The Nippon Foundation

OPRF

Ship & Ocean Newsletter

Selected Papers

No. 8
October 2007

Ocean Policy Research Foundation

Director's Message

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

Towards this end, the Ocean Policy Research Foundation (formerly: Ship & Ocean Foundation) has started an "Ocean Policy Research", with the mission statement "Living in Harmony with the Oceans".

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

We publish a Japanese-language newsletter called the "Ship & Ocean Newsletter" twice a month. The "Ship & 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 to achieve coexistence between mankind and the ocean.

Our Foundation believes that the Newsletter can expand effective communication on these issues through its function as editor, publishing timely research and welcoming responses from readers, which might then be published in turn.

"Ship & Ocean Newsletter Selected Papers No.8" contains English-language versions of papers from the Japanese Newsletter edition, published from No.111(2005.3.20) to No.130(2006.1.5).

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 issues.

Hiroshi TERASHIMA
Executive Director

■Publisher

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Executive Director, Ocean Policy Research Foundation

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NaGISA Project

Yoshihisa Shirayama
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(Ship & Ocean Newsletter No.111 March 20, 2005)

Despite the continuing controversy regarding the crisis of biodiversity and the necessity for conserving biodiversity, the actual state of biodiversity among marine organisms is not yet fully understood and the basic information we do have is not sufficient as a means to take effective action. The NaGISA (Natural Geography in Shore Area) Project is a research program designed to compare biodiversity along seacoasts in various regions of the world through sampling in accordance with unified protocols and capacity building in the field of taxonomy. A further goal of NaGISA is to establish a system by which to monitor changes in biodiversity.

What is NaGISA?

The NaGISA Project is one of the field endeavors being carried out under the CoML (Census of Marine Life) Project (http://www.coml.org/), a scientific research program established as a means to evaluate and analyze the diversity, distribution, and population of marine life in the world's oceans. From our headquarters at the Seto Marine Biological Laboratory, belonging to the Field Science Education and Research Center, Kyoto University, I serve as the Principal Investigator for the NaGISA Project, in which more than twenty countries from North America, South America, Southeast Asia and elsewhere are already participating (Figure 1). The name of the project was derived from the Japanese word *nagisa* (the shore). No other language has such a beautifully poetic word to describe the interface between the land and the sea. Professor Ron O'Dor is the chief researcher for the overall CoML Project, and it was from his strong affinity for Japan that the idea emerged of having NaGISA serve as the project's acronym, something, however, that required considerable ingenuity on the part of the planning group.

Sampling

This field project aims to clarify the topographic patterns of diverse marine organisms on a global scale. Accordingly, all the participants collect and analyze marine organisms through the use of a unified method, and subsequently they meet to exchange data for regional comparisons. The method is simple enough to allow the participation of many more people, in addition to specialists. In Japan, non-governmental scuba divers' organizations have participated in the project, and in the U.S. state of Alaska many private citizens have taken part. In 2004, high school students from Tanabe Commercial High School, Japan, and Niceville High School, in the U.S. state of Florida, took samples in a sea area near the Seto Marine Biological Loboratory, and along the coast near Niceville City, respectively.

This joint activity was based on the Fulbright Memorial Fund's Master Teacher Program, with support from Japan's Ministry of Education, Culture, Sports, Science and Technology (see Photo 1). It is expected that these efforts will continue in the future.

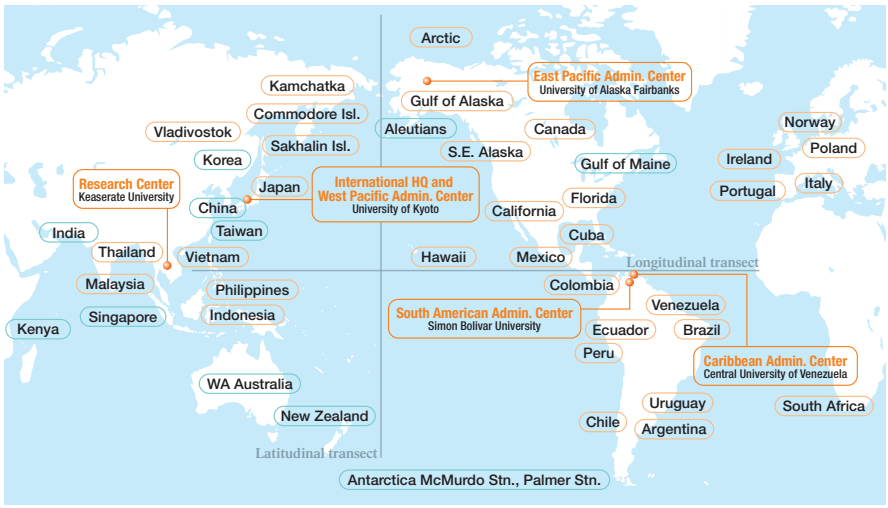
Promotion of taxonomy

To support research on sample collection under the NaGISA Project, a sorting center has been established at Thailand's Phuket Marine Biological Center, where young, trained local researchers were employed to identify organisms and prepare specimens. The sorting center was then relocated to Kasetsart University in Bangkok, where its activities have continued. Additionally, in order to train "para-taxonomists" to independently clarify and identify organisms in each country, an educational course on taxonomy was established, with the first training course taking place at Phuket in September 2003. The theme at that time was polychaetes (belonging to the same group as the

Photo 1: High-school students from Japan and the U.S. participated in the NaGISA Project, and took samples jointly in a sea area near the Seto Marine Biological Laboratory based on the Fulbright Memorial Fund's Master Teacher Program in July 2004.

Photo 2: A scene from a taxonomy training course on echinoderms held in March 2005 at the Seto Marine Biological Laboratory in Shirahama Town, Wakayama Prefecture.

■Figure 1: Countries currently participating in the NaGISA Project, and the locations of regional centers (March 2005)



Countries or regions committed to participating in the NaGISA Project
Countries or regions considering participation in the NaGISA Project

nereids). A second training course was held with the theme of amphipods at Nha Trang, Vietnam, in September 2004. The third training course was held with the theme of echinoderms (asteroids, sea urchins, sea cucumbers, etc.) at the Seto Marine Biological Laboratory in March 2005 (see Photo 2). Initially, most travel expenses for the instructors and participants were paid for by the NaGISA Project, but due to the popularity of the first and second courses, some students from South America participated in the third training course without any reimbursement. In order to obtain cooperation from professional taxonomists for the project, it is planned to send young taxonomists to the sites of each country, and to organize a caravan of taxonomists.

The data submitted by the participants from each country are stored at the NaGISA portal site for ready access. Results analysis is conducted through a GIS-based portal, and other programs are in place to assist the participants. The portal site is now under construction and will be complete by March 2005.

Future development

This project is operated mainly through scholarly contributions from the Sloan Foundation in the U.S., which is supporting the entire CoML Project until 2004. Japan and East Asia have also received financial aid from the Japan Society for the Promotion of Science and the Ministry of the Environment, the latter of which provides funds for global promotion efforts. However, as the number of participants increased faster than expected, it was decided in 2005 to begin organizing the NaGISA hierarchically by setting up the International Center at the Seto Marine Biological Laboratory to oversee the entire project, while establishing regional centers such as the North American and European centers. It was also decided that the International Center should be supported by the Sloan Foundation, and that the respective regional centers should raise the funds needed for their own activities. The Western Pacific Ocean Center, which covers Japan, is now asking various foundations for support and expects that more nongovernmental organizations will participate in the project.

This year, various countries along the Indian Ocean are showing keen interest in the project. That interest is deeply related to the disastrous consequences of the tsunami that struck the countries of the Indian Ocean at the end of 2004. The tsunami brought about enormous human-related damage to coastal ecosystems, but the impact on marine ecosystems has not been fully investigated. Fortunately, NaGISA collected samples prior to the tsunami, so it is expected that we will be able to compare before-and-after conditions and explain the impact of the tsunami scientifically. Even in areas where sufficient investigation had not been conducted before the tsunami, no one would dispute the necessity of implementing follow-up investigations. However, if each country takes action separately, it will give rise to complications in the future. Therefore, to compare data between regions it is particularly important to standardize the method of investigation. NaGISA's concept is readily adaptable in that regard, and it is expected that people from India and Thailand, and also from Kenya, will participate in the project.

