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Under the Sea: Marine Life in the South China Sea

A Roundtable Discussion

16 July 2024
Seminar Room, UP Asian Center, UP Diliman

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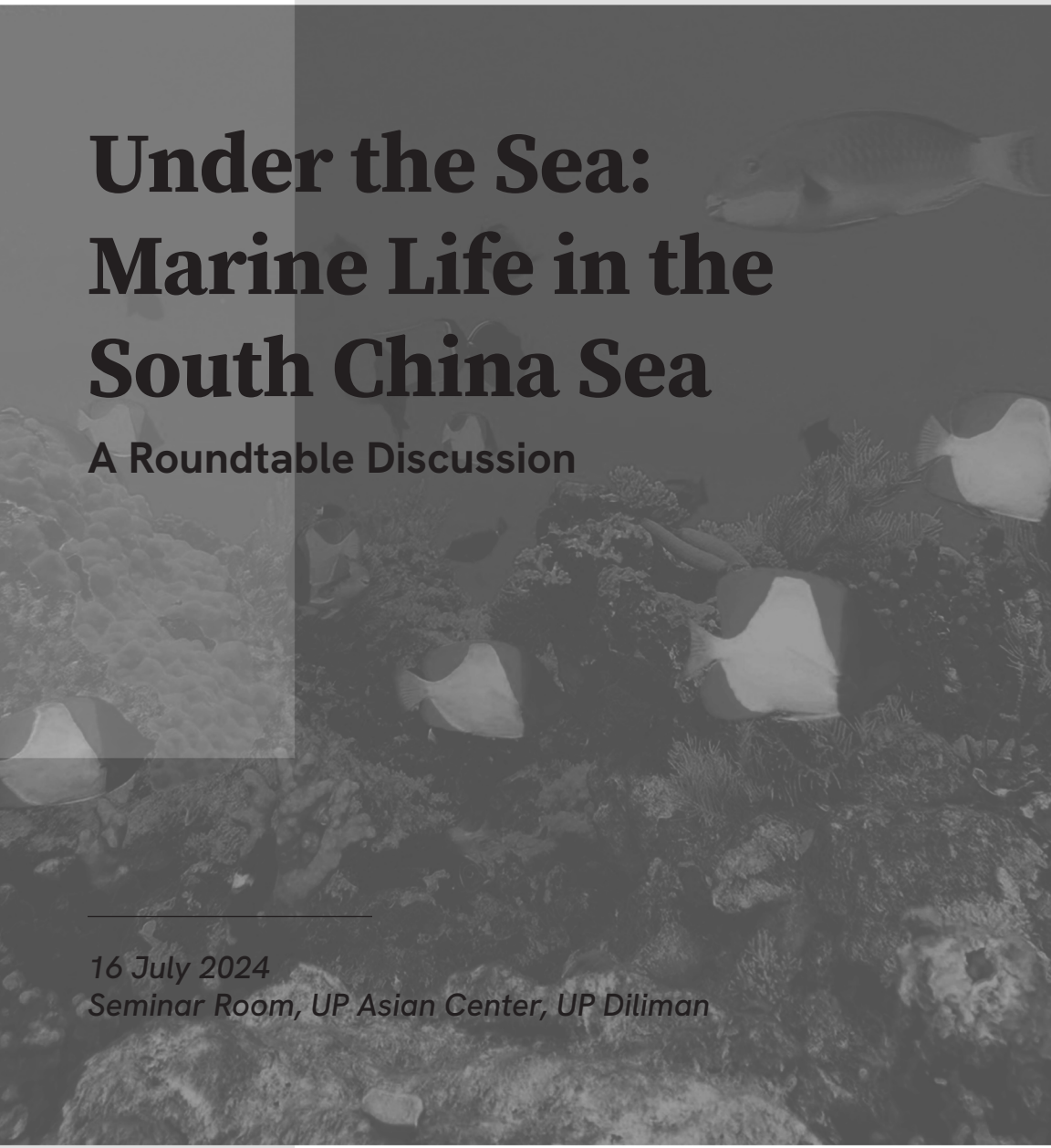

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"Unlocking the diverse bounty of the West Philippine Sea."

Photo by Valeriano Borja, Department of Agriculture, National Fisheries Research and Development Institute. May 20, 2024.

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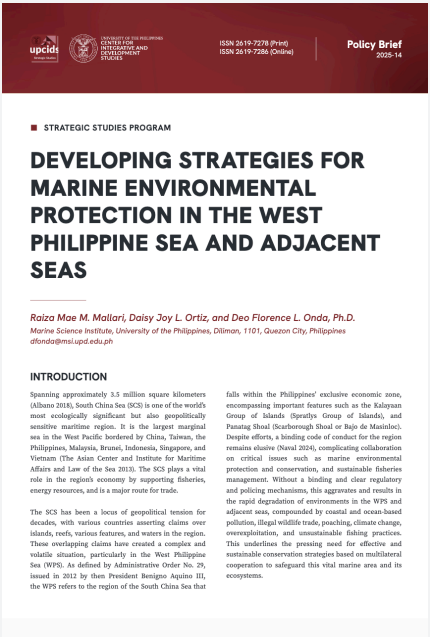

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Policy Brief
2025-14

STRATEGIC STUDIES PROGRAM

DEVELOPING STRATEGIES FOR MARINE ENVIRONMENTAL PROTECTION IN THE WEST PHILIPPINE SEA AND ADJACENT SEAS

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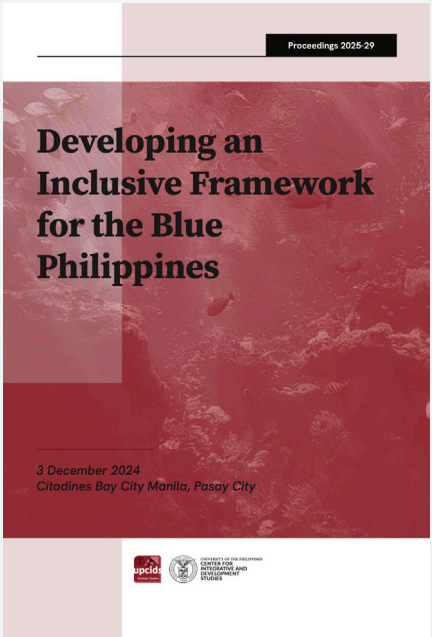
INTRODUCTION

Spanning approximately 3.5 million square kilometers (Albano 2018), South China Sea (SCS) is one of the world's most ecologically significant but also geopolitically sensitive maritime region. It is the largest marginal sea in the West Pacific bordered by China, Taiwan, the Philippines, Malaysia, Brunei, Indonesia, Singapore, and Vietnam (The Asian Center and Institute for Maritime Affairs and Law of the Sea 2013). The SCS plays a vital role in the region's economy by supporting fisheries, energy resources, and is a major route for trade.

