Maritime Community" was held at the World Maritime University (WMU), with over 350 participants from more than 70 countries, issuing in concrete goals from among their common issues.

Eliminating occupational fields that have a zero female participation rate

The Basic Act for Gender Equal Society came into effect in Japan in June 1999. In addition, the Act on Promotion of Women's Participation and Advancement in the Workplace (Promotion of Women's Advancement Act) has been in effect since April 2016 and is being enforced as 10-year time-limited legislation. The Promotion of Women's Advancement Act requires the national government, local governments, and companies with 301 or more employees, etc., to prepare and publish action plans with numerical targets for women's advancement, and is expected to accelerate gender equality. However, Japan has been lagging in international comparisons of gender equality, and in December 2018, Japan ranked 110th out of 149 countries in the Gender Gap Index released by the World Economic Forum. Particularly noticeable are the low numbers of female leaders among politicians, corporate executives, and professors. Although the employment status of women varies widely among occupations and job duties, female researchers in the natural sciences have often been studied as an example of an occupation with a low percentage of women. Women account for 14.2% of researcher positions in the natural sciences and 10.6% in engineering (White Paper on Gender Equality 2017). There is no statistical data for maritime fields, but my personal feeling and experience is that the ratio of women is even smaller. Women's employment and leadership are one indicator of social diversity and are beneficial to both men and women as it leads to enhancement of work environments and improvements in work styles. It can be said that the ratio of female participation is a barometer of such social diversity.

Trends show that the ratio of female participation in maritime fields is also rising. As such, even though the appellation of "first female" has become rare these days, in 2018 Dr Naomi Harada was appointed as the first female vice-captain and captain for the Japan Agency for Marine-Earth Science and Technology's (a national research institute) Antarctic observations. She has also contributed to Arctic research for many years and has embarked on many long-term voyages. Incidentally, the first woman in history to embark on a long-term voyage was Jeanne Baret, an 18th century Frenchwoman who was onboard as assistant to a botanist [1]. Oceanic research at the time was carried out on warships, and women were not allowed to board the ships, so I respect and admire the courage of this woman who dressed herself as a man to join the voyage as the only woman on board.

The latter half of the 19th century became an era for women to study oceanography. The Woods Hole Oceanographic Institution, with the support of the American Women's Educational Association, began actively accepting female students and female researchers. The ratio of female researchers in the institution grew so large that it reached one-third of all the researchers at times. Tsuda Umeko, who was the first female Japanese student to study abroad and later founded Tsuda University in efforts to promote education for women, participated in 1889 at the institution's summer school. While studying at the institution, Tsuda would probably have had a chance to get to know the female researchers and students there.

The Third WMU International Women's Conference

The female participation ratio in maritime occupations in Japan is 13% of marine fisheries (2015), 10% of fisheries researchers (2018), and 5% of shipbuilding engineers (2014), making the number of Japanese women working in maritime fields smaller than in the West. Taking the Third WMU International Women's Conference: Empowering Women in the Maritime Community [2] as an opportunity to learn about the know-how of European countries and the United States, I participated in the conference. The conference was held on April 4th and 5th, 2019, at World Maritime University in Malmö, Sweden, and was the first gender-related WMU conference in five years. WMU is a graduate school founded in 1983 by the United Nations' International Maritime Organization (IMO), and since 2015 Cleopatra Doumbia-Henry has been WMU's first female president. Furthermore, WMU had two female students when it was founded, but this number increased to 61 female students in the class of 2019. At this conference,

Meeting at Sasakawa Hall

held at a place like WMU where women's activities are advancing, there were more than 350 participants from 70 countries, and two video venues were prepared in addition to Sasakawa Hall, the main venue. Participating countries from Asia were India, the Philippines, Malaysia, Indonesia, Turkey, and Japan. Ms. Naomi Matsushita of Mitsui O.S.K. Lines, Ltd., and myself joined the conference at the invitation of WMU Associate Professor Momoko Kitada. I gave a presentation on the current state of female participation rates in various maritime occupations in Japan and the activities of Women for One Ocean, which was established in 2018. The overall themes of the conference spanned a number of areas, including female leadership in maritime occupational fields, new frontiers for female seafarers, female participation in port development, female roles in maritime policy, the current status of female marine scientists and researchers, SDG 5 and maritime industries, female contributions to the fisheries industry, and female participation networks. There were 76 lectures, including poster presentations, and I realized the need for international cooperation in considering issues related to women's employment, regardless of how big or small the female participation rates are.

An agreement was signed during the conference between Canada and the WMU-Sasakawa Global Ocean Institute to establish a research program entitled "Empowering Women for the United Nations Decade of Ocean Science for Sustainable Development."There were also many participants from African nations, and they had a great deal of passion for the future development of gender equality. It was also a good opportunity for me to consider putting gender equality initiatives into the "UN Decade of Ocean Science," which is to start from 2021, and to consider actively participating in some form of international cooperation.

The conference's results were finally summarized and organized [3] into 8 items, as follows: 1) Promotion of gender equality policies, 2) survey on the current status of women's activities in the maritime field, 3) utilization of role models, 4) enhancement of career education, 5) spread of the mentor system, 6) support for gender research, 7) development of gender equality plans in maritime industries, and 8) equal employment opportunities and equal wages based on fair evaluations. From the conference, we were able to identify global issues in the maritime sector that are related to Sustainable Development Goals (SDGs) 5 and 14. Going forward, I am looking forward to seeing the emergence of an international network for women's empowerment, and also hope to see an increase in participants from Japan at the next conference.

Launch of Women for One Ocean

Women for One Ocean, the organization about which I gave a presentation at the WMU International Women's Conference, was established in May 2018. The inspiration for starting the organization goes back to the 2005 and 2008 publication of the two volume self-development book series, "Umi no Professional (Professionals at Sea)" (Tokai University Press), that conveyed the attractiveness of maritime occupations to high school girls, and a seminar held to commemorate the publication of the books. Written by more than 30 female maritime professionals, the books vividly conveyed these women's efforts and brilliance to many people working in maritime-related fields. Aiming for further success 10 years later, in 2017 I conducted a program entitled "Opening the Future of the Sea! Dispatches from Women for One Ocean" as a Tokyo Ocean Alliance initiative program funded by the Nippon Foundation. This led to the establishment of Women for One Ocean. Women for One Ocean conducts many activities including holding monthly web conferences, publishing newsletter, posting information on social media and its home page, and running science clubs. The goal is to build a network through which both men and women can participate equally to help solve issues in maritime fields, including how to achieve SDGs 5 and 14. ■

Covers of Women for One Ocean Journal issues No. 1 and 2

On Nippon Yusen Kaisha Issuing the World's First Shipping Industry Green Bond

[KEYWORDS] ESG / Finance / Green Finance

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(Ocean Newsletter No. 458, 5 September 2019)

As it has become a worldwide trend for companies seeking long-term growth to adopt an ESG perspective (environment, society, governance), rather than focusing solely on returns, in May of 2018 Nippon Yusen became the world's first maritime transport company to issue a green bond of 10 billion yen. A green bond is defined as a corporate bond limited to those investments proven to have beneficial effects on the environment. Nippon Yusen hopes this will serve in a small way to increase general understanding of the merits of green bonds and know-how concerning them, and encourage companies to make what can be costly environmental investments.

What are Green Bonds?

Green bonds are corporate bonds that can be issued only for investments that have a positive environmental effect. Investors who provide capital to companies (i.e., buy corporate bonds) have become increasingly interested in investing not just in companies that give good returns, but also in companies with good ESG (Environmental, Social, and Governance) performance. Because of this trend, green bonds have attracted increasing attention from the public. In recent years, this fundraising method has become popular in Japan as well, resulting in a rapid increase in the number of newly issued green bonds.