Future prospects of NaGISA

The NaGISA Project research program is scheduled to run until 2010. Its ultimate goal, however, is to establish a worldwide system under which governmental organizations can make routine observations of the biodiversity of marine life, much the way that the Japan Meteorological Agency measures air and water temperature. If this kind of monitoring is done in various places around the world for fifty years or more, we can expect to reveal a topographic change of marine biota due to the change in the global environment, and to be able to conduct discussions on effective measures for its conservation based on scientific data. For more information on the NaGISA Project, please visit the official website at http://www.nagisa.coml.org/. ■

Freak Waves Exist

Takuji Waseda
Associate Professor, Department of Environmental and Ocean Engineering, School of Engineering, University of Tokyo
(Ship & Ocean Newsletter No.112 April 5, 2005)

A giant ocean wave more than twenty meters in height is no longer a maritime myth. Now that its existence is becoming scientifically evident, what should scientists, engineers, shipbuilders, shipping bureaus, ship owners and insurance companies do? As a scientist and engineer, I suggest the need for the prediction and observation of giant ocean waves to prevent accidents that could otherwise occur.

Why is a giant ocean wave called a "freak" wave?

Research has been actively conducted on giant ocean waves that suddenly roll up in the open ocean. Under the MaxWave Project [1] in Europe, researches on satellite observation, the generation mechanisms of giant ocean waves, impacts on ships and others have been conducted over a period of four years. The Royal Institution of Naval Architects has periodically conducted workshops on operation under abnormal marine conditions, with the third workshop being conducted this year [2]. At such workshops, a Japanese woodblock print has been frequently presented. The print, called "The Great Wave off Kanagawa," is from the series of Thirty-six Views of Mt. Fuji (see Photo 1). It is said to have been drawn by Hokusai Katsushika when he was over 70 years of age. A giant ocean wave that is just about to swallow a small boat is depicted in the woodblock print, which not only Japanese but many other people in the world might have seen at one time or another. The white, finger-like crest of breaking waves looks dreadful, and it is hard to believe it depicts reality. Though I admired the artist's talent for depicting the mentality of seamen as they are tossed about by the waves, ultimately I believed it was a fantasy.

The existence of giant ocean waves that could suddenly roll up on the open ocean has been known to seamen for many decades. Their depictions vary; a giant ocean wave of extraordinary size strikes a ship during stormy weather and on another day in a calm sea on a sunny day. Sea men have referred to such anomalies as freak waves or rogue waves. However, little attention has been paid by scientists to the giant ocean waves reported by seamen, for the reason that they have been statistically rare. According to the statistical distribution of waves (Rayleigh distribution), the probability of occurrence of a giant ocean wave of the kind reported by seamen is once in every 10,000 years. Because such an occurrence was unrealistic, it has been considered useless to take precautionary measures. It resembles the situation where doctors used to call a disease that struck one out of a million people a "rare disorder," without lending a helping hand to the victim.

Photo 1: "Great Wave off Kanagawa" (from a series of thirty-six views of Mt. Fuji)

The realities of giant ocean waves

It is said that the occurrence of giant ocean waves is linked to areas near strong ocean currents (such as the Agulhas current in South Africa and the Kuroshio Extension off Cape Nojima), and to sudden blowing of high winds. Seamen's reports and photos (Photo 2) exist as evidence for such connections. Over the past forty years, there have been dozens of reports of the possible accidental sinking of big ships as results of their encounters with giant ocean waves, involving over 500 casualties. The accident of the *Onomichi-Maru* off Cape Nojima in 1980 was also believed to have been caused by a giant ocean wave of over twenty meter-height. On January 1, 1995, a giant ocean wave with twenty-six meter in height was measured in the North Sea offshore oil-platform and further confirmed the existence of giant ocean waves. Later on, a large number of giant ocean waves were also observed from the space by satellite-borne synthetic aperture radar under the MaxWave Project.

By synthesizing all these observational facts, it has become known that there are two types of giant ocean waves: a giant ocean wave with a long, horizontal wave crest (i.e. two-dimensional), traveling from afar with its waveform intact (Photo 2); and a short-crested giant ocean wave (triangular pyramidal shape), which suddenly rolls up, breaks apart and disappears. It is considered that the former wave is caused by the amplitude modulation of ocean waves due to instability of the wave train, while the

Photo 2: Giant ocean wave in Biscay Bay (provided by W. Buckley)

latter is caused by the linear focusing of wave energy due to the interaction with the ocean currents, gusty winds and so forth. It has also been found that by taking into account the instability of ocean waves, the Rayleigh distribution is corrected, and consequently the occurrence of giant ocean waves more closely approximates the reality. Moreover, due to the advancement in oceanographic and meteorological forecasting through satellite observation and numerical weather prediction, deeper understanding has been gained regarding the way ocean currents and gusty winds relate to the generation of a giant ocean wave. For instance, the relationship between the eye wall of a typhoon and the generation of a giant ocean wave has also been pointed out.

Prediction, observation and avoidance

Now that the existence of giant ocean waves is becoming certain, the need to predict them is urgent. What is necessary to make that possible? For example, the interaction of the ocean currents, winds and ocean waves known to cause giant ocean waves, should be predicted at high-resolution. Recently high-resolution ocean current forecast products have become available. Each day the JCOPE system [3] of JAMSTEC predicts ocean currents in ocean areas close to Japan, at a resolution of approximately ten kilometers. However, to accurately estimate the wave energy convergence due to ocean current, the resolution of the ocean model should be increased to about one kilometer, because the giant ocean waves are said to be several hundred meters in length. At the same time, it is also necessary to predict high resolution atmospheric motion that drives the ocean currents and generates ocean waves. What about observations? In order to detect danger in advance, it is necessary to establish a new network of satellite, ship-borne and airborne radar observations, in-situ observations with mooring and drifting buoys, and the alert system that makes full use of information technology. Combined with the ocean models, these will lead to the finding of secure sea routes. To prepare for the worst situations, it is necessary to estimate the impact of the giant ocean wave on marine structures based on theories, wave-tank experiments and numerical models, and to develop design technology with higher safety standards. Are the current design standards for the strength of ships and marine structures sufficient to withstand giant ocean waves, whose existence can no longer be denied? More detailed verification is needed.

A giant ocean wave is not a freak wave.

Recently I have been working on the generation of a giant ocean wave in an experimental wave tank. It is still in the trial-and-error stage, but there is occasionally a surprising finding. Photo 3 shows the breaking water that was generated by energy focusing of waves. The breaking wave crest, separated numerously in a horizontal direction with the finger-like protruding jets, looks just like the giant ocean wave depicted by Hokusai. Encountering such a phenomenon, I realized the profundity of nature and my own ignorance, and convinced myself that giant ocean waves do

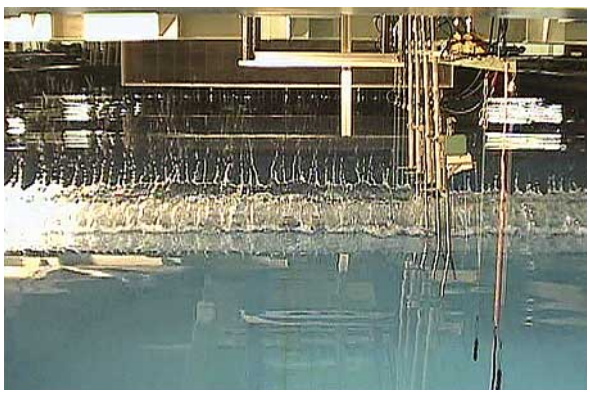


Photo 3: Ocean Engineering Tank at the Institute of Industrial Science, University of Tokyo

exist. There is an ever increasing possibility of accidents involving not only cargo ships but also passenger ships, which are becoming gigantic. As Mr. A. Graveson of Nautilus UK mentioned from a seaman's point of view [4], scientists and engineers are now required to persuade, based on their accumulated knowledge, the general public as well as government that solutions to giant ocean waves are necessary and possible. Shipbuilders, classification societies, ship owners, and insurance companies should take actions, which might include the review of safety standards and shipbuilding technology, to prevent possible accidents and to save ships and lives. ■

●Photo 2 was included with the courtesy of Mr. W. Buckley. I am sincerely grateful for his valuable advice for my writing of this paper.