The SCS has been a locus of geopolitical tension for decades, with various countries asserting claims over islands, reefs, various features, and waters in the region. These overlapping claims have created a complex and volatile situation, particularly in the West Philippine Sea (WPS). As defined by Administrative Order No. 29, issued in 2012 by then President Benigno Aquino III, the WPS refers to the region of the South China Sea that falls within the Philippines' exclusive economic zone, encompassing important features such as the Kalayaan Group of Islands (Spratlys Group of Islands), and Panatag Shoal (Scarborough Shoal or Bajo de Masinloc). Despite efforts, a binding code of conduct for the region remains elusive (Naval 2024), complicating collaboration on critical issues such as marine environmental protection and conservation, and sustainable fisheries management. Without a binding and clear regulatory and policing mechanisms, this aggravates and results in the rapid degradation of environments in the WPS and adjacent seas, compounded by coastal and ocean-based pollution, illegal wildlife trade, poaching, climate change, overexploitation, and unsustainable fishing practices. This underlines the pressing need for effective and sustainable conservation strategies based on multilateral cooperation to safeguard this vital marine area and its ecosystems.

Developing Strategies for Marine Environmental Protection in the West Philippine Sea and Adjacent Seas



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Developing an Inclusive Framework for the Blue Philippines

3 December 2024
Citadines Bay City Manila, Pasay City

Developing an Inclusive Framework for the Blue Philippines

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About the Proceedings

This roundtable discussion, "Under the Sea: Marine Life in the South China Sea," marked the beginning of a planned collaborative series between the UP Center for Integrative and Development Studies (UP CIDS) and the Foreign Service Institute of the Philippines. Held on 16 July 2024 at the Seminar Room of the UP Asian Center, UP Diliman, the event was conceived to address the critical gap between academic discussion and policy formulation regarding the West Philippine Sea/South China Sea.

The primary intention behind this inaugural discussion was to bring crucial scientific information to the forefront, enabling it to inform and shape government policies. As Professor Herman Joseph S. Kraft, Convenor of the UP CIDS Strategic Studies Program, noted, the forum aimed to foster a conversation about the realities "Under the Sea," allowing both academic experts and policy stakeholders to share and disseminate knowledge.

The discussion focused on the scientific understanding of the region's marine environment, recognizing the South China Sea as one of the world's most biodiverse and productive areas, particularly in fisheries. The event sought to underscore that while geopolitical tensions persist, the marine life—corals, fishes, and invertebrates—are not bound by political lines. As moderator Dr. Deo Florence L. Onda emphasized, "fishes do not have passports," suggesting that understanding the ecological dynamics offers a vital window for cooperation and moving beyond political boundaries to push for environmental protection and conservation.

The roundtable featured presentations from two distinguished Filipino marine scientists, moderated by Associate Professor Deo Florence L. Onda, PhD (UP Marine Science Institute and first Filipino to reach the Emden Reef):

1. Dr. Wilfredo Licuanan (Full Professor, De La Salle University): Shared his expertise on the status of corals and coral reefs in the West Philippine Sea and adjacent waters, emphasizing the imperative to establish a national reef monitoring system and map threatened species.

2. Dr. Charina Lynn Repollo (Assistant Professor and Deputy Director for Research, UP Marine Science Institute): Contributed insights from her specialization in physical oceanography, focusing on the strong

connectivity between distant coral reef habitats and ecosystems via ocean currents. This understanding is critical for crafting suitable and appropriate management frameworks, as conservation efforts should be based on science.

This collaboration seeks to continue with future discussions on issues related to the maritime domain, including strategic and scientific concerns.

Marine Life[1] in the South China Sea

Professor Wilfredo Roehl "Al" Y. Licuanan, PhD[2]

Dr. Wilfredo Roehl Y. Licuanan, the first presenter, covered the following topics: the status of databases regarding marine life in the South China Sea, mechanisms of data sharing among scientists, and joint research efforts. Dr. Licuanan mentioned that there is a need for more focus on resource surveys, particularly on determining coral cover. He pointed out that conducting surveys in the wrong places can lead to issues with accuracy and the generalizability of findings. When it comes to atoll reefs, scientists need to survey the correct areas to gain a comprehensive understanding of the reef's status. Regarding data-sharing, Dr. Licuanan explained that the Philippines lacks reef sites with more than 15 years of monitoring data, despite the country's involvement and commitment to the Global Coral Reef Monitoring Network. Lastly, Dr. Licuanan stated that there are currently no joint research efforts in the South China Sea, although there have been informative previous projects. For instance, he mentioned a project funded by the Singapore Ministry of Foreign Affairs, which led to the discovery of a new coral species while conducting a species inventory.

1 Coral and coral reefs

2 Prof. Wilfredo Roehl "Al" Y. Licuanan, PhD is is a Distinguished Full Professor and a University Fellow at De La Salle University (DLSU). Additionally, he serves as an Adjunct Professor at the UP Marine Science Institute and is a Fellow of the California Academy of Sciences. Dr. Licuanan is currently the director of the DLSU Br. Alfred Shields Ocean Research (SHORE) Center.

CORALS AND CORAL REEFS

Dr. Licuanan began his discussion on characterizing corals. Corals are animals, such as marine invertebrates, closely related to jellyfish. These animals have plants living inside them and provide 80 percent of their energy needs. Thus, corals are animals, but they need sunlight. Another distinct characteristic of corals is that their skeleton grows under and not inside them. As they deposit their skeleton, corals stay on top. Generations of corals build on top of each other, and over thousands of years or longer, they start building coral reefs.