Nippon Yusen Kaisha (NYK Line) issued the world's first green bond for a maritime shipping company for ¥10 billion in May 2018. The funds will be used for the following four investments: [1] LNG-fueled ships (ships propelled by LNG instead of by fuel oil), [2] LNG fuel supply ships (ships that supply LNG to LNG-fueled ships), [3] ballast water treatment equipment (equipment that treats the microorganisms in seawater that are taken in as ballast to balance a ship's hull), and [4] SOx scrubbers (equipment that removes sulfur particles from the exhaust gases of ships). All of these are included in NYK Line's long-term "Technology Roadmap for Eco-friendly Vessels."

NYK Line's reason for starting to consider green bonds was simple. It all started from the CEO's 2018 New Year's greeting in which he said, "Our company's themes for this year are 'digitalization' and 'green'." After hearing these themes, I started wondering if the Corporate Finance Team that I'm a part of would be able to help promote these themes through a fund raising method that is in line with the company's goals. During the consideration process, we became aware of a variety of merits green bonds possess. The first merit that we thought of was that green bonds may help us expand financing resources. Among investors, who are the source of funds, there has been a rapid increase in the number of institutions signing the UN's Principles for Responsible Investment (incorporating ESG perspectives when making investment decisions), and because of this trend, we felt that green bonds could help us forge new connections with these ESG investors, which might allow NYK Line to expand its financing sources. The second merit was, considering that green bonds have been attracting a great deal of attention from the media, NYK Line would be able to garner a lot of attention if it succeeds in becoming the world's first marine shipping company to issue a green bond, which would serve as a good opportunity for our domestic and international stakeholders to recognize NYK Line's efforts to address environmental problems. Thus, our team proceeded with a more concrete study on green bond issuance.

Difficulties on the Road to Issuance

As we started working on green bond issuance, we soon learned that it would not be an easy journey. One of the most important requirements for a green bond is to receive an evaluation from a third-party verifier assuring that the investment assets, i.e., the funds usage, are green (that the funds will have a positive environmental effect), but finding a verifier that would serve in this role was the biggest challenge for us. We consulted with a variety of verifiers, but were rejected by several over the use of funds for an LNG-fueled ship because LNG is cleaner than fuel oil, but it is still a fossil fuel. Overseas investors are looking for higher standards, such as renewable energy. We asserted, however, that LNG is currently the best technically feasible fuel for large oceangoing ships and that LNG fuel is a necessary intermediate step in achieving our long-term environmental goals. I felt that the biggest breakthrough for us was being able to finally find a verifier that understood our intentions.

In addition, green bonds require quantitative explanations and external disclosure (reporting) of the positive environmental effects that will arise from the investment assets, which is difficult for the Corporate Finance Team to handle by itself, and so we had to collaborate with various departments, such as the Environment Group, the Technical Group, the various sales groups, as well as the Corporate Communication Group to maximize the effectiveness of

our explanation and external communications. Obtaining cooperation from these departments was another challenge for us. However, we were able to meet this challenge because all the departments were very willing to cooperate with us, and we united with them under the company's keyword, green, and worked as a close-knit team towards the same goal.

Issuance Results

We overcame a variety of hardships and were finally able to issue the bond. Once the bond was issued, we soon realized that its effect far exceeded our expectations. Many investors took an interest in the bond and we received more applications than expected. In addition, the majority of the investors were new and had not bought our previous regular corporate bonds. As the world's first maritime shipping company to issue a green bond, NYK Line was also widely and continuously featured in both domestic and international media such as general interest magazines, industry magazines, finance magazines, ESG magazines, and on TV news. We also had many opportunities to talk about the green bond at forums hosted by the Ministry of the Environment, securities companies, financial media, and various industry groups. NYK Line was able to win three prestigious awards both at home and abroad.

While there were many visible results, I was personally gratified that such a wide range of people, both inside and outside the company, had worked together with us to bring this idea to fruition. This included not only relevant departments and stakeholders from within as well as outside the company who cooperated with us and the verifier who accepted our request, but also the people at the Ministry of the Environment who gave us a variety of advice aimed at promoting the spread of green bonds; the securities company who worked very hard for us, saying that the world's shipping industry could change if this green bond was realized; the media who supported our initiative and posted extensive comments from interviews; and the investors who were interested in our green bond. Probably everyone involved (even though they might not be aware of it) has the common goal of finally solving environmental problems, and they are all heading in the same direction. I also strongly felt that the words "green" and "environment" are magical keywords that create a sense of unity that goes beyond the interests of the people involved.

The Future

It is hard to predict how the green finance market will develop in the future but based on the know-how we gained from issuing our first green bond, we would like to continue issuing green bonds in the future if possible. NYK Line is also participating in creating standards for international shipping green bonds, which is sponsored by the Climate Bonds Initiative, an international NGO. NYK Line would like to become a leader in green finance (financing methods limited to investments with positive environmental effects), including those green initiatives that go beyond our own financing.

The act of issuing green bonds itself does not have a positive environmental effect, but ultimately it makes sense to increase the amount of environmental investment that is used for capital financing purposes. We hope that our initiatives for green bonds will serve as a small opportunity to cultivate a better and wider understanding of green bonds, including their merits and related know-how, among the general public, and will encourage other companies to carry out at least some investments in the environment even though costs are involved. ■

Award ceremony for the Japan Green Bond Award from the Ministry of the Environment (March 2019). In addition to receiving the Minister of the Environment Award at the Japan Green Bond Awards, NYK Line received the Award for Innovation - Use of Proceeds from the British magazine Environmental Finance and the Research Institute for Environmental Finance's Green Bond Award at the Sustainable Finance Awards in 2018.

Detecting Changes in the Ocean with "Kai-Lingual"

[KEYWORDS] Pearl Culturing / Heterocapsa circularisquama Red Tide / Biological Sensors

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(Ocean Newsletter No. 458, 5 September 2019)

In the early 1990s, Heterocapsa-red tide, brought on by the latest type of pearl oyster killer, plankton suddenly occurred in Ago Bay, Mie Prefecture, known as the birthplace of cultured pearls. As a countermeasure for this terrible phenomenon, the Mikimoto Pearl Research Laboratory co-developed the world's first organic-based marine environment monitoring system, "Kai-Lingual (Shell-Lingual, 'Kai' means 'shellfish' in Japanese.)," using an original device to measure the valve movement of bivalve shellfish. Mikimoto will continue to protect the ocean that grows its pearls and live in harmony with nature.

The World's First Red Tide Sensor

Mikimoto has been culturing pearls for more than 125 years in Mie Prefecture's Ago Bay, known as the birthplace of pearl farming. Ago Bay is formed by a Rias coastline and a variety of large and small islands, including Kashiko Island, where the G7 Ise-Shima Summit was held. It is one of the world's leading pearl producing areas, supported by a warm climate and the blessings of forests rich in nature.

Red tide is the most feared sea change in pearl farming. The first records of damage from red tide to pearl oysters for pearl cultivation date back to 1893, when Mikimoto founder Kokichi Mikimoto succeeded in cultivating semi-spherical pearls. A red tide occurred that year and killed most of the oysters that he had been raising. Fights against red tides may, in a sense, be the history of Mikimoto's pearl farming.

A devastating red tide suddenly appeared in the first half of the 1990s, killing a large number of oysters in Ago Bay. At that time, it was not known that the plankton itself could weaken the oysters, much less kill them. Pearl farmers working in Ago Bay at the time were confused to see that the farmed oysters became weakened even though the color of the sea had not changed. As research progressed, it was discovered that this weakening was caused by a new species of plankton called Heterocapsa circularisquama. This plankton rapidly spread to the inner bays of western Japan from the mid-1990s, and it is said that the total amount of damage to fisheries reached an estimated ¥7-10 billion in just 10 years.