1) MaxWave, the Fifth Framework Programme of the European Commission:
http://w3g.gkss.de/projects/maxwave/
2) Design and Operations for Abnormal Conditions III, January 2005, London, the Royal Institution of Naval Architects
3) Japan Coastal Ocean Predictability Experiment:
http://www.jamstec.go.jp/frcgc/jcope/index.html
Refer to the 93rd News Letter, "Toward the Practical Application of Oceanic Forecasts," by Toshio Yamagata.
4) "Abnormal Waves: 'An Abnormal Solution'" by A. Graveson, Design and Operations for Abnormal Conditions III, January 2005, London, the Royal Institution of Naval Architects

Piracy Problems in the Straits of Malacca

Yoshihiko Yamada
Team Leader, Maritime Education, Maritime Group, The Nippon Foundation
(Ship & Ocean Newsletter No.113 April 20, 2005)

While the existence of pirates is declining globally, it is still increasing in the Straits of Malacca. Formerly, incidents of piracy aimed at cargo stood out, but today many crimes of piracy involve kidnapping for ransom. Pirates commit crimes by cunningly using the national borders along the Straits of Malacca as barriers. Anti-piracy measures need to be strengthened and an international cooperative regime that recognizes no boundaries needs to be implemented.

The *Idaten* incident

On March 14, 2005, the *Idaten*, a Japanese-owned 498-ton tugboat, was attacked by pirates in the Straits of Malacca, and the boat's captain and chief engineer–both Japanese nationals–were abducted along with the third engineer, a Filipino national.

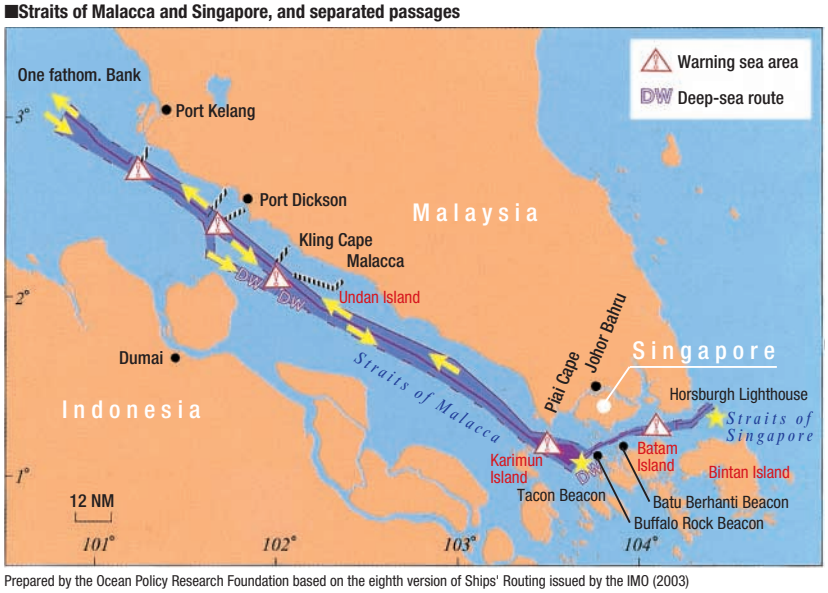
The incident occurred in the Malaysian sea area off the island of Penang in the northwest part of the straits, when the *Idaten*, which was loaded with oil-drilling machinery, was on the way to Myanmar from Batam Island, Indonesia. According to the testimony from the crew of the *Idaten*, the pirates approached on a fishing boat and, after several rifle shots, boarded the tugboat. They seized money, valuables, sea charts and the tugboat's register, kidnapped three seamen as hostages, and fled toward Indonesia. The pirate group consisted of about ten persons, all of whom were heavily armed with rifles and rocket launchers. The fact that it took only ten minutes to commit the crime indicates that the pirate group was well organized and trained. In the Straits of Malacca over the past several years, pirates have been responsible for increasing numbers of kidnappings for ransom. In 2004 alone, thirty-six seamen were reported kidnapped, and ransoms were demanded for each of them.

Among the piracy incidents that have occurred in the Straits of Malacca, the *Alondra Rainbow* incident of October 1999 brings back vivid memories. The *Alondra Rainbow*, loaded with ¥1.2 billion worth of aluminum ingots, was attacked by pirates while en route to Japan from Kuala Tanjung Port in the central part of Sumatra, Indonesia. The pirates seized the load and the vessel, and seventeen crewmembers–including the Japanese captain and chief engineer–were put in a life raft and left at sea. After drifting for ten days, they were rescued by Thai fishermen and reported that they had narrowly escaped death. With its hull repainted and its name changed, the *Alondra Rainbow* was discovered by the Indian Coast Guard as it sailed westward in the Indian Ocean. The vessel was captured together with the pirate group that had taken it. Half of the load remained on the vessel, but the other half had disappeared. It was later found that the other half had been sold in the Philippines via China.

The *Alondra Rainbow* incident and an international cooperative regime

The occurrence of the *Alondra Rainbow* incident prompted the establishment of an international cooperative regime for anti-piracy measures. In April 2000, an international conference on anti-piracy measures was held in

■Straits of Malacca and Singapore, and separated passages



Prepared by the Ocean Policy Research Foundation based on the eighth version of Ships' Routing issued by the IMO (2003)

Tokyo, where it was confirmed that each Asian country should stand against piracy, work with coast-guard authorities through information exchange, and build up an international cooperative regime. Since then, expert meetings on anti-piracy measures have been held annually in a rotation involving each participating Asian country. In 2004, the Heads of Asian Coast Guard Agencies Meeting was held in Tokyo to address maritime security concerns, including terrorism. There it was confirmed that Asian countries should cooperate in order to combat maritime crime. The Nippon Foundation has been providing support, including the cost of a series of meetings.

The number of piracy incidents reported by the International Maritime Bureau (IMB), which collects information on piracy, was 469 in 2000–the highest ever recorded–and 325 in 2004, showing a downward trend. The trend is thought to have resulted from ongoing international cooperation for anti-piracy measures as well as the positive efforts made by coast-guard authorities in each country. Additionally, maritime companies have taken defensive measures by stationing guards in piracy-prone areas around the clock, resulting in a decrease in the frequency of pirate attacks upon large Japanese commercial vessels.

Change of piracy in the Straits of Malacca

However, the number of piracy incidents in the Straits of Malacca has been on the increase: sixteen in 2002, twenty-eight in 2003 and thirty-seven in 2004. Furthermore, the crimes have become increasingly violent. Among the piracy incidents reported in the Straits of Malacca in 2004, all the pirates were armed with guns, and increasingly there have been incidents in which pirates attacked vessels, kidnapped seamen, and demanded ransom.

Pirates in the Straits of Malacca have been changing their crime patterns in response to the anti-piracy measures taken by the respective countries. In around 2000, international piracy syndicates committed crimes targeting expensive cargo, such as in the aforementioned *Alondra Rainbow* incident. However, the international piracy syndicates disappeared after anti-piracy measures were reinforced by the respective Asian countries. Then came incidents where people living in coastal areas used speedboats to stealthily approch on boats passing off the coast, stealing the money and valuables on board and fleeing. These incidents were termed "Robin Hood piracy" because they were carried out with the cooperation of people living in the seashore communities nearby.

