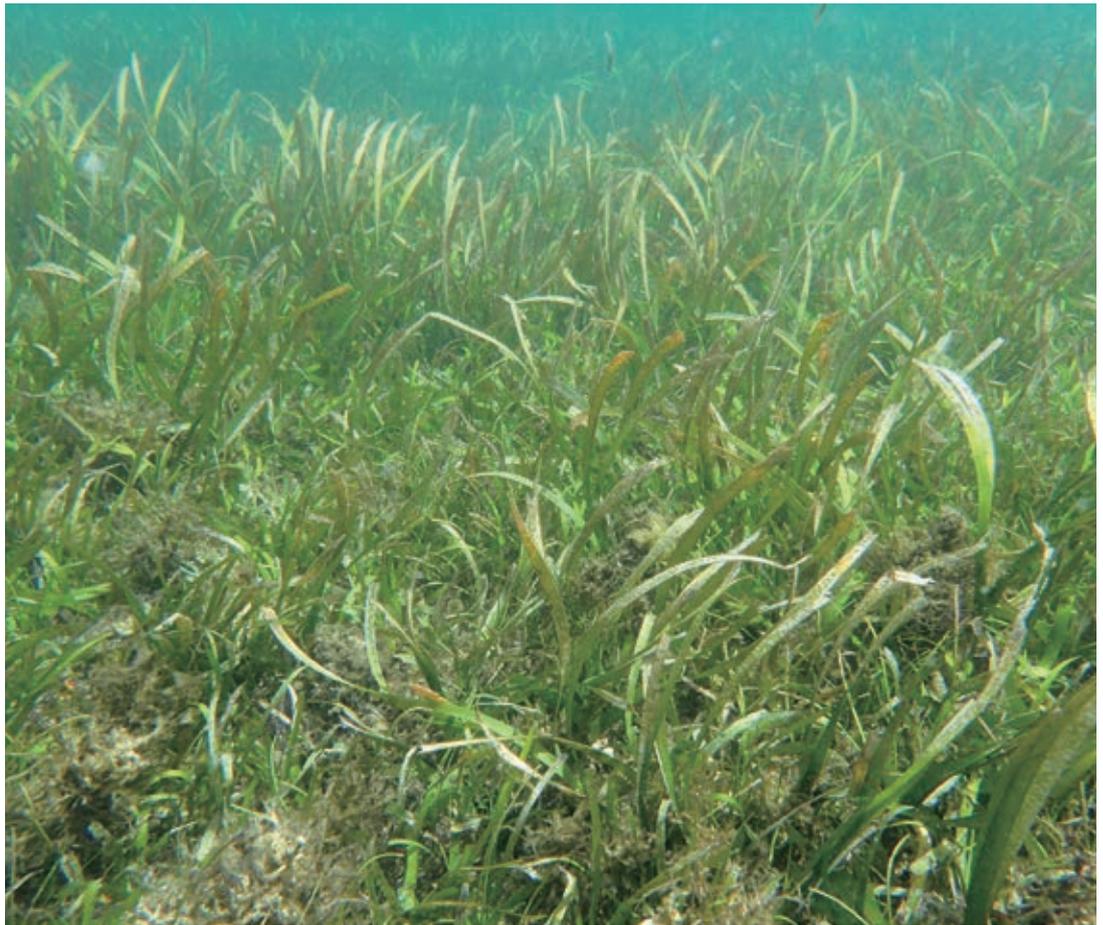


A seagrass meadow in the Bunaken Sea National Park in northern Sulawesi, Indonesia



Conserving Marine Fauna for the Coastal Community and the World

The advance of global warming has prompted researchers the world over to seek ways of lowering environmental carbon dioxide. The mangroves and seagrass that flourish in coastal regions in the tropics not only offer a habitat for fish, but also act as a ‘sea forest’ that absorbs carbon dioxide. However, even as they are being recognized for their environmental merits, these habitats are rapidly being destroyed. Japan, the Philippines, and Indonesia are launching collaborative research projects to save these invaluable coastal ecosystems.



The Bunaken Maritime National Park, famous for its coral reefs and wide variety of fish, is a popular diving spot.



Preparing for a diving survey at the Bunaken National Park. Professor Nadaoka (second from the left) had already begun tackling coastal ecosystem problems which had been brought to his attention during his lectures in Okinawa, Japan.

GROWING ATTENTION TO ‘BLUE CARBON’ ABSORBED BY COASTAL ECOSYSTEMS

Carbon dioxide is one cause of global warming. Photosynthesis, the process by which plants use carbon dioxide and water to produce carbohydrates for energy, may be a key to fighting it. When we think of plants, we tend to picture forests and grasslands, but there are also plants by the seaside and under the sea in coastal regions, particularly mangrove

forests and great patches of seagrass. Now the United Nations and researchers all over the world are lauding the power of these coastal plants to absorb carbon dioxide. “We give the name ‘blue carbon’ to the carbon that the coastal ecosystem absorbs and fixes as organic matter, to distinguish it from land-based carbon,” explains Professor Kazuo Nadaoka of

the Tokyo Institute of Technology. “Despite the fact that sea plants absorb as much carbon dioxide as do land plants, it was only in 2009 that a United Nations Environment Program (UNEP) report brought the world’s attention to blue carbon.”