From this point, Dr. Licuanan emphasized that corals and coral reefs are different. Coral reefs are huge geologic structures built by corals. To illustrate the difference, on an island, portions of it might have corals growing on them. As these corals grow on that island's rocks, there are corals present, but no coral reefs. Likewise, there can be coral reefs without corals. After 1,000 or 2,000 years, an incipient reef (baby or juvenile reef) is formed as coral skeletons accumulate in that part of the island. However, Dr. Licuanan explained that there are well-developed coral reefs in many parts of our country.

In contrast to incipient reefs, these reefs grow on the remains of corals, which have accumulated over 2,000 to 10,000 years. A well-developed reef can be readily recognized as it has a flat and very shallow portion, with a depth of about 5 to 10 meters. Then, there is a drop-off where corals can be found, an actively growing part of the reef. As a well-developed reef becomes older, it extends farther from the shore. The fastest growth rate of such reefs is about one meter every 100 years.

Dr. Licuanan proceeded to discuss the effect of monsoons on reef growth. He explained that the part of the reef that faces the monsoon wind and waves is where the reef is actively growing either through extending farther from the shore or, if the sea level rises, by growing vertically. The reef crest can be found in such a part of the reef. The crest appears at low tide and is a line of rocks. Dr. Licuanan also noted that to determine the health of the reefs, it is necessary to measure coral cover and the reef crest. Another feature of the reef is that it is flat and typically has seagrass.

At this point, Dr. Licuanan has discussed one type of reef, i.e., fringing reefs. Fringing reefs are those attached to the soil. He added that there are two other types: barrier and atoll. As the sea level rises, the island sinks, or both, the reef continues to grow upwards or laterally. With such movements, a lagoon will form between the reef and the land. This structure is called a barrier reef. If the island completely sinks, what is left is a ring-shaped reef and a lagoon. These constitute an atoll.

While these types of reefs differ in structure, Dr. Licuanan clarified that they are just the same things with different ages and histories. This clarification is necessary because when the features of the Spratlys, the Kalayaan Island Group, and the South China Sea are being discussed, what pertains to atolls. As much focus is given to islands and fringing reefs, it is often forgotten that such a reef is the same as its adjacent reefs because they form part of a giant atoll. Even if different countries control these islands, they are grabbing portions of the same reef. Hence, what happens in one portion affects their "brothers and sisters" because they are connected both physically and by the current. Setting the Spratlys as an example, Dr. Licuanan explained that the Spratlys are made up of giant atolls.

ACCURACY AND GENERALITY ISSUES

One of the questions posed to Dr. Licuanan is the status of marine life databases in the South China Sea. First, he explained that existing databases are "not very good but… getting better." Second, "there has been a lot of focus on [resource] surveys like determining coral cover." Dr. Licuanan argued that focusing on such a survey poses issues with the accuracy of data and the generality of findings. To expound on the issue, Dr. Licuanan started his discussion on surveying.

To determine coral cover, scientists use transects. These are long measuring tapes ("medida") between 20 and 50 meters. As the density of coral differs per location, the use of transects will result in having different values ranging from the lowest possible value for coral cover to the highest possible value for coral cover. The problem, then, arises as "standard deviation will be terrible." Consequently, "if you have imprecise measurements, you will have to worry about accuracy." Dr. Licuanan added:

> [W]hen somebody tells you [about] the coral cover in this reef is this much, you have to ask, where did that measurement come from? How did you make that measurement? And what is the precision and accuracy of those measurements? [It is] because coral cover is very variable.

Dr. Licuanan cited the 1985 work of Aliño and Palaganas conducted at the Tubbataha Reef. In one location (T4), the coral cover was 11 to 37 percent, depending on the depth. Meanwhile, in another location (T3), the value ranged from 18 to 71 percent (White and Palaganas 1991).

In 2014, Dr. Licuanan was allowed to run a nationwide assessment of reefs. Dr. Licuanan visited 415 reefs around the country, 20 of which were surveyed. The findings showed that on the part of an island that is not facing the monsoon (e.g., southwest monsoon or *habagat*), the hard coral cover (HCC) is at the highest level, while the diversity is at the lowest. On the other hand, on the part of an island facing the monsoon, the HCC is lower than that of the part not facing the monsoon, but the diversity is at the highest level. This is the case for fringing reefs. However, the same patterns were also seen at the Tubbataha Reef, an atoll.

Dr. Licuanan explained that surveys should be conducted on parts of the reef facing the monsoon. In the case of Pag-asa Island, he argued:

> It is not enough that we do surveys around Pag-asa. We need to go to the part of that atoll that faces the southwest, the part of that atoll that faces the northeast, for us to get a good idea of how that reef system is doing.

However, Dr. Licuanan reiterated the point raised by Dr. Onda that Chinese militia vessels are stationed in the said area and are threatening to harass anybody who plans to do measurements and surveys. Evidently, the surveys in the area were conducted decades ago.

To acquire good data in the region, Dr. Licuanan suggested that scientists must work together; otherwise, the "numbers will be misleading." He cited an example of a survey done by Russian and Vietnamese scientists. The surveys were conducted in certain parts of the reef facing the monsoons. However, by zooming out, the rest of the surveys are in the wrong places. At this juncture,

Dr. Licuanan argued that, given the subject reef is an atoll, one must zoom out and survey other parts of said reef. He also reminded us that one must distrust generalizations based on a few measurements done in the wrong places, as seen in the above-cited survey.

DATA SHARING

In discussing the data sharing mechanisms regarding the SCS, Dr. Licuanan began by narrating the reef diversity of the Philippines in comparison to other countries: the third largest reef area in the world, which is equivalent to 8 percent of the world's coral reefs, and home to 600 coral species. He added that the town of El Nido in Palawan has more coral species than the entire Great Barrier Reef of Australia. On the other hand, Dr. Licuanan explained the benefits brought by reefs: 25 percent of the Philippines' fisheries production is supported by reefs, specifically the reef crest, which dissipates 97 percent of wave energy headed towards the country's coastlines.