What should be done to protect pearl oysters from this plankton? Are there any countermeasures? At the time, Kiyohito Nagai (currently a Senior Fellow), Director of the Mikimoto Pearl Research Institute, and Tsuneo Honjo (currently General Manager of the Seto Inland Sea Regional Research Center, Kagawa University and Professor Emeritus at Kyushu University), Department Head of the Nansei Regional Fisheries Research Laboratory at the Japan Fisheries Research and Education Agency, had been engaged in collaborative research and noticed that pearl oysters react

Kai-Lingual and a solar panel for monitoring the Mikimoto Tatoku farm in Ago Bay. The house on the hill is Kokichi Mikimoto's former residence.

sharply when they sense the existence of *H. circularisquama*, and detecting this reaction would help people identify the emergence of red tides of this species. This finding was obtained from viewing the situation upside down. Specifically, they realized that the oysters are the best teacher of unusual sea condition, in terms of the presence of *H. circularisquama*.

At first, in order to understand the shellfish's reaction, the team made a hole in its shell, attached an electrode to its heart to take an electrocardiogram or measure the oyster's muscle action potential. They also attached strain gauges to both ends of the shell, and tried many other things. However, in all these cases, it was difficult to monitor the health of the sea onsite while it was in a seemingly healthy condition. Then, while searching for appropriate sensors that would make it possible to detect the seawater conditions, the team found a Hall element sensor which converts magnetic fields into a voltage. They affixed this matchstick-size sensor wired to a measuring device to one side of the oyster's shell and a small magnet to the other side of the oyster's shell. Using this sensor in this way, the team was able to detect the oyster's opening and closing of its shell by looking at the changes in the strength of the magnetic field.

The use of this small sensor made it possible to capture, in real time, the condition of oysters in the sea without put-

ting any strain on the organism. In 2004, in collaboration with Tokyo Measuring Instruments Laboratory Co., Ltd., which has technology for measuring Hall effect sensors, the technology was put to practical use as Kai-Lingual (Shell-Lingual), which makes use of the bivalve opening/closing measuring device, and this was the moment of birth for the world's first marine environment observation system using biological sensors.

Monitoring Red Tides with Kai-Lingual

Pearl oysters pass seawater through their gills to take in oxygen and also to collect and eat phytoplankton. There is the saying, "tight as a clam," which is an analogy for keeping your mouth closed, but healthy pearl oysters in normal seas only close their shell a few times an hour, usually keeping their shell open instead. However, they begin to open and close their shell over and over again when *H. circularisquama* arrives, as if they want to spit out the things that got in their mouth. Laboratory experiments show that low-density *H. circularisquama* cause oysters to weaken while opening and closing their shells frequently, and high-density *H. circularisquama* paralyze the oyster's heart in a short time, ultimately causing the heart to stop. The sea does not necessarily turn red, despite the name of red tide, and it is hard to notice changes in the sea, but the terrifying *H. circularisquama* can now be detected in its early stages by Kai-Lingual, thanks to the sharp reactions of the pearl oysters, and the cultured oysters can be treated before red tide fully develops.

Kai-Lingual is installed at two locations in Ago Bay — two Kai-Linguals at the back of the bay and two Kai-Linguals in the center of the bay. The sensor shells are set at different depths — surface depth (0m), 2m deep, 5m deep, and bottom layer (1m above the seabottom), and this arrangement provides information for different areas of the bay and for different depths. Information is sent from them and downloaded hourly to a computer via the internet and researchers are alerted via an email to their smartphones when abnormal sea conditions are detected.

Responding to *H. circularisquama* Red Tide

In Ago Bay, which has many pearl farmers, weekly sea observations and surveys are conducted mainly by the Mie Prefecture Fisheries Research Institute. Sea monitoring systems are also in place, and information such as water temperature, salinity, chlorophyll, and dissolved oxygen is used to understand stagnation or seawater inflow from outside the bay. This is useful in forecasting plankton trends. In addition to that, *H. circularisquama* cell densities in the sea area are investigated when Kai-Lingual detects reactions to *H. circularisquama*. This allows early responses so that the shellfish can survive and their physical strength can be preserved even if *H. circularisquama* proliferates and becomes a red tide.

H. circularisquama starts by growing in deep areas and then gradually turns into red tide while moving back and forth from the upper water layers in the daytime and then back again to the bottom layer at night. Looking at the trends sent from sensor oysters placed in various water depths, the effects of red tide can be reduced by moving cultured oysters to fishing grounds in the bay that have cleaner seawater, to which fresh seawater keeps coming in, or by raising them to upper layers of the water. This lets us refrain from indiscriminately evacuating the oysters to another bay even when a red tide occurs. Closed shells might contain seawater with *H. circularisquama* and moving them indiscriminately to another bay might spread red tide.

Wanting to Listen to Oysters

Mikimoto uses Kai-Lingual to monitor the marine environment so as to continue farming pearls in Ago Bay, the home of cultured pearls, and Kai-Lingual allows aquaculture-damaging abnormalities, such as red tide plankton, seawater hypoxia, and hydrogen sulfide generation to be detected in real time. Kai-Lingual is now used for non- *H. circularisquama* red tide applications, successfully handling multiple types of plankton, such as *Chattonella marina* and *Karenia mikimotoi*. It is expected that this technology, developed with the aim of reducing as much as possible the burdens on both shellfish and the environment, will also be applied to observe aquatic environments other than the sea. Analysis of Kai-Lingual information will continue in the future so that shellfish can provide many more kinds of information about the sea. ■

Towards Mapping 100% of the World's Ocean Floor: GEBCO-Nippon Foundation Team Wins International Competition

[KEYWORDS] Deep-sea exploration technology / Shell Ocean Discovery XPRIZE / Seabed 2030

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(Ocean Newsletter No. 459, 20 September 2019)

In May of 2019, a team of GEBCO-Nippon Foundation Fellows won the international competition Shell Ocean Discovery XPRIZE for deep-sea exploration technology. The team members lived in different countries and could not work together in one location, which was a challenge in practical terms. Even so, their "diversity" proved to be a factor in winning the competition. In entering the competition, the team also had a goal beyond just winning the event. All of the prize money is expected to be used to achieve the goals set in the Nippon Foundation-GEBCO Seabed 2030 Project to completely map the world's entire sea floor topography by 2030.

At the competition's award ceremony in Monaco

In May 2019, a team comprised of fellows from the GEBCO-Nippon Foundation Training Program won the Shell Ocean Discovery XPRIZE, an international competition to advance deep-sea exploration technology.

There was a practical challenge in that the team members could not work together in one location as they lived in different countries. Even so, their diversity proved to be a factor which contributed in them winning the competition.

In entering the competition, the team had a goal beyond just winning.

The prize money is planned to be used for furthering the goals of The Nippon Foundation-GEBCO Seabed 2030 which aims to map the world's entire ocean floor by 2030.

A Multinational Team with Members from 13 Countries

Since 2004, with the cooperation of the General Bathymetric Chart of the Oceans (GEBCO) [1], The Nippon Foundation has been running a training program to raise experts in ocean mapping at the University of New Hampshire in the U.S. To date, the program has trained 90 fellows from 40 countries. With 16 fellows from 13 countries at its core, the GEBCO-Nippon Foundation Alumni Team (hereafter the "GEBCO-NF Team") was formed to take part in the Shell Ocean Discovery XPRIZE, an international competition in deep-sea exploration technology.

In the competition organized by the XPRIZE Foundation, participants competed for rapid data collection from an extensive area of the sea floor, using deep-water unmanned exploration robots at a depth of 4,000 meters. Entering the competition were 32 teams from 22 countries. After the screening of documents and technology evaluation in Round 1 of the competition in Norway in November 2017, 9 teams were selected to compete in the final round (Round 2) off the coast of Kalamata in Greece from November 2018 to February 2019. Japan's Team KUROSHIO, formed with members from industry, government and academia, also advanced to the final.

The GEBCO-NF Team was diverse. Not only did the members come from different countries, but they also had different affiliations, fields of specializations, and positions. Since it was difficult for them to gather in one location to work for the competition, they communicated online. This meant that some members only got to see other members of the team face-to-face for the first time at the award ceremony on May 31, 2019. No other team had members scattered across the globe.