Recently there have been an increasing number of groups deemed terrorist pirates who are heavily armed and work systematically. In June 2001, the spokesman of the separatist Free Ache Movement declared that vessels passing through the Straits of Malacca must obtain approval from the separatists. It was due to their use of armed force in attacking passing vessels that they were labeled terrorist pirates. The terrorist pirates do not target expensive cargo but instead take seamen as hostages for ransom. They target and raid small, slow-moving tankers, fishing boats or tugboats, instead of larger vessels.

■Number of piracy attacks in the Straits of Malacca and Singapore, neighboring areas and around the world

	2000	2001	2002	2003	2004
Indonesian coast	119	91	103	121	93
Straits of Malacca	75	17	16	28	37
Straits of Singapore	5	7	5	2	8
Malaysia	21	19	14	5	9
Total worldwide	469	335	370	445	325

Source: IMB Annual Report

What is expected from anti-piracy measures

Pirates who now frequently appear in the Straits of Malacca commit crimes by exploiting the international boundaries along the waterways. Even if the pirates are pursued by the security authorities of one country, they know that pursuit will not continue once they enter the territorial waters of another country. Therefore, to implement transnational anti-piracy measures, it is necessary to build up an international cooperative regime. Accordingly, through a series of international conferences, a cooperative relationship has been established. What is needed now is to take action for the sake of international cooperation. Specifically, it will be necessary to consider implementing joint precautionary measures against pirates by countries along the Straits of Malacca and to organize multinational maritime security authorities such as the Naval Police of the United Nations. It is also conceivable for nongovernmental organizations that can navigate international boundaries in the straits to operate patrol boats and pursue pirates.

As the country that uses the straits more than any other, Japan should provide personnel and material support for the coastal states and promote effective anti-piracy measures. In addition, those concerned with maritime affairs should be aware that pirates exist in Asian seas, and take measures to protect themselves. ■

Floating Marine Debris

Masahisa Kubota
Professor, School of Marine Science and Technology, Tokai University
(Ship & Ocean Newsletter No.114 May 5, 2005)

Human activity has led to a drastic increase in debris such as non-biodegradable plastic. Much of the floating marine debris consists of plastic products, and such debris is certain to increase with time.
We carried out a simulation on the movement and accumulation of floating marine debris with current speed at the sea surface, using satellite data as the basis. As a result, we demonstrated that floating debris tends to gather in a specific sea area in the mid-latitudes within less than a year.

Human activity and debris

Hojoki (An Account of My Hut) starts with the famous statement, "Rivers flow incessantly, so no water remains the same. Bubbles floating on stagnant water disappear, or get united, so no bubble remains the same." There may be many people who learned while studying the Japanese classics that the statement essentially explains the concept of the impermanence of all things. The concept of the impermanence of all things is based on the concept of transformation. In the natural world, it is obvious that everything is transformed, and one can say that the idea of transformation was also accepted by people in earlier times. However, transformation also implies deformation and destruction. This may be unacceptable to people in the short run, which is why people try to produce more durable, unbreakable things. That, however, goes against the course of nature.

For instance, plastic is a strong, durable and wonderful material for people, but it is incompatible with the concept of the impermanence of all things because plastic does not disintegrate over time. The fact that plastic does not disintegrate means that it accumulates over time. As long as plastics are used effectively as part of human activity, their non-breakable properties can be justified, but the use of plastic will no longer be justified once the item becomes unnecessary, such as when it is discarded as debris.

There is an old saying, "Let the water carry it away." This implies that everything will be cleaned and restored to its original state once it has been washed in water. However, what will happen to things that have been washed away? If they are discharged into rivers, they will ultimately flow into the sea. We used to think that all the things washed away would be taken care of by Mother Ocean in her great tolerance. However, we now know that only perishable things can be embraced by Mother Ocean, so plastics –which will only increase over time–remain troublesome.

Major currents at the sea surface

It is very difficult to directly observe the actual conditions of floating marine debris on the open ocean. Therefore, in most cases there is no way other than to guess from the actual conditions of debris drifting ashore. As a result of guessing, it is said that approximately seventy percent of that debris is plastic. We wonder how the mechanism of the movement and accumulation of floating marine debris works. Because floating debris itself does not have a swimming function, its movement depends on the flow of currents. In other words, the actual conditions of the movement and accumulation of floating marine debris can be assumed if we can find currents at the ocean surface.

It can be thought that major currents at the sea surface consist primarily of a flow that combines an Ekman flow and a geostrophic flow. Probably not many people have heard of either term, but they are major currents that are closely linked to the rotation of the earth. The former is a current generated mainly by winds, and it has been shown theoretically that the Ekman flow moves at 45 degrees toward the right (left) in the north (south) hemisphere because of the effect of the earth's rotation. On the other hand, the geostrophic flow is generated under conditions where the Coriolis force–which is apparently generated by the effect of the earth's rotation–and an inclination force are balanced [1].

How can we make observations of the Ekman flow and the geostrophic flow? Considering the vastness of the ocean, we can readily acknowledge that it is technically impossible to make observations of the Ekman flow and the geostrophic flow by boat. However, it has recently become possible to observe the Ekman flow and the geostrophic flow globally for a short period of time by satellite. The Ekman flow can be estimated theoretically by observing ocean winds. On the other hand, the geostrophic flow can be estimated once a pressure distribution is known. Therefore, it can estimated if the distribution of ocean surface heights can be observed. Recently it has become possible to make observations of ocean surface heights with surprising accuracy through the use of a satellite-mounted instrument called a ocean-surface altimeter.

Movement and accumulation of floating marine debris in the North Pacific Ocean

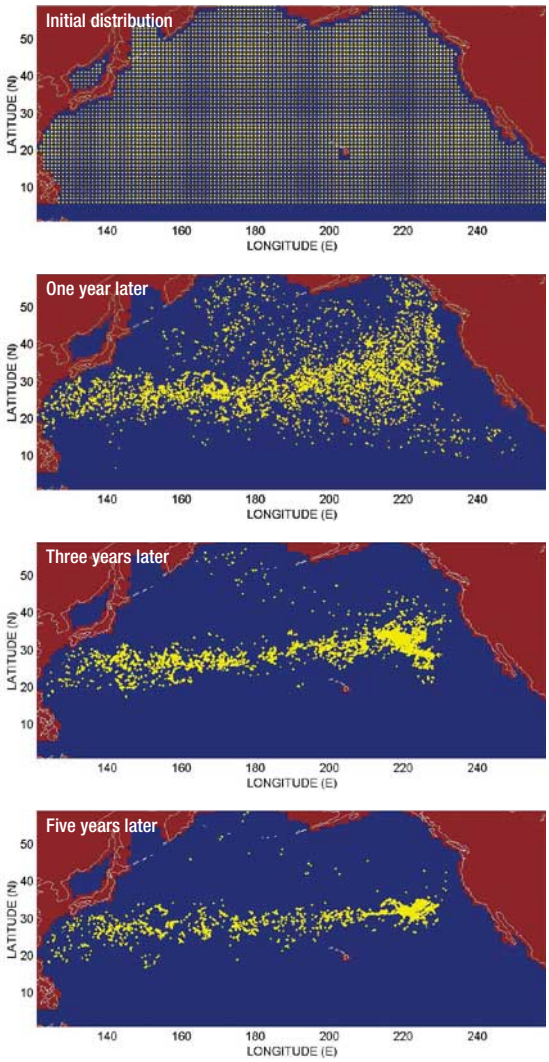
The question remained of how floating marine debris

moves and accumulates according to location with different speeds of current at the ocean surface. Accordingly, we carried out a simulation by placing a piece of floating debris at each degree in a grid of the North Pacific Ocean in order to find out how the floating debris would move and be distributed over time. In that simulation, we used current patterns obtained by combining the Ekman flow and the geostrophic flow, which were estimated through the use of data from spacecraft. Figure 1 shows the distributions of floating debris at the initial stage, and after one, three and five years, respectively. It clearly shows that the floating debris, which was evenly distributed at the beginning, eventually accumulated in specific ocean areas. Almost all the floating debris drifted to the mid-latitudes within less than a year, with a very low concentration in the high and low latitudes.