Notwithstanding the Philippines' reef diversity and its benefits for Filipinos, the country falls behind in monitoring its reefs. At present, there is no reef site in the Philippines for which there is more than 15 years of monitoring data. According to the latest report of the Global Coral Reef Monitoring Network, subregion 1 of the East Asian Seas, to which the Philippines and parts of Sulawesi belong, has no long-term monitoring site. Meanwhile, the East Asian Seas subregion has 158 long-term monitoring sites. Notably, the Philippines is one of the founding members of the International Coral Reef Initiative, of which the Global Coral Reef Monitoring Network is a part.

In a more recent report, Vietnam showed an increasing trend of coral reef area from 23 to 34 percent between 2001 and 2017. Myanmar, on the other hand, has an overall decline in coral cover. Thailand, meanwhile, declined precipitously while Malaysia showed limited recovery. Dr. Licuanan noted, however, that the foregoing countries have relatively small coral reefs. The Philippines, which has 8 percent of the world's coral reefs (3rd in the world), presents strong declining trends. He highlighted a statement in the report:

Overall, the cover data reported here are higher than a recent report by Licuanan, Robles, and Reyes (2019), mainly because most of the sites surveyed here are located within marine protected areas.

Compared to Indonesia, the largest reef area in the world at 18 percent, its coral cover is improving. In conclusion, there are sharing mechanisms, and surveys are being shared. Still, the Philippines is not contributing to the monitoring data because the country is not monitoring its reefs systematically and in an organized manner. Dr. Licuanan furthered that the Philippines does not even have a map of its coral reefs, which was admitted no less by the Department of Natural Resources (DENR) in a Senate hearing on the then Philippine Ecosystem and Natural Capital Accounting System (PENCAS) bill.

RESEARCH EFFORTS

According to Dr. Licuanan, there are no ongoing research efforts among scientists in the South China Sea. However, there were past ones that "were very informative." In a work funded by the Singapore Ministry of Foreign Affairs, the team headed by Danwei Huang, of which Dr. Licuanan is a part, conducted research in the area.

One of the products of this work is a species inventory comprising a list of the number of coral species found in different parts of the South China Sea basin. According to Dr. Licuanan, one surprising finding in this list is that Vietnam, while not considered part of the Coral Triangle, presents a high coral species richness. Western Luzon has 433, Northern Palawan has 398, and Southern Vietnam has 406. This finding shows that the Coral Triangle is broader than it was previously known to be.

Another product of said research is the discovery of *Leptoseris kalayaanensis*, a reef species found in the Northeast Investigator Shoal. The Joint Oceanographic and Marine Scientific Research (JOMSRE) Expedition, a joint Vietnam–Philippines expedition, found the same coral in the South China Sea. Meanwhile, an independent study by Malaysian scientists found the same coral in a Malaysian-controlled reef.

In the same research endeavor, Huang showed that while the Coral Triangle is the center of coral diversity, it is not likely that it is the center of origin.

Dr. Licuanan concluded his presentation by emphasizing that the simple act of sharing species inventories could yield valuable information necessary to guide conservation actions. They suggested this practice was a beneficial idea, provided it was properly organized to ensure the collection of high-quality

data. However, the speaker expressed concern that such data collection might falter if stakeholders engaged in mutual blame or recrimination, such as accusing others of poor reef stewardship. In closing, the speaker urged self-reflection, acknowledging the unfortunate reality that their own collective efforts in conservation were currently insufficient.

Marine Preservation and Cooperation

Assistant Professor Charina Lyn Amedo-Repollo, PhD[3]

The second presenter, Dr. Charina Lyn Amedo-Repollo, first discussed the significance of the WPS and its features and resources to the Philippine economy and biodiversity. Then, Dr. Repollo laid down the past surveys conducted in the West Philippine Sea. These surveys began in 1993 and were mostly funded by the DENR and DOST. Despite these previous efforts, she highlighted that most of the unoccupied maritime features in the WPS are yet to be surveyed. She also discussed the present marine science research efforts in the WPS, such as the Pag-asa Island Research Station (PIRS) and the National Academic Research (NAR) Fleet. In the latter half of the presentation, Dr. Repollo highlighted some threats and their impacts on marine environments in the WPS, including the increase in sea surface temperatures, coral bleaching events, frequency and intensity of typhoons, plastic pollution, and oil spills. She concluded her presentation by laying down emerging opportunities for cooperation. These include the establishment of marine protected areas (MPAs) in the Kalayaan Island Group (KIG), the implementation of an ecosystem approach to fisheries management, cooperation on transboundary issues, and the provision of more government support for marine science research, education, and information dissemination to the public.

3 Assistant Professor Charina Lyn Amedo-Repollo, PhD is an Assistant Professor at the University of the Philippine Marine Science Institute and the Deputy Director for Research and Development of said institute. She earned her PhD in Oceanography, specializing in Physical Oceanography, from the University of Hawai'i at Manoa in Honolulu, Hawai'i, USA, in 2016.

THE WEST PHILIPPINE SEA (WPS)

Dr. Repollo began her discussion by describing the biodiversity and conditions present in the South China Sea. She argued: "[b]efore we preserve before we sit down and cooperate, we need to know what we are going to protect and what [we are] going to preserve."

The dispersal of larvae of coral reef organisms in the SCS shows that the Kalayaan Island Group (KIG) is a main source of larvae not just for the Philippines but also for its neighboring countries. These larvae move across the SCS and into the internal seas of the Philippines. Hence, "the offshore reefs of KIG have a wide impact on a very large scale. It shows us the interconnectedness of our ocean and the vast and diverse ecosystem that it supports."

Administrative Order No. 29-2012 defines the West Philippine Sea (WPS) as the maritime area west of the Philippines. It covers the Luzon Sea, the Scarborough Shoal, and the waters surrounding the Kalayaan Island Group (KIG). It encompasses about 40 percent of the approximately two million square kilometers of the Philippine maritime area. According to Dr. Repollo, the WPS plays a very important role in our ecological, economic, social, and cultural heritage.