The fact that they could only communicate online posed some practical difficulties but having members from all over the world also worked to the team's advantage. That is to say, the team could combine and make use of each fellow's connections and networks. The members contacted companies who are technological forerunners in their respective countries and negotiated with them directly for their cooperation. By utilizing each member's networks, it was possible to immediately contact the right persons when issues or questions arose. This would probably not have been possible for a team coming from a single community. We believe that to bring about a breakthrough, not just in reference to this competition, but in everything, "diversity" is key. Diversity is also one of the values that is regarded as important by The Nippon Foundation.

A Shared Vision

In the competition's final round, the teams conducted exploration using unmanned robots and were tested on

their technologies to create a deep-sea 3D map at a depth of 4,000 meters over an area of more than 250 square kilometers within 24 hours. Even when faced by these rigorous competition requirements, the GEBCO-NF Team had managed to collect the required data and create a map using that data within the allocated time and had managed to win the competition. The GEBCO-NF Team was the only team that cleared all of the competition requirements.

It should be emphasized that in addition to the considerable knowledge and expertise derived from the diversity of the team members, the focus of the entire team was not on winning the competition but on something far larger than that. Participation in the competition was part of their endeavor to fulfill humanity's dream of unlocking the mysteries of the world's ocean floor. Although it did not directly affect the outcomes of the competition, it appears that many involved in the competition held high regard for the fact that the team was operating under this shared vision.

Round 1 (technology evaluation) in Norway in 2017

GEBCO-NF Team processing data in Round 2 (final round) in Greece

Towards Mapping 100% of the World's Ocean Floor

The Grand Prize of 4 Million US Dollars was donated in its entirety to the Nippon Foundation. The amount is expected to be used to further the goals of the Nippon Foundation-GEBCO Seabed 2030 Project, a joint initiative between the Nippon Foundation and GEBCO to map the world's entire ocean floor by 2030. Several members of the team have started on new initiatives after the competition, accompanying long expedition voyages to collect data in unexplored areas of the sea. The prize money may also be used for these initiatives.

The data from mapping the sea floor topography can be used for forecasting tsunami propagation and global sea level rise, safe navigation of ships, monitoring of marine life, and in addressing many other issues. In the mere 2 years since the project had started, the percentage of the world's ocean floor that has been mapped has increased from 6% to 15%. Achieving the project's goal, however, will require further cooperation from across the world.

The competition provided opportunities not only for all the teams to explore new ways of mapping the ocean floor,

Surveying system developed and used in the competition by the GEBCO-NF Team

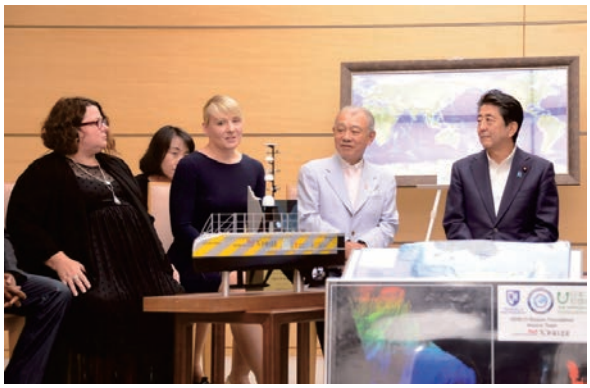
but had also served as a platform for creating new encounters and building connections. It is expected that the efforts to map the ocean floor will accelerate with the growth of the global network across different disciplines.. It is hoped that people from diverse backgrounds will join in this effort to realize humanity's shared dream.

On 18th September 2019, representatives of the GEBCO-Nippon Foundation Alumni Team had paid a courtesy

Mr. Unno reports about the alumni's contribution at the Seabed 2030 Symposium in London

call to the Prime Minister of Japan, Mr. Shinzo Abe, to report on their performance in the Shell Ocean Discovery XPRIZE.

Not limited to participation in XPRIZE, contributions of the alumni from the GEBCO-Nippon Foundation training program were also reported at The Nippon Foundation-GEBCO Seabed 2030 Symposium held at the Royal Society in London on 22nd October. ■



A team representative, Ms. Karolina Zwolak, reports to Prime Minister Shinzo Abe

1) GEBCO is a joint project between the International Hydrographic Organization (IHO) and UNESCO-IOC to map the world's entire ocean floor and standardize the names of undersea features.

Survey and Evaluation of the Environmental Impact of Offshore Wind Power Generation: Future Outlook Based on Examples from Europe

[KEYWORDS] Offshore Wind Power Generation / Environmental Impact Monitoring / Windmill Artificial Reefs

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(Ocean Newsletter No. 460, 5 October 2019)

Use of renewable forms of marine energy resources such as offshore wind farms showed a remarkable advance in Europe in the last half of this century's first decade, and has now accumulated 10 years' worth of many types of knowledge and know-how regarding investigations and assessments of environmental impacts. Keeping these European conditions in mind, I would like to explore how we should think about impacts on marine life and habitats as we begin to promote offshore wind farms in ocean areas around Japan.

Development of Offshore Wind Farms in Europe

Utilization of renewable marine energy resources, such as offshore wind power, has seen remarkable progress in Europe as one of the main sources of low carbon power to combat global warming. The installation areas of offshore wind farms expanded rapidly in the 2000s, particularly in the North Sea and Baltic Sea, and by the end of 2018 the total number of wind turbines installed in European countries reached 4,543, with a cumulative power generation capacity of 18,499 MW.

Needless to say, engineering technology developments and economic cost reductions have significantly contributed to the expansion of these offshore wind power generation projects. However, we should not overlook the fact that, as a preliminary step to this expansion of offshore wind power generation, there had been efforts made to evaluate and monitor environmental impacts in order to prevent and/or mitigate them. In the years since the late 2000s the countries leading the way in total installation of offshore wind farms, i.e., the UK, Germany, Denmark, the Netherlands, and Belgium (the 5 countries in all of Europe that account for 98% of wind farms), have already acquired a wealth of knowledge and know-how about ways to investigate and evaluate the environmental impacts of wind farms.

Based on the above-mentioned situation in Europe, this article will consider how we should proceed with investigating the effects of offshore wind power generation on marine life and their habitats when promoting offshore wind power in ocean areas around Japan.

Effects on Marine Life and Their Habitats

The environmental impacts associated with installing offshore wind power facilities varies depending on their distance from land, the water depth in the installation area, the installation method (anchored/floating) and the type of structural foundation (monopile/gravity-base, etc.). In most marine coastal areas, existing information and knowledge about their environments, organisms, and ecosystems, etc., needed to assess the impact on the environment, is limited. The Ministry of the Environment of Japan has organized the Study Group on the Basic Concept of Environmental Impact Assessments for Offshore Wind Power Generation and has begun studying ways to summarize related information, both from Japan and overseas, and considering how to select evaluation criteria. [1)]

Additionally, the findings to date about the impacts of offshore wind power generation on the environment and marine organisms obtained from preceding examples in Europe are comprehensively summarized in the recently published "Wildlife and Wind Farms, Conflicts and Solutions, Volume 3" (Perrow, 2019). This book also reveals that there have been few cases until now in which significant impacts have been detected over the long run. However, there are still many uncertainties about the currently available forecasts and evaluations about environmental impacts. Therefore, there are many issues that require further research, including the cumulative impact associated with future expansion of offshore wind power generation projects. As such, it is fundamentally important to further enhance preliminary baseline surveys on environmental impacts and to promote the accumulation and sharing of survey monitoring data both during and after construction, which will likely contribute significantly to the establishment of modeling techniques and enhanced accuracy of impact assessments in the near future. In addition, in 2013, the German Federal Maritime and Hydrographic Agency (BSH) stipulated in their "Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment" standards a pre-construction baseline survey period of two years and an operational monitoring period of 3 to 5 years. We should refer to this when considering system designs for Japan in the future.

Furthermore, Marine Spatial Planning (MSP) in Europe has been formulated and is being used to select suitable sites for offshore wind power facilities. Utilization of marine areas for the fishing industry has been given precedence in Japan, and it would be difficult to introduce

such a comprehensive management plan, as is, for use and conservation of marine coastal areas. Still, when installing an offshore wind power facility, it is extremely important to select a suitable site at the planning stage in order to prevent environmental impacts. Foreseeing the level of impacts the facility would have on the surrounding environment, based on the preliminary baseline survey results and existing findings, and establishing planning methods that include preventative measures against these impacts is one of the most urgent tasks.