This characteristic is caused by the north-south distributions of ocean winds, which are composed of westerlies and tradewinds. Floating debris in the high latitudes is carried southwards by the Ekman flow accompanied by westerlies, and floating debris in the low latitudes is carried northward by the Ekman flow accompanied by trade winds. As a result, floating debris is concentrated in the mid-latitudes. Additionally, very strong westward currents, such as the Kuroshio Current and the Kuroshio Extension, exist to the east of Japan, so it is understandable that floating debris would be carried away immediately, disappearing almost entirely. Another characteristic is that there exists an ocean area that collects a huge amount of debris to the northeast of Hawaii. What is important here is that the distribution of debris is never uniform. It is said that a large amount of debris is washed up on the Midway Islands, which are located in a sea area that would otherwise be assumed to have less debris due to its lower population.

What is important is that floating debris such as plastic will never decrease but will certainly increase, and that the density of debris can increase drastically in specific ocean areas. To solve this problem, it is necessary to promote the use of biodegradable plastic and develop a system for the collection of floating debris. ■

■**Figure 1: Distribution of floating debris**



Time change of the distribution of floating debris, a piece of which was placed in each grid of one degree over the entire North Pacific Ocean. The floating debris was moved by ocean currents, as estimated through the use of data from spacecraft.

1) "Science of Ocean Waves and Currents," Sanae Unoki and Masahisa Kubota, Tokai University Publications, 356 pp. (1996)

The Modern Undersea Highway: Communications Cables

Mitsuhiro Takase
CEO & President, NTT World Engineering Marine Corporation
(Ship & Ocean Newsletter No.118 July 5, 2005)

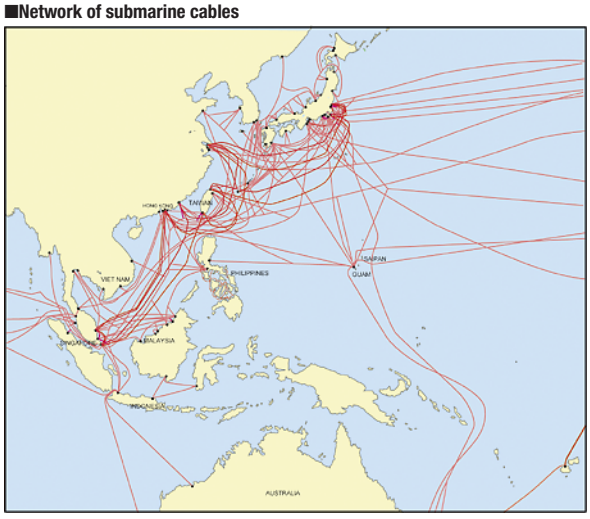
The network of submarine cable spanning the globe has a length of approximately 800,000 kilometers, and if arranged end to end would circle the earth up to twenty times.
The cable network is indispensable in the present-day broadband era. It carries information across the globe and has become quite simply an undersea highway.
In Japan's waters, there is a need not only to work on the maintenance of a stable communications infrastructure but also to find new ways of using submarine cable, such as in the promotion of industry on isolated islands, environmental awareness, and the removal of old cables.

What is a submarine communications cable?

To conduct trade and exchange with other people, roads and sea courses have long been used. The Silk Road, which is famous for its role in the exchange of goods between East and West, is mainly thought of as a land route. Recent study, however, indicates that sea courses thrived to a considerable extent, that they eventually surpassed the land routes, and finally helped open the age of geographical discovery. We now live in an age of worldwide information, which is also the broadband era. In this respect, submarine cables–our undersea roads–play a major role.

Today, communications networks connecting countries and people around the world consist of roughly two systems: wired networks (on-land and submarine cables) and wireless networks (land-based wireless stations and communication satellites). On the seabed around the globe, watertight and pressure-proof communication cables (submarine cables), durable enough to be laid in deep waters, are laid in a finely meshed pattern from one continent to another and from one island to another. Recently, submarine cables have mainly consisted of high-capacity optical cables. These cables make up the undersea roads, serving as highways that connect not only phones but also facilitate the exchange of images, all kinds of business and personal information over the internet. They play a vital role as a basic infrastructure in the broadband era.

■Network of submarine cables



The submarine cable has a long history, and it is said that the first submarine cable was laid between England and France (across the English Channel) in 1851. Even in Japan, submarine cables were first used from home and abroad during the early Meiji period (the 1870s). It is not known exactly how many submarine cables have been laid and are used worldwide. According to a report made at a certain conference, the major submarine cables across the globe amount to approximately 800,000 kilometers and could circle the earth up to twenty times.

Conditions of submarine cables in Japan's waters

Japan is surrounded by the sea and has many islands. For the implementation of broadband in the island nation of Japan, it is essential that we have not only international submarine cables connecting Japan with Asia, the U.S. and other foreign countries, but also a large volume of domestic submarine cables between domestic islands. Our company, NTT World Engineering Marine Corporation, has been fully entrusted with the construction and maintenance of domestic submarine cables from each NTT company. The total length of the cables adds up to approximately 5,500 kilometers, covering about 400 sections. That length is much less than that of international submarine cables, but our assignment is characterized by the high number of sections used. This may not be a good comparison, but 5,500 kilometers roughly equals the length of the West Japan Railway Company's track network, while being slightly less than the total length of the Nippon Express Companies' expressways.

The national government, local governments, and private companies such as NTT have recently been working on broadband implementation for isolated islands as part of their efforts in regard to the e-Japan strategy [1]. The submarine cables serve as one element in the basic infrastructure for that effort. For example, last year, when NTT West

Submarine cable laying vessel *Subaru*, owned by the NTT World Engineering Marine Corporation

Cable landing in Miyako for submarine cables running to and from Okinawa-Honto Island and Miyako Island

Japan planned and executed the construction of the latest submarine optical-fiber cables between Okinawa-Honto, Miyako Island and Ishigaki Island, our company was entrusted with the design and installation. We laid a total of approximately 500 kilometers of cable with our submarine cable laying vessel, the *Subaru*. To protect the environment, we designed a route away from coral reefs, devised ways of installing the cables without damaging coral reefs, and performed the actual installation. Our company believes it has thus contributed to the realization of what had long been needed by local people in the isolated islands: the infrastructure necessary in order to close the digital divide and promote industry in those locations. Currently, many autonomous bodies with isolated islands are also considering the introduction of information technology for regional administration and medical care, as well as broadband connections to attract industry. Accordingly, submarine optical-fiber cables are included as a basic infrastructure. However, the autonomous bodies have financial difficulties and other challenges, so it is never easy to do. In the future, we think it will be necessary to promote a cooperative system between the private sector, what has already partially introduced information technology and broadband implementation, and autonomous bodies, the national government, and others.

Future issues and activity

Submarine cables will be indispensable to the future broadband society, but certain issues and problems are associated with such cables. One such problem is that the capacity of submarine cables, particularly in global communications, has not been fully employed from a global perspective, and a large amount of capacity remains unused. This is mainly due to the impact of the collapse of the dotcom bubble [2] in around 2000, and due to the multiplexing that has become possible through technological innovation. Because of this, many companies in the industry related to submarine cables (including manufacturers of cables and relays, and cable-laying companies) in Japan and elsewhere have become bankrupt or undergone major restructuring. Apparently, it will take time for the overall industry to recover.

The problem of safety for the submarine cable network has also been a topic of study and discussion. Last year, Japan was hit by a record number of typhoons, as well as many earthquakes. Given the impact of these disasters, the number of malfunctioning submarine cables in coastal areas around Japan increased considerably. The causes included the anchors of drifting boats, as well as the exposure of buried cables due to the impact of currents and ocean waves. Considering that abnormal weather is likely to continue worldwide in the future, we are convinced of the importance of daily maintenance and a prompt repair system for submarine cables in securing the communications lifelines.