CORAL REEF AND FISHERIES RESEARCH IN THE WPS

Dr. Repollo then proceeded to discuss the surveys conducted in the West Philippine Sea. The first was in May 1993 through a project by the UP Marine Science Institute (UP MSI), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the Department of Science and Technology (DOST), and the Bureau of Fisheries and Aquatic Resources (BFAR). A series of surveys followed in 1997, 1998, and 1999, funded by the Philippine Council for Aquatic and Marine Research and Development (DOST–PCAMRD). Between 2014 and 2017, the National Assessment of Coral Reef Environments (NACRE) was undertaken with funding from the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (DOST–PCAAARD). Between April and May 2017, the Capability Assessment

for Rehabilitation Enhancement: Capability Development and Resiliency of Ecosystems (CARE–CaDRES) West Philippine Sea project was undertaken with the funding of the Biodiversity Management Bureau (DENR–BMB). Subsequently, the Protect WPS 1 and 2 projects were launched in 2019 and 2021, respectively.

In 2019, the National Security Council (NSC) funded the refurbishment of the Pag-asa Island Research Station (PIRS). The following year, it was inaugurated as the base of UP MSI in the WPS. However, due to a lack of continuous funding, no researchers could man said station. In the meantime, it was used by the Philippine Navy, particularly its diving team, and it was called a "fragments barracks." The 2019 project was stalled, however, by the COVID-19 pandemic. Only in 2021 was the refurbishment continued and finished.

Currently, the PIRS has a basic field and research facilities for marine science. Its facilities and capabilities are as follows: laboratory and accommodations (i.e., six folding beds), satellite internet (GSAT and Starlink), solar power and NAPOCOR-provided rotational electricity, rubber boat and outboard motor, VHF radio, annual cruises to Pag-asa Island, and AIS monitoring system. The latter is used to identify the movement of Chinese ships, among other functions. Further, they have cruised through the National Research Fleet funded by the NSC. The funding is used to buy and refurbish ships that will conduct cruises in the WPS and other Philippine waters. To maintain the monitoring and research undertakings at Pag-asa Island, Dr. Repollo said that they continuously look for funding.

As a way forward, Dr. Repollo said they plan on turning the PIRS into a hub in the middle of the South China Sea. She argued that "one way to assert [Philippine] sovereignty in [the] area is to have a presence and to have activities, especially in the marine scientific research around [the] area."

MARINE LIFE IN THE WPS

The major features in the WPS include seven islands (Pag-asa, Likas, Parola, Lawak, Kota, Patag, and Panata), three reefs that are above sea level regardless of the tidal pattern (Balagtas Reef, Ayungin Shoal, and Rizal Reef), and one totally submerged reef (Bajo de Masinloc). Among these features, Likas Island, Balagtas Reef, and Rizal Reef have not yet been surveyed by the UP MSI.

There are also unoccupied maritime features in the WPS, most of which are submerged. Out of 35 unoccupied features, only four have been surveyed (Del Pilar Reef, Nares Bank, Escoda Shoal, and Baybayin Dagat Shoal). Dr. Repollo added that the UP MSI has recently received funding from the DENR–BMB to expand their surveys in other features of the WPS. However, the planned survey was postponed due to the recent pronouncement by Chinese authorities that persons who will come out in the area by 15 June will be arrested.

In terms of area covered, the reefs of the KIG are estimated to cover 3,258 square kilometers, while the WPS has an estimated area of 3,712.10 square kilometers. The KIG reef areas, then, comprise 88 percent of the reef areas in the WPS or 34.5 percent of the total coral reef area in the Philippines. Various surveys between 2015 and 2021 documented over 530 reef fish species. In terms of species richness, the WPS has moderate to high species richness. Meanwhile, the WPS (including Palawan and offshore reef) records moderate fish abundance. While the KIG and Palawan have diverse and abundant species, a faster decline in fish diversity, fish density, and fish biomass has been reported.

As to fish diversity, the WPS has experienced an average decline of 7 to 9 percent per decade over the last 30 years. The decline overall for the past three decades is between 21 and 27 percent. In Palawan, the decline is 32 percent, while 28 percent is in KIG. This translates to a loss of around 20 species per 500 square meters.

In the 2010s, fish density saw an average decline of 50 percent in fish counts compared to initial estimates in the 1990s. This number translates to the loss of more than 1,000 individuals per 500 square meters over the last 30 years. Specifically in Palawan and KIG, the decline is at 70 percent.

Reef fish biomass, measured as metric tons (MT) per 500 square meters, decreased by an average of 23 percent per decade. This translates to a reduction of 14mT per square kilometer over the past three decades. The fish biomass decline for KIG and Palawan is at 58 percent.

Dr. Repollo discussed the seaweed ecosystem in the WPS next. Citing the surveys conducted by Dr. Fred Santiañez, there are documented 693 seaweed taxa found in the WPS. These comprise about 65 percent of the total seaweed

flora in the Philippines. More so, the exploration in the WPS revealed at least 19 new and putative new seaweed species and another 37 new records, many of which are known to produce bioactive and high-value products. According to seaweed type, 56 percent of the seaweeds found in the WPS are red algae, 28 percent are green algae, and 16 percent are brown algae. The economic value of seaweeds found in the WPS, meanwhile, amounts to 98,118,206.57 Philippine pesos, including current and potential monetary values. Dr. Repollo furthered that another "remarkable discovery" of the Santianez team is the discovery of *Griffithsia* species, known to produce griffithsin, an anti–human immunodeficiency virus (HIV) compound. Said species also has the potential to be a COVID-19 cure.

Another characteristic of the WPS is its traditional fishing ground, which has a high capture fisheries yield. It contributes up to one-third (1/3) of the total Philippine fisheries production. Specifically, offshore reefs of the KIG have been found to be more productive than nearshore areas. These benefits brought by the WPS highlight the importance of extending resource management to remote and often inaccessible reefs.

THREATS AND THEIR IMPACTS TO MARINE ECOSYSTEMS IN THE WPS

In this section, Dr. Repollo discussed the natural and anthropogenic stresses and their impacts on the marine ecosystem in the WPS. First, one consequence of climate change is the increasing temperature. Comparing the sea surface temperatures (SST) during the 2015–16 El Niño phenomenon and the years 2023 and 2024, the latter shows equal or even higher temperatures than the former. Notably, the SST of June 8 is higher than the temperature on the same date for 2015, 2016, and 2023.

The SSTs of waters surrounding the Philippines dated 2 May 2024 and 8 June 2024 show that the warmest temperatures are recorded in the West Philippine Sea, and they get higher closer to the coast. Dr. Repollo explained that the disparity in the temperature between the WPS and the Pacific Ocean, the temperature in the former being warmer than the latter, is because El Niño highly impacts the South China Sea. She furthered: "Whenever there is an El Niño, our areas in the South China Sea are the most threatened or impacted by El Niño."