When an artificial structure appears on the surface of the sea or underwater, marine organisms will appear and attach themselves to the structure. These organisms vary in species and numbers depending on the structure's material and shape. Fish may be attracted to the structure looking for food and shelter, and seabirds and large predators may gather to feed on the fish, thereby creating new habitats. In Europe, there have also been cases in which an anchored offshore windmill or a structure installed on the seabed functions like an artificial reef. Because of their similarity to artificial reefs, these offshore wind power structures are called windmill artificial reefs and their effects are attracting attention. It is expected that the artificial reef functions of offshore wind power facilities will allow the facilities to serve as hot spots that enhance biodiversity and as places for the production of fish resources that gather around the facilities. On the other hand, there are also reports that these facilities may act as stepping stones to promote the expansion and distribution of non-indigenous species in offshore waters as well as there being possible impacts on water quality and seafloor sediment near the structures due to the accumulation and collapse of sessile/immobile organisms. It should also be noted that existing habitats, such as sand and mud seafloors, will be lost in conjunction with the emergence of new hard substratum habitat.

Looking Ahead

In addition to the above mentioned demands for developing renewable energy resources in the seas surrounding Japan, including offshore wind power, as a measure against global warming, and promoting their use for purposes such as the revitalization of local human communities are considered to be an important task for Japan, a resource-poor country. In that sense, it is desirable for the country to start focusing now on building a foundation for developing offshore energy sources that can coexist with marine ecosystems and biological resources. In addition to developing methods to investigate and evaluate environmental impacts by learning from European examples, it will be necessary

Floating offshore wind power facility off Sakiyama, Goto City, Nagasaki Prefecture (Photo: Professor Ryo Kawabe, Nagasaki University)

to make efforts to involve major stakeholders, including fishermen, in discussions on the design, site selection and period of operation of the wind power facilities from their planning stage, so as to gain understanding while presenting, in an easy-to-understand manner, scientific data regarding the reef effects that have the potential to create new habitats for seafood.

In contrast to European countries located in high latitude climate zones where the number of offshore wind power facilities has been rapidly increasing, the waters around Japan have a relatively high water temperature and so will likely see far more impacts from organisms attaching to wind power facilities. The reef effect may be an important point of discussion that needs to be emphasized to gain the cooperation of local fishing communities, but there is still insufficient scientific knowledge about the actual conditions of organisms attaching to undersea structures as well as regarding the ecological characteristics of the fish that gather there. Japan has already accumulated a wealth of research findings on the evaluation of effects of artificial reefs on fish attraction, and it is hoped that research and investigations in this field will progress, employing a wide range of perspectives from basic research to practical applications. ■

1) Refer to the following URL for the study group's report : http://www.env.go.jp/press/103898.html

Japan's Withdrawal from the IWC and its Whaling Industry

[KEYWORDS] International Whaling Commission (IWC) / Commercial Whaling Moratorium / Whales

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(Ocean Newsletter No. 464, 5 December 2019)

Japan withdrew from the International Whaling Commission on June 30th 2019, and restarted its whaling operations within its 200nm EEZ on July 1st. There were criticisms that by this decision Japan is turning its back on international society, and that it should have persevered at the negotiating table. However, the decision came only after 30 years of negotiations with anti-whaling countries, in which all attempts at discussion and compromise in scientific, legal, economic, and cultural areas ended in failure. We must ask now where the whaling issue is headed.

Japan's Withdrawal from the IWC

Japan announced on December 26, 2018, that it would withdraw from the International Whaling Commission (IWC) and that from July 1, 2019, it would resume commercial whaling in waters within 200 nautical miles of Japan. This decision was met with surprise, both inside and outside Japan, and the Japanese media also criticized the decision, calling it a "simplistic decision," wondering if "Japan was turning its back on the international community," and saying that "more tenacious negotiations should continue."

From Scientific Discussion to the Charismatic Animal Concept

As a result of anti-whaling movements that have been active since the 1970s, the IWC adopted a moratorium on commercial whaling in 1982, and there has been a widely-spread perception that the moratorium was issued to ban commercial whaling permanently because overfishing had exhausted whale stocks. However, Paragraph 10 (e) of the Schedule to the International Convention for the Regulation of Whaling (ICRW), which prescribes the moratorium, clearly stipulates that catch limits for the killing for commercial purposes of whales shall be zero for the time being because there was uncertainty about the scientific information necessary for managing whale stocks (please note that it did not ban whaling), and during the moratorium period the IWC will undertake a comprehensive assessment of the scientific information and, by 1990, consider the establishment of catch limits other than zero. This is the procedure for resuming whaling.

Japan conducted whale research programs (research whaling) in accordance with this provision, and the IWC Scientific Committee developed the Revised Management Procedure (RMP) that could calculate catch quotas which would not deplete whale stocks. Now, many types of whale stocks have recovered and can be used sustainably. Dr. Phillip Hammond from the United Kingdom, a key member and the then Chair of the Scientific Committee, declared in

The 67th Meeting of the International Whaling Commission (IWC), held in Florianopolis, Brazil, in September 2018 (The author, at the center of the stage, was the Chair of the Meeting)

1993 that the scientific problems of whaling management had been resolved. In response, anti-whaling countries set new hurdles for the resumption of whaling. They claim that strict monitoring and enforcement measures are necessary because, even if there is a scientifically appropriate catch quota, it is possible that poaching and smuggling will occur, which may result in non-observance of the quota. Discussions about these monitoring and enforcement measures were carried out over the course of approximately 50 meetings and 15 years since the first half of the 1990s. In this process, Japan accepted the proposed measures one after another, such as having international observers aboard Japan's whaling vessels, tracking whaling ships via satellite, preventing poaching and smuggling through analysis and registration of DNA in whale meat, as well as bearing the enormous cost burden for such measures. Just as these discussions on surveillance measures started delivering results, anti-whaling nations declared that they would not agree to the resumption of whaling even after the surveillance and enforcement measures were established.

Moreover, in anti-whaling countries whales have emerged as a special animal that should be protected under any circumstances. This idea is called the "charismatic animal concept," and this category includes elephants, tigers, and wolves. Charismatic animals are basically large vertebrates, known by everyone including children, endan-

gered (or thought to be endangered), and not regarded as resources. There is a fundamental difference between the view that regards whales as charismatic animals and the view that regards whales as marine biological resources that can be sustainably used.

"Peace Negotiations" and their Failure

Conflicts over whaling adversely affect the relationships between countries that are normally friendly to each other and bring about emotional conflicts among their citizens. Furthermore the radical anti-whaling movement has engaged in violence and sabotage that can lead to major accidents in whaling research. Concerned with these situations, successive IWC chairs have proposed and led a variety of "peace negotiations" aimed at alleviating the conflicts. But all such efforts have failed. Details of these past efforts can be found in the references provided at the end of this article, but, as a natural course of any "peace negotiations" in which a compromise is sought, a middle ground between the two sides is proposed as a goal of negotiations. The proposed final goal, being a middle ground between the arguments of both sides, naturally requires the involved parties to accept some form of whaling. This unavoidable nature of compromise was the source of failure for all the "peace negotiations." Any and all whaling is unacceptable in anti-whaling nations that see whales as charismatic animals that should be protected under any circumstances. In fact, at past IWC meetings, Japan even went so far as to propose a very small catch limit of minke whales (even just one) whose stocks are in good condition for Japan's coastal whaling communities, but this proposal was also rejected. As seen in these past developments, these anti-whaling nations would oppose seeking any sort of middle-ground compromise. They will oppose any compromise proposal that would allow any sort of whaling, even on a small scale, and even if the compromise proposal includes elements that will bring great benefits to the anti-whaling nations (for example, designating the southern Atlantic Ocean as a whale sanctuary).