Environmental considerations will also be important in the future. They include the impact on fisheries, the protection of coral reefs and other marine life, the removal of old or unused submarine cables, and other problems. Approval must be obtained from the national government and local autonomous bodies when submarine cables are laid in Japanese waters, and the waters must be restored to their original conditions after the cables have been used, in accordance with the Seacoast Law. Our company removes unnecessary cables gradually, and restores the waters to their original conditions.

Communications traffic is sharply increasing worldwide due to the internet and other factors. Many of those involved with submarine cables expect a recovery in domestic and global demand for submarine cables over the next several years, as well as the laying of new cables in various places around the world. In addition to the original need and use of submarine cables, the pursuit of new possibilities represents another issue. The use of submarine cables with has already been implemented in certain places, and research on the use of submarine cables for surveys related to the continental shelves is ongoing. In the future, and with consideration for the environement, new possibilities for the use of submarine cables should be continuously pursued. ■

1) e-Japan strategy: This is the Japanese government's strategy for providing the world's most advanced environment for information technology. (Implementation started in 2001.) One of its priorities is to rectify the digital divide due to geographical restrictions and other factors.

2) Dotcom bubble: This is the term for the economic crisis involving companies related to information technology and the internet, which occurred in or around the years 1999 and 2000. Facilities were substantially expanded and the stock markets soared, but the bubble collapsed and stock prices crashed while excessive production capacity remained.

Two Policy Proposals to IMO Council Members

Yohei Sasakawa
Chairman, The Nippon Foundation
(Ship & Ocean Newsletter No.119 July 20, 2005)

On July 21st of last year, at the invitation of the International Maritime Organization, I was invited to give a special lecture following the 94th IMO Council Meeting. The theme of my talk was the present and future conditions for maritime human resources. The opportunity to give this talk came about as a result of Secretary-General Mitropoulos' visit to Japan last October, when he expressed interest in the Malacca Straits maintenance projects, capacity building projects, and other activities being carried out by The Nippon Foundation.

Along with introducing The Nippon Foundation's maritime human resources initiatives, I made two policy proposals to IMO Council members and the many others in attendance from various maritime related fields. Happily, the proposals were positively received as possible guidelines for international initiatives to solve the maritime problems we are currently facing and were also extensively reported on by Lloyd's List and Reuter's. Only the sections of my talk dealing with the proposals are reproduced below. Any comments or criticism on the proposals would be appreciated.

The oceans are the "common heritage" of mankind and benefit people in all countries. They are our common property and our common responsibility. However, today's oceans face innumerable problems, including maritime accidents, piracy, and environmental pollution. These problems present a challenge not only to individual nations but to global society as a whole. In addition, disasters like the recent Sumatran earthquake and tsunami show us how difficult it is to coordinate responses across national borders. Unfortunately, UNCLOS' ideal of global coordination has yet to be applied as a solution to issues such as these. On this occasion I would therefore like to offer two policy proposals.

Firstly, let me focus on the concept of "sustainable development of maritime activities". To my understanding, "sustainable development of maritime activities" means an international policy framework that enables us to seek the coexistence of the oceans and mankind. Today, however, that coexistence is endangered by serious maritime problems in the fields of the environment, safety, and security. It has been proven that emissions of CO_2 and NOx from ships have adverse effects on the marine environment, and it is well known that substandard vessels endanger the lives of seafarers and represent potential dangers to coastal nations. In recent years, there has also been the problem of pirates who operate across borders in some regions, taking advantage of the geographical limits of the sovereignty of coastal states.

Although IMO member states are trying to address these issues, many are too difficult to be tackled by the unilateral measures of individual governments. The only feasible approach is through international cooperation, in which it is hoped the IMO will play a central role. The IMO is rich in both experience and expertise in maritime matters. I thus firmly believe that it can work together with member states for the most realistic and effective measures.

The Nippon Foundation is prepared to make further contributions as the IMO undertakes more positive initiatives in addressing the difficult challenges facing the international maritime community. We are prepared to set sail with you for the sustainable development of maritime activities.

The second proposal concerns the safety of the Malacca Straits.

80,000 ships a year traverse the Malacca Straits. This includes container ships as well as tankers en route to Asia from the Middle East. At the stern of these ships fly the flags of Panama, Honduras, Liberia, Greece, and many

other countries. Countries from around the world benefit from the Malacca Straits, which are the busiest in the world and therefore always at great risk of maritime accidents.

To date, The Nippon Foundation has provided financial assistance totaling approximately 100 million dollars for the emplacement of 45 lighthouses and other navigational aids. Engineers from Japan also visit the Straits to help maintain the navigational aids and train local personnel. We have recently built buoy tender ships for both Indonesia and Malaysia.

Last June, our foundation invited high-level representatives from Asian coast guards to an international conference that we sponsored in Tokyo, where we discussed cooperative measures against crimes at sea. Building on this opportunity, Asian coast guards have begun to move toward sharing information and building cooperative frameworks.

In this connection, I welcome the initiative of the IMO in holding a Malacca Straits Conference in Indonesia this fall. I sincerely hope that the conference will be an important step forward, for all parties concerned, for safety of navigation in the Malacca Straits.

Whenever I contemplate the situation in the Malacca Straits, I am always left with the certainty that dependence on traditional approaches to securing safe navigation in this high-risk area are no longer realistic. To secure the safety of navigation in high-risk areas, I feel we need to reevaluate our traditional thinking that safety on the seas is always offered free of charge. In high-risk areas where the safety of navigation incurs high costs, we need to examine a new system whereby the burden is born not only by Coastal States but by Users as well.

I hope that the IMO will exercise leadership in consideration of such a new system, taking advantages of all the expertise and enthusiasm of its member countries.

●

My father, the founder of our foundation, Ryoichi Sasakawa, made the following his philosophy: "The world is one family; all mankind are brothers and sisters." The family of the mankind is endowed with a very precious asset: our common heritage of the oceans. I hope that all of us will continue to work together to protect and preserve our common heritage and ensure our coexistence with the oceans. Thank you very much. ■

Ocean Travels

Masahiro Akiyama
Chairman, Ocean Policy Research Foundation (OPRF)
(Ship & Ocean Newsletter No.120 August 5, 2005)

Over the past six months, I traveled to Russia, the U.S., India, Turkey and China. My visits to foreign countries are always related to the research activities of OPRF, and each visit always gives me an opportunity to consider, from different perspectives, the issues related to the ocean. Issues such as the safety of maritime traffic, the marine environment, and maritime security are interrelated, and they are vividly revealed when one travels the world.

I often travel abroad. Over the past six months, I have traveled to Russia, the U.S., India, Turkey and China. In July, I visited Indonesia on business for the first time in eight years. Whenever I make an overseas trip --always in relation to the research activities of OPRF--I have an opportunity to think about the ocean.

Petroleum and natural gas development in Sakhalin

To study the relationship between petroleum and natural gas development and the ocean, I visited Sakhalin, a land of severe cold, at the end of last year. The Sakhalin I and II [1] sites for petroleum and natural gas development were just about to start operating, and Sakhalin had the atmosphere of a northern frontier, not a western one. There was a mixture of vitality, development and waste. I was not able to visit the Sakhalin I site because of the secretive Exxon company, which is developing Sakhalin I. I was interested in what kind of environmental measures were being taken. Government authorities in charge and other related corporate parties said they were working hard on environmental measures. However, once major marine contamination occurs its impact on Hokkaido will be unfathomable.

It is bitterly cold in the Okhotsk Sea, even though it is not located at a very high latitude. It is important to know the thickness, properties, and amounts of ice to be formed, and how the ice moves from the perspective of climatic fluctuations. It is also necessary to conduct thorough investigations on the collisions between the ice and the petroleum and natural gas drilling facilities, workboats, transport boats, and underwater pipelines.