Another threat faced by the WPS is coral bleaching. There have been periods in history when mass or global coral bleaching events occurred, such as in 1998, 2010, and 2015. In 2024, the National Oceanic and Atmospheric Administration (NOAA) and the International Coral Reef Initiative (ICRI) confirmed the Fourth Global Coral Bleaching Event.

In the Philippines, the UP MSI has the Coral Bleaching Watch—a citizen science project that collects data on the reported coral bleaching in the Philippines. From several students, coral bleaching was recorded in the Philippines that coincided with the coral bleaching event—in 1998 and 2010. In recent years, more records have been received, as Facebook has already emerged. Dr. Repollo added, "It is easy to report and collect data through citizen science."

Dr. Repollo gave some instances of coral bleaching recorded in the Philippines this year. The first was in Escoda Shoal, where coral bleaching was observed on 4 June. Another was observed in Zambales on June 8 and in the North Atoll of the Tubbataha Reef on 1 June.

Another indicator of climate change is the increased intensity and frequency of typhoons. The whole Philippines experiences an average of 20 typhoons annually. In Pag-asa Island, it experiences an average of one typhoon annually. However, since the 2000s, this frequency has nearly doubled.

Dr. Repollo then discussed changes in shoreline position. There are changes in shoreline position that are seasonal. However, long records show that the change is caused by rising sea levels, which erode the shoreline of small islands in KIG. In the WPS, the sea level rise ranges from 4 to 6 millimeters per year. This rate is two times faster than the global average of 3.3 millimeters per year. In Manila Bay, however, the sea level rise is at 13 millimeters per year, or four times higher than the global average.

Ships and oil spills are another set of threats to the WPS. Data shows that the major tracks of ships and the locations of historical oil spills are colocated.

Lastly, Dr. Repollo cited plastic pollution as a threat to the WPS. In Pag-asa Island, citing the work of Dr. Onda and his team, it was observed that most of the beverage bottles they collected were foreign plastics (60 percent), and only 40 percent were local. They ranked China, Vietnam, and Malaysia as the

countries that contribute much of this marine litter around Pag-asa Island. While Pag-asa Island has only around 250 inhabitants, Dr. Repollo said, " garbage is really a lot around the island, and it becomes... a transboundary problem right now that we can address."

SUGGESTED COOPERATIONS IN THE FUTURE

Dr. Repollo laid down some opportunities for future cooperation.

1. First is the establishment and implementation of marine protected areas (MPAs). There are several MPAs along the coastal areas in the WPS, but none in the KIG. Close to 300 MPAs have been established, covering around 5,700 square kilometers, but an MPA has yet to be established in the offshore areas. Dr. Repollo added that UP MSI has a recently approved project whose objective is to help the DENR design an MPA network in the KIG.

2. Second is the improvement the management of existing MPAs to address illegal and destructive fishing activities. Several surveys have collected fish nets left on the reef, which are destructive to reefs.

3. Third is the establishment of ecosystem-based management or an ecosystem approach to fisheries management (EAFM). Dr. Repollo posited that creating a fisheries management area is one way of doing this.

4. Fourth is collaborative management for issues that transcend political boundaries, such as plastic pollution and fisheries.

5. Fifth is continued support to marine scientific research and the PIRS. According to Dr. Repollo, the DENR is planning to build its own research station on the island, as well as dormitories and more facilities to conduct research and field laboratories. With that, reports concerning China's alleged continuous or attempted reclamation in the West Philippine Sea can be confirmed through monitoring data.

6. Last is strengthening the general public's interest and involvement by educating and disseminating information to a wider citizenry.

Open Forum

LIMITATIONS ON EXISTING SURVEYS

Dr. Onda asked, "Is the issue that… we need to distrust the data? Is it actually because of the scientific rigor being done, or is it actually related to how much we are actually going out there and measuring the coral reef cover?

Dr. Licuanan answered that it is a mix of both. He argued that while there are a lot of surveys done, over 11,000 surveys already, scientists are not collecting enough data pertaining to other important information. One example is the lack of data on coral diversity. There are measurements on coral cover, but very few recognize what kinds of corals are there. It had already been a decade since the last nationwide assessment was conducted by Dr. Licuanan and his team. When they planned to conduct another assessment, other constraints arose. While there is funding, "the transaction costs of the funding [are] horrible." To wit, they are required to list three quotations for renting a boat (bangka). However, normally, boat operators do not issue official receipts (ORs). Further, no one government organization is in charge of coral reefs. The mandate to manage coral reefs "is falling between cracks: DENR, BFAR, and so on."

Dr. Licuanan said there is a draft national policy, but it is "not moving fast enough." He noted that key government officials, like the DENR secretary during a Senate hearing, are using the correct terms concerning coral reef management, such as "dedicated agency," "dedicated personnel," and "adequate resources." The secretary was talking about the Philippine Ecosystem and Natural Capital Accounting System (PENCAS) law. Dr. Licuanan discussed PENCAS and emphasized that such a measure serves as an example of why a national monitoring system must be implemented.

Dr. Licuanan argued that if the government intends to put value on the ecosystem and the ecosystem services (e.g., coral reefs) provided, two things must be known: habitat extent and habitat condition. As to the former, it requires coming up with a map. The latter requires determining coral cover and diversity. The case is that these data are not being collected; if they were, they would not be centralized. The data are spread through different sources:

citizen science monitoring of municipality-managed MPAs or reports from field personnel. Dr. Licuanan noted, however, that no personnel have lasted in their posts and can use their training to make sense of the data and make that data available and valuable to conservation efforts.

STATUS OF DATA COLLECTION, COLLATION, AND ARCHIVING IN THE PHILIPPINES

Dr. Onda posed the following question to Dr. Repollo: "... we do not have that directed agency that tries to collate, synthesize, and then visualize and use this data for advocacy for policymaking education. How do you think data information collation is in the Philippines?"