Negotiations have been held over the course of 30 years to explore all possibilities, but no compromise has been achieved. In response to this, Japan proposed a new approach at the 2018 IWC Meeting instead of seeking a compromise as before. The proposal can be thought of as "living apart under the same roof," that the parties "agree to disagree" and will avoid interfering with each other as much as possible while living under the one roof of the IWC, which should make it easy for both sides to pass their proposals. This proposal was also rejected by a vote, which means that the IWC rejected even the concept of peaceful coexistence.

In response to this, Japan decided to leave the IWC.

A small coastal whaling vessel engaged in commercial whaling in coastal areas (©Japan Small-Type Whaling Association)

Whaling in Japan and its Symbolism

Withdrawal from the IWC resolved Japan's policy goal of resuming commercial whaling, and in doing so it will be necessary for Japan to show to the international community in a highly transparent manner that the resumption of whaling is scientifically sustainable and that conservation and management measures are being adhered to under appropriate monitoring and enforcement structures. It is also important to make the reopened whaling socio-economically viable and stable for local communities.

On the other hand, the whaling issue is not just a question of whether or not Japanese whaling can be resumed. It has to do with much wider issue that specific values should never be imposed on the use of any sort of animal as a resource as long as sustainable use is possible. Both for food security and for conservation of biodiversity, ensuring diversity shall be the key to resilience. However, the international community is advancing monopolies under intolerance, sentimentalism, and so-called globalism. The whaling issue is a symbol of these wider problems. ■

- Reference: Joji Morishita, "Withdrawal from the IWC and International Negotiations," 2019, Seizando-Shoten Publishing Co., Ltd.
- Reference webpage: "Whaling Affairs," Fisheries Agency of Japan

Can Maritime Boundary Delimitation Disputes Be Resolved?

[KEYWORDS] Maritime Boundary Delimitation / United Nations Convention on the Law of the Sea / Peaceful Settlement of Disputes

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The maritime boundary delimitation disputes between Japan and China and Japan and Korea have become serious political issues with little prospects of resolution in sight. As the issue with China concerns a territorial dispute over the Senkaku Islands and with Korea over Takeshima Island, if these are not resolved the base lines necessary for sea boundary delimitation cannot be determined, therefore leaving the states involved without agreement on their borders. In order to resolve these maritime border disputes peacefully, based on international law rather than through force, direct negotiations as well as consideration of international arbitration by third-party dispute settlement mechanism should be considered.

Why Dispute Over Maritime Boundary Delimitation Arises

While a state's land borders can be easily understood the oceans are all connected and spread round the world, so many people wonder why disputes arise between countries over maritime boundary delimitation. Behind these disputes are conflicts between states over the acquisition of marine resources. There was an energy revolution in the 1960s in which states switched from coal to oil, and various states embarked on developing their coastal continental shelf for sea-bed and subsoil oil resources and natural gas. At the UN General Assembly in 1967, Malta's Ambassador Arvid Pardo made a speech in which he warned that the seabed and subsoil around the world could be divided up amongst developed coastal states, so the extent of the continental shelf should be clarified, a deep seabed regime differing from that of the continental shelf should be established on the seabed beyond the continental shelf, and the resources contained therein should become the common heritage of mankind. With this famous speech, the 1982 United Nations Convention on the Law of the Sea (hereinafter UNCLOS) was concluded.

Framework of the United Nations on the Law of the Sea

UNCLOS adopts two ideas as the basic ideas forming order on the ocean. One idea is the concept of the classification of maritime areas. In this, a coastal state's territorial waters are defined as extending 12 nautical miles from the coast, and, at the same time, the area up to 200 nautical miles from the coast is newly defined as the coastal state's exclusive economic zone (EEZ), thereby recognizing the coastal state's sovereign rights for exploration, exploitation, and management of the waters, seabed and subsoil up to 200 nautical miles from the coast. The other idea is a system of subject-specific regulations for navigation, fishing, resource development, maritime environmental protection, and maritime scientific research and surveys. In doing so, the important issue becomes to what extent coastal states can exclude other states and monopolize resource exploration and exploitation. States separated by less than 400 nautical miles and neighboring countries will thus have disputes over maritime boundary delimitation for their continental shelf and EEZ.

At the Third United Nations Conference on the Law of the Sea, which adopted UNCLOS, there were two opposing ideas about the criteria for maritime demarcation. One was the principle of an "equidistance plus special circumstances" and the other was an "equitable principle plus relevant circumstances." However, UNCLOS does not adopt a specific standard, and states with disputes over maritime demarcation have settled the disputes by agreement on the basis of international law. UNCLOS defines rules for maritime demarcation, so many people think that states should negotiate in accordance with the rules, but it is not that simple. To illustrate, let's consider each state in the disputes.

What is China Disputing?

Japan asserts that both continental shelf and EEZ maritime delimitation should be demarcated based on equidistant median lines, but China asserts a sovereign right to the Okinawa Trough as a natural prolongation of the continental shelf, and so the dispute continues. As the concept of the EEZ has taken root since the adoption of UNCLOS, the continental shelf has been subsumed into the 200 nautical mile distance criteria and the concept of the continental shelf has been absorbed into the EEZ system. For states opposite each other across the East China Sea, such as Japan and China, the boundary line / equidistant line are seen as a single criterion.

In cases where the demarcation for the continental shelf has not been decided, as with Japan and China, then Article 74 (2) and Article 83 (2) of UNCLOS stipulate that "if no agreement can be reached within a reasonable period of time, the States concerned shall resort to the procedures provided for in Part XV (Settlement of Disputes)." However, China has deposited with the UN Secretary-General a declaration to the effect that it is exempted from Part XV Section 2 (Compulsory Procedures Entailing Binding Deci-

sions) because of Article 298 (1) (a) disputes related to sea boundary delimitation, (b) disputes concerning military activity, and (c) disputes in respect of which the UN Security Council is exercising the functions assigned to it by the UN charter. In other words, the path for Japan to commit this maritime delimitation issue to a compulsory arbitration tribunal has been closed.

The only way to refer this issue to the International Court of Justice (ICJ) is to conclude a special agreement between Japan and China, but China is unlikely to consent to such a special agreement. As a result, there is no resolution to this issue other than diplomatic negotiations.

Unfortunately, there are difficult issues between the two countries, such as those concerning sovereignty over the Senkaku Islands (Chinese name: Diaoyu Islands), and negotiations to realize a joint development agreement have been suspended. There is now a need for the two states to work towards resuming talks within the larger framework of Japan-China friendship.

Shirakaba Gas Field (Photo: Provided by the Ministry of Defense)

Why is South Korea Disputing?

South Korea and Japan both insist on a median line as a criterion for demarcating the EEZ, and in that sense both states have agreed to apply the equidistant median criteria. Japan insists on using the "Takeshima-Ulleungdo Median Line" with Takeshima (South Korean name: Dokdo) as a reference point, while South Korea insisted until 2006 on the "Ulleungdo-Oki Median Line."

However, Korea changed its attitude in 2006 and changed the reference point for the median line from Ulleungdo to Takeshima. Japan, on the other hand, has traditionally insisted on the "Takeshima-Ulleungdo Median Line" with Takeshima as the reference point, so demarcation negotiations were deadlocked. As a result, it became difficult to demarcate the EEZ without resolving the territorial dispute over Takeshima. Even if Japan were to propose, in order to break the impasse, "to stop using the Takeshima as an EEZ reference point because it is an island over which there are sovereignty disputes," it is thought that South Korea would not accept it. This is because South Korea has taken the position that the Takeshima dispute itself does not exist, and as such the Japanese proposal cannot possibly be accepted.

South Korea is also unlikely to settle the dispute in an international court. Japan proposed appealing the Takeshima issue to the ICJ in 1954 and 1962, but this proposals were rejected by South Korea. The Japanese proposal of jointly appealing the Takeshima issue to the ICJ was also rejected by South Korea, saying it would be "a complete waste of time and money." As such, it can be said that South Korea, which has taken the position that there is no Takeshima dispute, is highly unlikely to refer the dispute to the ICJ.