I would like to add that OPRF has been conducting an investigative research project on the promotion of the use of waterways in the North Pole region and a safe navigation system in arctic seas [2], and an analysis research project on the state of ice in the Okhotsk Sea through the parameter of temporal changes in sea ice.

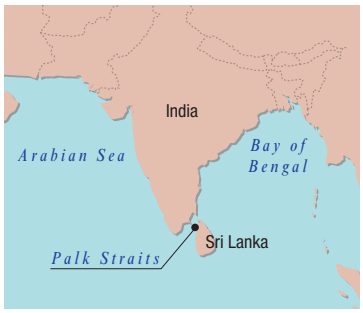
United Nations' Headquarters, New York

In January of this year, I visited Washington D.C. and New York for a short time. I had chosen to visit those cities around that time because I wanted to listen to President Bush's second inaugural address in the U.S. However, I had to give up on my planned visit to Washington D.C. before the delivery of the inaugural address because of unprecedented tight security, so I went to New York. I exchanged opinions about extension of the continental shelves with the staff of the Division for Ocean Affair and the Law of the Sea (DOALOS) [3], at UN Headquarters. The problem of the shift in the Japan-China border through the action of the continental shelves has become serious, as China has proceeded with the development of submarine petroleum resources. Moreover, China insists that it is not permissible to admit Okinotori Island as a base for the demarcation of the Exclusive Economic Zone, so the tension between Japan and China has increased further. Japan has not taken quick action in response to the problems of the continental shelves, and as a result its national interests are suffering. We must say that Japan has lost status as an ocean state.

We can say that Japan is an ocean state, but I am concerned about the lack of an ocean strategy. As long ago as the 1960s, the U.S. had already established its comprehensive ocean policy. The U.S. reviewed that policy last year, and now is going to establish a new ocean policy. Japan has not established its ocean policy, and still has a vertically segmented administrative system for ocean affairs. OPRF has research projects on U.S. ocean policy as well as on the problems of the extension of continental shelves.

A visit to Madras, India

A conference between Japan and India was held in New Delhi in March. From the Japan side, Former Prime Minister Mori, Former Foreign Minister Ms. Kawaguchi, and Mr. Okamoto, the former assistant to the Prime Minister, attended the event. At the conference, I made a speech about Japan-India cooperation for ocean security. During my



speech, I explained the joint statement issued in autumn last year by the Japan-India Dialogue on Ocean Security, which was supported by OPRF. After the conference, I visited Madras in the southeastern part of India. To my surprise, Madras University had a research course on marine security, and its professors, researchers, and students were seriously engaged in research and study of many aspects of this field. India is not an ocean state, but the country realized the importance of the ocean in the 1970s, and started laying out not only a military but also an academic structure.

The Palk Strait lies between Madras and Sri Lanka, and it has shallow waters of four to five meters in an area of more than 10 kilometers in length. However, a seabed digging plan that would allow the navigation of vessels has recently been established, in which the east-west navigation time via the Indian subcontinent will be reduced by approximately three hours. Nevertheless, it presents a big problem. How will a likely seabed explosion be coordinated with environmental protection? The area offers good fishing grounds, so the issue of compensation will present a major challenge. In fact, a digging plan was proposed quite a long time ago, but was not implemented because of these problems. Even now, environmental protectionists and fishing people are strongly opposed to the plan because the impact of digging cannot be predicted. I presume that the plan might also be suspended based on the concept of the precautionary principle. OPRF is conducting a research project on the "precautionary principle under the International Environmental Law and the protection of the marine environment."

The Black Sea, viewed from Turkey

I had leave in May through the use of consecutive holidays, and thus was able to take a long-planned trip to Turkey. I traveled across Asia Minor by car for six days. I kept driving for such a long time because I wanted to make a return trip between Trabzon, the capital of the Byzantine Empire on the Black Sea side, and Georgia along the Black Sea. The weather was fine, and the sea was calm. Thinking of the Shonan Coast, I drove at full speed, but ran out of time while driving toward the national border and instead returned at a point forty kilometers from the national border.

The Black Sea is connected to the Mediterranean Sea by the Bosporus Strait. However, because the circulation of seawater is limited to a very small area, a dead zone lies at a depth of two hundred meters or more. Considering the length of the Bosporus Strait, one should not be surprised. However, fish catches are actually high, and many fish are caught in an area at a depth of two hundred meters or less. The sardine dish I had in Trabzon was excellent. In Turkey, it is said that people from the Black Sea area are either fishing people or boat builders. The Black Sea is an almost completely enclosed sea area. The environmental degradation of enclosed bays has become a problem in Japan, but it seems that the problem can be solved in various ways if we take advantage of the analytical investigation into the conditions of enclosed bays carried out in one of OPRF's research projects [4]. I believe positive actions are also possible based on OPRF's research on "the disappearance and prevalence of a dysoxic water mass in enclosed bays."

To realize the Black Sea Ring Highway Project, the highway is under construction along the Black Sea in Turkey, with work proceeding at a rapid pace. The highway runs mostly along a sandy beach. The environment of the area along the Black Sea has been undergoing a transformation due to massive structures, construction waste and dust. It is incomparable to our ongoing efforts to remove waste from beaches [5]. I would like to visit the area again five years from now and see whether the project has achieved "sustainable development [6]."

Conclusion

I travel abroad for various purposes, and I always feel that various issues such as the safety of marine traffic, the marine environment, marine security, resources, fisheries and battles over borders are interrelated. However, it should be remembered that these problems cannot be definitely solved under a vertically segmented administrative system and fixed ideas. Accordingly, I value the opportunity for many people to express opinions from various viewpoints on these issues. ■

1) Petroleum and natural gas development called the Sakhalin Project is divided into nine mining sections, including a coastal area consisting of Sakhalin I-IX. Of those sections, Sakhalin I and II–located on the eastern shore of the northern area–are in operation. Sakhalin II started the production of crude oil in 1999, and its crude oil has been exported to Japan since 2001. Sakhalin I aims to start the production of crude oil at the end of 2005.
2) For information on the OPRF's research project, please visit the official website.
3) Division for Ocean Affair and the Law of the Sea (DOALOS), United Nations
4) Analytical investigation on the conditions of national closed bays
5) Investigative research on the problem of waste in sea and coastal areas
6) Investigative research on marine policy and marine sustainable development

Jewel of the Sea—Precious Coral —Its Appeal as a Research Subject

Nozomu Iwasaki
Usa Marine Biological Institute, Kochi University
(Ship & Ocean Newsletter No.122 September 5, 2005)

Precious coral is familiar to us as an ornamental comb or a Japanese hairpin, but its true image as a living organism is less well known. Precious coral has long been prized by man as an art object, an accessory, and trade good.This is the reason that precious coral is an appealing subject of research in the humanities as well as biology.We began an interdisciplinary study on the appeal of coral, its biology and cultural history.

Precious corals and hermatypes

Speaking of corals, I am sure that many people will imagine a scene of coral reefs in a blue sea populated by colorful fishes. There may be people who think that precious corals are also picked from coral reefs. But corals from coral reefs and precious corals are different living organisms. Taxonomically, the former belongs to the subclass Hexacorallia, and is called hermatypic coral because it forms a coral reef. In contrast, the latter belongs to the subclass Octocorallia.

Both have different modes of life. The distribution depth of the Acropora species, a typical hermatypic coral, is a hundred meters or less. However, the distribution depth of precious corals is deeper than that. A red coral *Corallium japonicum*, from Japan, exists at a depth of a hundred to two hundred meters, and precious corals from Midway are found at a depth of a thousand to fifteen hundred meters. Additionally, symbiotic algae called zooxanthellae live with hermatypic corals, but no algae lives with precious corals. Furthermore, the calcium-carbonate crystals that form the skeletons of the respective corals are different. Hermatypic corals made of aragonite are brittle and easily soluble, but precious corals made of calcite are hard and stable. Both are generalized as a coral, but though they are closely related they're not the same living organism.