Coastal plants have benefits in terms of what are called ecosystem services. For example, seagrass can support rich fishing grounds, and mangrove forests can mitigate the damage caused by tsunami and rough waves. There is rising concern that the rapid destruction of coastal ecosystems may hurt the coastal communities that are directly affected and that it may indirectly impact the rest of the world, too.

The fact that Indonesia has more than 20% of the world’s mangrove forests indicates how important the coastal ecosystems in Southeast Asia’s maritime countries are for the global environment. “The triangular area covering Indonesia, the Philippines, Malaysia, East Timor, Papua New Guinea, and the Solomon Islands is called the ‘Coral Triangle.’ The biodiversity in that area, the great number of species including coral, is the most extensive biodiversity in the world’s seas; however, in that region, human activity has a significant influence on coastal ecosystems,” says Professor Nadaoka. “There is a large population of poor people in the coastal areas. There is use of illegal fishing methods, which are easier than traditional ones, and destruction of the mangrove forests to make fish farms. The significant issue here is that it is difficult to halt that excessive use of coastal resources; and of course, we cannot just drive out the people who live in that region to create a vast nature reserve.”

COLLABORATION WITH LOCAL COMMUNITIES: FROM RESEARCH TO POLICY PLANNING

Japanese researchers under the leadership of Professor Nadaoka have studied coastal ecosystems and blue carbon in cooperation with government institutions and universities in the Philippines and Indonesia. Together they have started a large-scale project, BlueCARES, aimed at creating ‘Blue Carbon Initiative’ policy recommendations to preserve coastal ecosystems as a countermeasure to global warming. BlueCARES is managed by the Science and Technology Research Partnership for Sustainable Development (SATREPS), a Japanese government program that promotes international joint research projects. The Philippines is working to establish a national blue carbon commission, and Indonesia is also moving to incorporate the maintenance and management of marine resources into its policy.

The conservation of marine ecosystems is an urgent task for the Coral Triangle countries. Japan shares this sense of urgency: While on a much smaller scale than those in the Philippines and Indonesia, the Islands in the south of Japan are endowed with coral reefs and mangrove forests, and seagrass is widely distributed in other areas around Japan. Another commonality between those two countries and Japan is the deep relationship between coastal human life and ecosystems.

Until two years ago, Professor Nadaoka was at work on another SATREPS project, a joint survey conducted in collaboration with the University of



Busuanga Island in the Philippines. The rich forest along the coast has a significant impact on the coastal ecosystem.

the Philippines, studying coastal ecosystem conservation in six regions of the Philippines. The team discovered major ecosystem damage in all but one of the survey sites, damage resulting from excessive use of coastal resources. To solve that problem, the investigation team recruited local people.

“No matter how wonderful the survey results or research papers are, it is the locals who have to actually take action, so we tried thinking together with them about the means of balancing sustainable local development with coastal ecosystem conservation. We conducted a total of 30 local meetings at six locations, and incorporated what we learned there in our research policy approach in order to return the project’s achievements to the local communities. Now again I would like to hear the opinions of the local people from the early stages and devise a strategy to help them conserve their local ecosystems,” Professor Nadaoka comments.

One essential tool for applying survey results to create actual countermeasures is computer simulation. To run large-scale simulations that can take into account various marine ecosystem factors, the team will use the the TSUBAME 3.0 supercomputer that went into operation in the summer of 2017 at the Tokyo Institute of Technology. Takashi Nakamura, a Tokyo Institute of Technology lecturer who is in charge of creating the simulation model, explains, “This project is intended to cover 80% of the coastal areas in both countries. Simulation on that scale is a challenge, but I will be taking special care not to miss any pitfalls that could arise in the calculation process. I will observe the site carefully and verify the simulation design so that the results accurately reflect reality.”

Nakamura said that his hobby, scuba diving, led him to choose to study marine ecosystems and eventually be involved in this project. On the other hand, Professor Nadaoka started to pay attention to coastal ecosystems when a number of local students in his class at the University of the Ryukyus presented a report on their study of the damage to the ocean resulting from outflows of red soil. It is said that due to the recent worldwide rise in sea temperature, 70% of Sekiseishoko, a stretch of coral reefs (Japan’s largest) near Ishigaki Island, have died as a result of bleaching. Protection of these coastal ecosystems is an urgent matter. Current and planned research to protect the ocean ecology in Southeast Asia could help preserve Japan’s ocean resources and eventually the environment for the entire world.



A meeting with the mayor of Puerto Princesa on Palawan Island in the Philippines.