Why is it Difficult to Settle East Asian Maritime Delimitation Disputes?

East Asian disputes between Japan and China and between Japan and South Korea over maritime delimitation have become important political issues whose resolution is uncertain. Behind these issues are the existence of territorial disputes over islands. If the dispute with China over the Senkaku Islands and the sovereignty dispute with South Korea over the Takeshima Island are not resolved, then the problem is that agreement on demarcation cannot be reached because the maritime demarcation reference points are not decided.

Under the single-party control of the Communist Party, China has no intention of entrusting issues of sovereignty to third parties, not even to the United Nations. South Korea, unlike China, is a democratic country, but there is fierce competition between the conservative and reform parties, and political power will be lost if an appeal over the issue is denied by an international court. The recent worsening of Japan-South Korea relations has additionally further reduced the prospects of resolving this issue.

Nevertheless, the parties to the disputes should find a way to entrust the issues to third party dispute resolution institutions, such as through direct negotiations and mediation so as to settle the maritime demarcation conflicts peacefully and based on international law, not force. This is because Japan, China, and South Korea are all member states of the United Nations, and the United Nations imposes on its member states the obligation to settle their international disputes by peaceful means under Article 2 (3) of the Charter of the United Nations. ■

Iceland's Chairmanship Program for the Arctic Council and the Role of Japan

[KEYWORDS] Arctic Council / Iceland / 3rd Arctic Science Ministerial (ASM3)

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(Ocean Newsletter No. 469, 20 February 2020)

On 7 May 2019, Finland handed over the Chairmanship of the Arctic Council to Iceland at its 11th Ministerial Meeting in Rovaniemi, Finland. The Icelandic Chairmanship runs for two years (2019-2021), until the next Ministerial meeting. Iceland will co-host the third Arctic Science Ministerial Meeting (ASM3) with Japan to discuss increased international collaboration on Arctic science, which was originally scheduled to be held in November 2020 but postponed to May 2021 due to the COVID-19 pandemic.

Iceland's Arctic Council Chairmanship program for 2019-2021

Iceland puts four priorities for the Arctic Council Chairmanship program with "Together Towards a Sustainable Arctic" as an overarching theme.[1] The theme of its program reflects Iceland's commitment to the principle of sustainable development and refers to the necessity of close cooperation between the states and peoples of the Arctic region and beyond. With regard to the first priority, "the Arctic Marine Environment", Iceland puts particular importance on combating marine plastic pollution in the Arctic and plans to convene the international symposium on plastics in the Arctic in March 2021 in Reykjavík. [2] It also mentions an improvement of the utilization of living marine resources for driving sustainable economic growth in the Arctic coastal communities and promotion of safe and sustainable shipping in the Arctic. The second priority, "Climate and Green Energy Solutions", highlights the importance of each member state taking actions to address climate change in accordance with their respective international commitments and national policies with noting that the impacts of climate change not only affect the environment of the Arctic but also the economic and social wellbeing of Arctic communities. With the aim of promoting the wellbeing of the approximately four million people living in the Arctic, the third priority, "People and Communities of the Arctic", focuses on three areas of work: new economic opportunities in a sustainable manner, reliable and affordable telecommunications and gender equality, in collaboration with relevant stakeholders. With regard to the fourth priority, a "Stronger Arctic Council", noting that a key strength of the Arctic Council lies in the constructive cooperation, Iceland states to strive to enhance close consultations between the Member States and the Permanent Participants as well as mutually beneficial collaboration with Observers. Iceland also refers to strengthen cooperation between the Arctic Council and the Arctic Economic Council, a group of Arctic business stakeholders. As its overarching theme indicates that Iceland's Arctic Council Chairmanship program gives full consideration to the three dimensions of sustainable development: the economic, environmental, and social (human rights).

Japan-Iceland Cooperation on the Arctic

Iceland is very active in collaborating with Japan, an observer in the Arctic Council. Shortly after assuming the chairmanship of the Arctic Council, Iceland´s Minister of Education, Science and Culture, Lilja Alfreðsdóttir visited Japan in May 2019 and confirmed close cooperation for the ASM3, which was originally scheduled to be held in October 2020, in Japan and co-hosted by Iceland, also agreed to advance bilateral cooperation in science and technology. On this occasion, Minister Alfreðsdóttir also paid courtesy visit to Ocean Policy Research Institute of the Sasakawa Peace Foundation and recognized the importance of promoting cooperation for Arctic policy and scientific research with private sectors.

In September 2019, Iceland's Ambassador on Arctic Affairs and Chair of the Senior Arctic Officials Einar Gunnarsson visited Japan and made a presentation on Iceland's Chairmanship Program of the Arctic Council for stakeholders in Japan including embassies of Arctic Council countries, the government of Japan and the Arctic science community at the seminar hosted by Embassy of Iceland in Tokyo. At the seminar, Ambassador Gunnarsson expressed his expectation for further scientific cooperation and industrial collaboration between Iceland and Japan on marine plastics issues and the blue bioeconomy, [3] which are areas

Exchange of views meeting at the Sasakawa Peace Foundation. Center right is Lilja D. Alfreðsdóttir, Iceland's Minister of Education, Science and Culture.

of particular importance to Iceland.

Ambassador on Arctic Affairs Einar Gunnarsson explaining Iceland's Chairmanship Program at a seminar.

The 3rd Arctic Science Ministerial (ASM3) in Tokyo

The Arctic Science Ministerial (ASM) is a ministerial-level meeting aimed at strengthening international cooperation in Arctic science and research, and use of its knowledge to decision making process, also known as an important international forum for Arctic cooperation same as the Arctic Council. The first-ever meeting was hosted by the United States in September 2016, and the second meeting was co-hosted by Germany, Finland, and the European Commission in October 2018 with participation of more than 20 countries, including the Arctic Council member states and Japan. At the ASM2 meeting, the proposal submitted by Iceland and Japan for the ASM3 to be held in Japan on 21 to 22 November 2020 and co-hosted by Iceland was unanimously agreed. [4] However, due to the COVID-19 situation, the host governments officially decided to postpone the meeting to 8 and 9 May 2021. It is the first time for the ASM to be held in Asia and is quite important for Japan for convening the meeting in Japan from the perspective of promoting Japan's Arctic policy and research.

Towards Arctic Policy Research After and Beyond 2020

It can be said that the year 2020 is the "Year of the Artic" for Japan for various reasons. It is not just because an important international conference on the Arctic known as ASM3 will be held in Japan. Another reason is that the year 2020 marks five years since the "Japan's Arctic Policy", which is the first-ever comprehensive and strategic Arctic policy has been adopted, and mid-years since the "Third Basic Plan on Ocean Policy" has firstly included the policy for the Arctic as one of the main measures. It is time to review and reconsider the Arctic policy and Arctic cooperation in Japan. Additionally, upon the completion of the Arctic Challenge for Sustainability (ArCS) project, a national flagship project funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), in March 2020, the subsequent project called ArCS-II has started from FY2020 for five years. Furthermore, although it has been postponed to May 2021 due to the COVID-19 pandemic, the "Arctic Circle Japan Forum", a regional forum of the "Arctic Circle Assembly" which is the largest network of international dialogue on the Arctic, also known as the "Arctic Davos forum", was to be held in association with the ASM3 in November 2020 in Tokyo. This forum will be organized in cooperation with the Sasakawa Peace Foundation and the Arctic Circle Secretariat. In light of the domestic and international situation with regard to the Arctic, the Polar Cooperation Research Centre of Kobe University will hold the 13th Polar Law Symposium online in November 2020 and its 14th symposium will be held in November 2021 at Kobe University, Japan. [5] This will be the first time the event is being held in Asia region. It is expected that Japan's Arctic policy research will be further developed and contribute to sustainable development in the Arctic region through these processes and opportunities. ■

1) https://arctic-council.org/index.php/en/about-us/arctic-council/iceland-chairmanship
2) https://www.arcticplastics2020.is/index.php/en/
3) https://arctic-council.org/en/projects/blue-bioeconomy-in-the-arctic-region/
4) https://asm3.org/about-asm3/
5) https://2020polarlawsymposium.org/

Marine Education Programs Through School-Museum Collaborations

[KEYWORDS] Environmental Education / School Education / ESD

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The Tokai University Marine Science Museum has set up marine education programs based on its research results and utilizes them for school education and collaboration with local communities. The purpose of these programs is to deepen students' interests in marine fields and develop individuals who might pursue careers in them. The museum's education programs currently in use are the Environmental Education Program Utilizing the Deep-sea Lancetfish, *Alepisaurus ferox*, and the Marine Education Program Utilizing Ocean Plankton and Whitebait. This article introduces these marine education programs which have been designed with Education for Sustainable Development (ESD) in mind.