Dr. Repollo pointed out that in the Philippines, the data are scattered, unlike in other countries where there is a designated agency. She cited the Japan Oceanographic Data Center (Japan) and the British Oceanographic Data Center (United Kingdom) as examples. While the National Mapping and Resource Information Authority (NAMRIA) has a Geoportal that collects government agency data, the UP MSI has yet to receive information on how it can contribute to said platform. Dr. Repollo added that the existing data collection is costly and that "it is a waste that these data are scattered."

Dr. Repollo shared that in a policy workshop she attended, it was said that the fastest route to creating a national agency is through the issuance of an executive order. The foremost volunteers to be the lead agency are NAMRIA, DENR, and DOST. She said that she is hopeful that it will push through because, in the case of climate change and climate studies, one cannot observe a trend if available data is less than 30 years old.

Dr. Onda argued that there are government agencies designated for certain policy areas, such as the Climate Change Commission with regard to climate change, the DENR for the environment, the BFAR for fisheries, the NAMRIA for geomaps, and the state universities and colleges (SUCs) for environmental data. So, he asked Dr. Licuanan:

> Is it a matter of coming up with another policy to actually come up with another agency, or is it just a matter of coming up with a policy to direct all of these agencies together to have that platform where we can actually just collate all of this information? Because laging bato sa

> atin is bureaucracy (we were always given bureaucracy as a solution): "If we have a problem, magtayo tayo ng department (let us create a new department). If we have a problem, magtayo tayo ng center (let us create a new center)." Is this actually going in that direction that we really need that physical center right now? Or is this a matter of why don't we ask the agencies to talk about how they can actually make sense of this data and collate all of this data together?

Dr. Licuanan started by pointing out the budgetary constraints in implementing projects. When a need is identified and a corresponding solution is conceptualized, the latter cannot be immediately implemented because such a project has no budget allocation. If a budget allocation has already been granted, supervening conditions will arise, such as the personnel who ought to implement the project having already been reassigned elsewhere, there being a "qualified job order," or the position being nonpermanent.

For Dr. Licuanan, while there are many examples of the same problems in many areas of the government, he suggested that they can at least be allowed to implement their project in "one very important ecosystem," and if it works, the project can be applied to solve other problems. He concluded: "[s]o in effect… it is always 'all of the above.' The problem is, 'Where do we start?' It is better to have something than having none at all."

Dr. Repollo answered the same question. She explained, "Oceanography, we are more open to data." Data can be shared easily with other scientists. Hence, she suggested that the Philippines can adopt a model framework like the one used in the United States. In such a framework, some institutions collect data, such as the one collecting data in the Pacific region. Those data are housed inside academic institutions before being forwarded to NOAA. Regional data centers are tasked to apply quality assurance and quality control to the data before they forward it to NOAA. This is because NOAA, as a national agency, has no capability or enough scientists to collect the data before it can give it to the public.

Oceanographic data are also used for operational oceanography in the U.S. For example, they have a real-time circulation pattern that can be seen from their models. These are used to locate oil spills and drowning incidents. Dr. Repollo said that such a system is lacking in the Philippines.

PROSPECTS IN MONITORING AND ASSESSING WPS THROUGH RECENTLY FUNDED INITIATIVES

Dr. Onda said that most of the discussions focus on offshore environments where resource limitations are a concern. Hence, he asked Dr. Repollo: "How do you think the availability of such resources [referring to the National Academic Research Fleet] to scientists will allow us to become more proactive... in terms of doing monitoring versus assessment in the areas that we have offshore, the environments of the West Philippine Sea?"

Dr. Repollo explained that the National Academic Research (NAR) Fleet is a co-management framework patterned after the US University-National Oceanographic Laboratory System (UNOLS). It is co-managed by the UP MSI, Bicol University, UP Visayas, and Mindanao State University. The fleet is said to capacitate scientists from higher education institutions (HEIs) and other constituent units (CU) of UP to conduct offshore surveys of reefs. Dr. Repollo reasoned that the fleet is "one way to improve our data and also to capacitate scientists on how to monitor and assess coral reefs and then harmonize all the protocols that we have."

Following the discussion on the NAR Fleet, Dr. Onda asked:

> If we now have the capability to do more research, the capability to actually gather more information... allowing us to have a better view of what is happening in the South China Sea, would proposals such as MPA networks... be more feasible right now, given these opportunities and given these assets and infrastructure and resources available to the Filipino scientists? And... how do you think marine scientific cooperation can help establish these MPA networks and hopefully pacify the geopolitical tension in the area?"

Dr. Licuanan reasoned that the work initiated by the Ministry of Foreign Affairs of Singapore is "fairly easy" to do because ASEAN was composed of only a handful of countries in the late 1980s.

He added that a series of marine science programs funded by Australia, Canada, and the US allowed, particularly the Australian-funded one, three generations of coral reef, mangrove, and seagrass scientists to work together,

allowing scientists from different countries to get to know one another. Dr. Licuanan said that such relationships should be enhanced.

Notwithstanding, these surveys have taught other lessons. In the late 1980s, Dr. Licuanan was the regional data manager of the Asia-Australia Cooperative Program in Marine Science. He was mandated to collect coral data from ASEAN member countries. However, according to Dr. Licuanan, such a mandate was met with "a lot of resistance." Dr. Licuanan recalled:

> [F]or example, if you know coral reef ecology well, I can teach you how to figure out how to enter a foreign territory by just recognizing certain organisms in the reef that will indicate that there is a channel there or to the side. Because of that, I remember that when I was the data manager, the Malaysians did not want to share the bathymetry data, such as how deep the reefs were. Because you're going to invade another area.

Meanwhile, Dr. Licuanan said that sharing the list of species was no danger. This could, then, be the starting point of cooperation. As people have their own political beliefs, common ground should be reached to help scientists from different countries manage protected areas better.

Dr. Licuanan discussed the research vessels and facilities and the DENR initiative to set up marine stations. While these are "good ideas," he said that there are neglected matters. He cited the example of state universities and colleges (SUCs). The SUCs are hesitant to submit proposals regarding corals and coral reefs to government funding agencies due to the transaction costs of utilizing such funding. For instance, they are required to submit reports (quarterly, semiannual), which will lead scientists to "run out of time to do the science."