Marine Education Initiatives by the Museum

The Tokai University Marine Science Museum opened in May 1970 at the northern end of the Miho no Matsubara scenic spot and will celebrate its 50th anniversary in 2020. The museum was established in 1962 by Shigeyoshi Matsumae, founder of Tokai University, who stressed that "as Japan is surrounded by the ocean, it should look to the ocean with its infinite possibilities and aim to become a maritime nation that uses it peacefully." The Marine Science Museum is affiliated with Tokai's School of Marine Science and Technology, the first such faculty in Japan (see http://www.umi.muse-tokai.jp/).

In addition to its activities, it has given back its educational and research know-how, accumulated over half a century, to the local community and society. Since 2000, the Marine Science Museum has been promoting school-museum collaboration initiatives that aim to use its know-how for school education. Beginning in 2013 with exchanges at local elementary schools in Shimizu City, the museum started dispatching curators to schools to give classes. Every year, the author conducts science classes for 5th graders from May to July and for 6th graders from October and December, and during other times, I give lessons in environmental education, marine education and marine-related career education as part of "the periods for integrated studies" offered under the Japanese school system (hereinafter referred to as "integrated studies") in ways that fit the students' needs and ages of each class. Though I mainly give visiting lectures/classes at local elementary schools, I have also made a point of traveling to schools in other prefectures to give them using the materials and equipment I bring from the museum.

Under the museum's educational initiatives that teach topics in the natural sciences in an interdisciplinary way, we have been working for the past 20 years to develop programs that teach educational topics related to environmental education and to utilize such programs to meet the needs of a variety of student groups ranging from 5th and 6th graders to adult extension classes. From all the lessons I have conducted under these initiatives, I will here introduce three of them: Activities in the Environmental Education Program Utilizing the Deep-sea Lancetfish, *Alepisaurus ferox*, Visiting Lectures/Classes Using Ocean Plankton and Whitebait, and Collaborative Projects Between High Schools and the University's Museum.

Activities in the Environmental Education Program Utilizing the Deep-sea Lancetfish, Alepisaurus ferox

This program originated from a study on anomalous phenomena in lancetfish (1971) by Tadashi Kubota, Professor Emeritus at Tokai University, as well as research conducted from 1964 to 1983 on the phenomenon of sea debris appearing in the stomach contents of lancetfish. I took over the research and started compiling records from 2001 to the present, comparing the 19 years of data from 2001 with that of the 20 years from 1964, and treating it as an indicator of marine debris. According to the latest records, there was a 62.2% appearance rate of sea debris in stomach contents for the 1964-1983 period, and an increase to 71.9% for the 2001-May 2019 period.

One issue we have with this program is that it is difficult to obtain the teaching materials. The lancetfish, to begin with, is a deep-sea fish that normally lives at depths of 400 to 1,400m in the northern and southern Pacific Ocean, the northern and southern Atlantic Ocean, and the Indian Ocean excluding the polar regions, and is thus difficult to acquire. However, due to the seafloor topography of Suruga Bay and seasonal wind influences, there is a chance for upwelling currents to wash lancetfish ashore on the Miho coastline, and we have obtained an average of 9 lancetfish per year in the 19 years since 2001. However, this is not enough to meet the needs for lessons in other prefectures, and even though we sometimes show pictures taken when dissecting the fish, it is best if we can show students the real fish. Therefore, we would truly appreciate it if those

who support our initiative help us with collecting the fish washed ashore. This program is unique in that it can only be made possible when we are blessed with people who support us and nature. I made a presentation about this program under the title of "Environmental education utilizing the deep-sea lancetfish (*Alepisaurus ferox*)" at the 6th International Aquarium Congress held in December 2004 at the Monterey Bay Aquarium in California. At the time, there had not been any lectures or presentations about programs using fish and sea debris as teaching materials for environmental education, so it attracted much attention from the participants.

It all started in 2002 when I was involved in developing lessons for the comprehensive learning hours for 5th graders at Shimizu Okitsu Elementary School. Through this project, I gained an opportunity to incorporate the program in classes at local elementary schools. At the time, it was a transition period when the comprehensive learning hours had been newly introduced into the national curriculum guidelines, and there were creative and innovative ideas being introduced at elementary schools nationwide. Shimizu Okitsu Elementary School continues to use this program even today as a class to teach its students about the marine environment. The issue of marine debris has become a major issue around the world in recent years, and this program, which uses lancetfish as teaching materials, started to be used not only in schools but also for projects conducted by the government and other public bodies including The Nippon Foundation's Umi-to-Nippon project (2017-2019), while also being utilized widely in training sessions for companies and other organizations.

A plastic bag from the stomach of a lancetfish that drifted ashore at Miho Beach in January 2000

Giving Visiting Lectures Using Ocean Plankton and Whitebait

Since 2013, the museum has been organizing visiting lecture/classes to local elementary schools in Shizuoka City, with the contents including a program that incorporates observation experiments of ocean plankton and the topic of whitebait. The teaching materials are ocean plankton collected in the early morning of the day of the class and one microscope for every two students. These microscopes were obtained through aid from The Nippon Foundation. Japanese 5th grade elementary school students learn about small rice fish called *medaka* during their 5th grade "The Connections of Life" physiology unit, and this program is used for those lessons. These *medaka* rice fish (*Oryzias latipes*) are endemic to Japan and have been used as scientific teaching material for many years, but their numbers have been severely declining all over the country and they are no longer a familiar creature to students. I therefore tried using whitebait fish instead of *medaka* rice fish as teaching material that students would be familiar with. When conducting the class, I would always start out by explaining that some whitebait fish have red spots on their belly, which people rarely notice when they eat them. The color results from the whitefish feeding on zooplankton. Mentioning this zooplankton topic as I talk about the findings from the dissection of whitefish would always stimulate the students' curiosity and lead easily to subsequent observations of ocean plankton. Through this, students learn that their food is directly connected to the ocean's food chain of creatures that eat and are eaten; as a result they realize the importance of preserving and taking good care of the oceans. We hope to continue utilizing this program as part of marine education at schools.

Education Program Results and Future Prospects

The educational programs of our museum aim to stimulate students' interests in marine fields so as to develop future talented individuals that might want to enter into these fields and enhance their abilities. In an example developed from compulsory education, Urawa Minami High School, a public high school in Saitama City which is not near the sea, has been conducting a project comprising the more sophisticated versions of the three aforementioned programs, Lancetfish Dissection, Ocean Plankton Observations, and Whitefish Dissection along with Observations of Organisms near Ports every summer since August 2009, through collaboration between the high school and the Marine Science Museum. The high school students usually do not have many opportunities to experientially learn about the ocean, so they participate actively in the classes and learn eagerly about the ocean. Many students even come back to take the classes again and again, saying with

shining eyes, "I want to learn more about the sea" and "I want to pursue a career in a marine field." Watching them has made us realize the importance of promoting marine education for high school students who are interested in seeking more specialized learning opportunities for developing marine studies even further.

Going forward, we would also like to incorporate ESD (Education for Sustainable Development) initiatives into the marine education program, together with our activities up until this point. ■

Every summer, 20 high school students who sign up for our program visit the museum and take part in a 2-day, 1-night hands-on seaside training.