Consequently, the Philippines cannot meet its international commitment to contribute data, for example, to the Global Coral Reef Monitoring Network. He furthered: "[t]that is why our contribution is zero. Because there is only an effort to collect the data because the funding is international."

Dr. Onda then posed the following questions to the audience: "Now that we are acknowledging that there's really a need to push for scientific cooperation, to come up with a grander plan, a national plan for marine scientific research,

the question is, who should be leading this? Who should actually be taking the helm?"

THE EDUCATION SECTOR'S ROLE IN CONSERVING THE MARINE ENVIRONMENT

Ambassador Laura Quiambao-del Rosario, president of Miriam College, entered the discussion and raised two points. First, given the resource limitations scientists face, she suggested that they may "develop a champion in Congress who will fight for what [they] need." She argued that legislators should be made to understand that marine resources are part of the country's economic security, ergo, national security.

Second, she suggested that scientists make their projects known to those in the education and training sector. This is to augment the human resource needs of the scientific community. She cited the example of Miriam College as an effort to cater to the needs of scientists. Ms. Sylvia of Miriam College elaborated on this matter. In their undergraduate program, they are introducing a new program called Bachelor of Science in Sustainability and Environment that covers marine sciences topics next semester. The program was benchmarked at the US, UK, and Australian universities.

Dr. Licuanan added that through citizen science, they are training people to know how to assess and monitor coral reefs, even if they are not trained to scuba dive. The model of citizen science is to enable people to collect and process data publicly to make everyone see what is happening to the reefs. People can initially analyze their data through diagnostic trees. Further, Dr. Licuanan said that the DepEd has a new program that encourages extracurricular activities in high school, focused on the environment and citizen science.

Dr. Onda interposed that the discussion goes back to developing a national maritime consciousness. He said, "We should be reminded how connected we are to the oceans. He also noted that in developing manpower, one must also talk about retention, "brain drain," and the government's absorptive capacity to give scientists employment." He concluded that resolving this set of problems must be addressed through a whole-of-government approach, from instilling the national marine consciousness to developing experts who will stay in the country and help protect the environment.

MARINE CONSERVATION AS A NATIONAL SECURITY CONCERN

Mr. Noel Fernandez, Director-General of the Foreign Service Institute (FSI), then inquired first, given scientists' data, "What help is that to us in the WPS issue?" Second, "Can you tell the government now that with the data that you have collated so far, it is important for us to take a step now based on science because, in the long term, it will affect us as a nation?" He argued that if such a concern is not put forward in conversations on WPS, the discussion will continue to be led by security and military concerns.

Dr. Repollo answered the latter question in the affirmative. The declining diversity and fish abundance on the KIG signal that something must be done.

Dr. Licuanan emphasized that science and data are needed in conservation and resource management. In dealing with ecosystems that are not understood well enough, management must be adaptive. Scientists try a solution, and they, as well as the resource managers, monitor it. If it is working, they keep doing it; if it does not, they will adjust. He furthered that solutions are not technical but require behavioral or societal change. However, he argued that most organizations are not set up like that: the ones that manage the resources are different from those that monitor the same. He cited as an example the common notion in natural resource settings in government wherein the academe is the one directed to be the monitoring entity. Dr. Licuanan, however, reasoned:

> [He] is monitoring for management, and nobody is doing that. So, in business, they teach you: how can you manage something that you cannot count? If no one in the government knows how to count, how can it claim that it can manage the reefs?

In such a case, Dr. Licuanan admitted that there was a failure of communication to which both the scientist and the government were accountable. He cited the PENCAS law as another example of such failure. He said in the technical working group (TWG) for said law: "All the government offices represented in the technical working group clearly did not understand what an ecosystem is." Nonetheless, he said: "ultimately... I walk away with failure in education. Ultimately, it is also my fault if they are like that."

Dr. Licuanan also raised the uncertainty of the institutionalization of existing initiatives. Some of the initiatives mentioned by Dr. Repollo pertaining to research vessels, among others, are funded by the National Security Council. Given this, Dr. Licuanan inquired how it can be expected that the manuals crafted by scientists be in the hands of agencies such as the local government, housing and urban development, and social work. More so, as the funding agency has "no stake" in instituting these initiatives in the country, "resources will be wasted." Dr. Licuanan argued that those resources could be better used if the rest of the government could be mobilized to implement these initiatives undertaken in the WPS to the entire country. He ended his statement in this wise: "Puwede ba ayusin muna natin [ang mga] problema ng coral reefs na kontrolado natin, then, meron tayong credibility na magsalita about ano 'yung gagawin sa West Philippine Sea."

Dr. Benjamin Vallejo, Convenor of the Conservation of Biodiversity Program, raised the issue that the Philippines has no existing defense and environment doctrine. He said that even textbooks on national defense by national defense universities abroad have a doctrine on integrating marine science research with national security concerns. Such a doctrine, he said, "is so basic; it's just that they have a superior in science, information, management, and a collecting platform to pursue our national interests. Suppose this is to protect our reefs that are controlled. We have to have the data there, immediately process the data, and come up with advice."

SYNTHESIS

Dr. Onda began his synthesis by positing that the issue in the WPS goes beyond politics. There is a need to preserve marine resources in said area for the benefit of present and future generations. To meet such an end, data, scientific, and ecological understanding are crucial in developing effective policies for management, mitigation, and conservation.

Dr. Onda also recalled the discussion on the need for a whole-of-government approach in honing national marine consciousness among the people, beginning from the classroom setting where Filipinos are taught that they are connected to their environment, then producing scientists who will produce more information and understanding of those environments, and finally, helping scientists to translate their science into practical policies. The

latter highlights the importance of providing platforms and opportunities for scientists to communicate with policymakers and for policymakers to listen.

While there remain questions on whether the voices of scientists are weak or whether there are enough champions who can push for policy reforms, Dr. Onda argued that it all boils down to the fact that marine environments do not have boundaries. If the Philippines wants to solve problems in the WPS, it must begin by addressing problems within its own "backyard." However, he emphasized the need to work with neighboring countries, including China. To be able to do so, there is a necessity to formulate potential frameworks to foster marine scientific cooperation using science as a potential science diplomacy avenue and information as a low-hanging fruit on how other countries can be engaged to return to the negotiation table. Further, to utilize information in developing strategies that will benefit the entire region.

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