The progress of research on the respective corals is different as well. Research on hermatypic corals has proliferated due to growing public concern for the protection of coral reefs. However, research on precious corals–particularly those of Japan–has been delayed, so their growth and reproductive periods are unknown and species without taxonomic names are marketed as products.

Encounter with a precious coral

I became interested in precious corals when I encountered one unexpectedly. In 2001, research conducted by my laboratory with regard to deep-sea animals was compiled as a documentary video called "Life in the Abyss, 4 Years Observations in Nankai Trough, Japan" (Tokyo Cinema Inc.). During the course of production, Dr. Yoko Watanabe (a former professor at Ochanomizu University), to whom I owe much, said that an Italian researcher had been looking for precious coral from Japan, so she asked me how precious coral could be collected. I had heard that precious corals in the Mediterranean Sea are attacked by boring marine sponges, diminishing their commercial value. Because precious corals are mainly collected in the Mediterranean Sea and Japan, the researcher wanted to investigate the distribution of boring sponges in Japan. I asked my colleagues to search for a precious coral, and I asked participants in academic conferences whenever such gatherings were held, but I was not able to obtain any useful information. Meanwhile, I remembered that there were several stores selling corals in the Obiyamachisuji shopping arcade in Kochi. I went through a telephone directory and found that an organization called the All Japan Coral Fishery Association was located in Kochi. I immediately visited the association, and there I was told that bidding on coral was held twice a year in Kochi City, that corals from waters close to Okinawa and Kagoshima were the main items of trade, and that bidding for coral from Kochi was held also in Sukumo City, Kochi Prefecture. Thus it became possible to collect samples of corals in Kochi without imposing on other researchers.


Bidding for corals in Sukumo, Kochi Prefecture

Thanks to the Sukumo Coral Union, I visited a bidding session in Sukumo on September 12, 2003. Boards with casters were placed in a U-shape configuration in a room the size of a classroom, and boxes with corals in them were placed on the boards. Red coral *Corallium japonicum*, pink

Pink coral Corallium elatius, from Okinawa

coral *Corallium elatius*, white coral *Corallium konojoi* and other corals were presented, and there was also a coral called Magai, of a color somewhere between pink and white. Bidders sat around the boards, examined the corals and entered bidding prices in notebooks called *nagecho* (meaning to throw a notebook). Then, to propose bidding prices the bidders literally threw the nagecho to a bid opener who was seated before them. For good-quality red coral, bidding prices went high enough to buy a car. It took less than three minutes to win a bid of corals in a box, so the bidders had to make a judgment on the quality of corals and enter bidding prices instantaneously. I was impressed by the bidders' ability to make such accurate observation. The bidders not only distinguished the quality of the corals but also guessed, based on their delicate colorations, the names of the islands where the corals were collected. While I was looking at the various corals that passed by, I wondered whether a difference in the colors of the corals resulted from the species or reflected the marine habitat. Moreover, various questions such as their reproductive periods and speed of growth came to mind. Suddenly, I had become interested in precious corals. Then, at a bidding held in Kochi City, I was able to obtain a long-sought boring sponge from a coral collected in waters close to Okinawa.

The attraction of precious corals

I promptly sent the boring sponge to Dr. Giorgio Bavestrello in Italy, who was looking for such a marine sponge. There it was found that the marine sponge was the same as a marine sponge (*Alectona verticillata*) discovered in the Madeira Islands (Portugal) in the Atlantic Ocean in 1899. The species had not been seen since it was discovered in the Madeira Islands, and thus it was rediscovered after a hundred years, in the Pacific Ocean, far away from the Madeira Islands.

Many of the people involved in coral told me that not only marine sponges and other creatures but also people in Japan (especially Kochi) and Europe have been connected for more than a hundred years through precious corals. In Japan, it was known in the early 1800s (Edo period) that precious corals could be collected off Muroto in Kochi Prefecture, but it was prohibited to collect them by the Tosa (Kochi) Domain. During the Meiji period, when the ban was lifted, precious corals began being exported to Europe. At around the end of Meiji period, Italian brokers of precious coral visited the little fishing village of Kosaitsuno in Kochi Prefecture. Today there is no one who has first-hand knowledge of the time, but I did meet an eighty-seven-year-old woman and was able to ask about things that her deceased husband used to tell her. Italian people brought fried chicken as food, and when they slept they used two sets of futons because the futons were short. The people of Kosaitsuno have long been involved in coral trading, and some still are today. Thus, a small fishing village in Kochi has been open to the world through precious coral trading since the Meiji period.

In Muroto, where it is said that precious coral was discovered for the first time in Japan, dozens of coral fishing boats still moor for coral fishery. Thanks to the owner of one of the boats, I decided to conduct research on precious corals. I also initiated a research project called "Sustainable Use and Cultural History of Precious Corals" in order to obtain a general understanding of the relationship between precious corals and people. This I did with the participation of biologists, chemists, historians, cultural anthropologists, artists, and others. Biology and culture are related to precious corals, and the history of exchange between the East and the West through precious corals becomes more attractive with time, just as the coral increases in value as a jewel. ■

[Reference material]
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What is the Volume of Japan's 200-nm Exclusive Economic Zone?

Takatoshi Matsuzawa
Researcher, National Maritime Research Institute,Former Research Fellow, Ocean Policy Research Foundation
(Ship & Ocean Newsletter No.123 September 20, 2005)

The ocean, the new frontier, has three dimensions. People tend only to notice its planar extent, but it is time to start paying attention to what lies beneath the surface. That is especially true of the exclusive economic zones defined in the United Nations Convention on the Law of the Sea: these will need to be viewed in spatial terms if they are to be successfully exploited and their ecology protected. The present paper focuses on volume of ocean waters in an attempt to identify the characteristics of waters under Japanese jurisdiction and determine how they compare with those in other parts of the world.

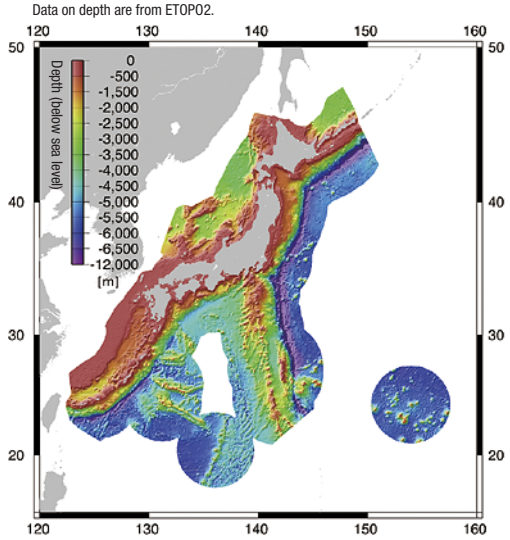
Why volume?

The question of whom the ocean belongs to often arises. Politically speaking, the oceans are parceled out among different countries. The United Nations Convention on the Law of the Sea demarcates, in two dimensions, the waters in which each country can exercise sovereign rights and jurisdiction. In particular, coastal states can declare an exclusive economic zone (EEZ) not to extend more than 200 nautical miles from a defined baseline; here they can claim exclusive rights to exploit fish stocks and other resources.

One often encounters two-dimensional maps showing these 200-mile zones [1], and the question of which countries rank highest by area thereof is a topic of frequent discussion. Countries around the world typically gather planar information on these zones as part of their basic data. In Japan, the Japan Coast Guard supplies the relevant official figures [2].

But the ocean has three dimensions. The utility and exploitability of an area of water differ depending on its depth, and the 200-mile zones of different countries can each be expected to exhibit their own three-dimensional character (see Fig. 1). The ocean is the new frontier, one about to be actively exploited; but as each country goes about developing its own particular 200-mile zone, a basic requirement will be to form a spatial portrait of it. According to the author's investigations, however, few attempts have been made, whether in Japan or abroad, to calculate the volume of any area of ocean water; with respect to 200-mile zones in particular, there appears to exist no worldwide comparison or analysis at all.

■**Figure 1. Japan's 200-mile zone and its depth**
Data on depth are from ETOPO2.



Using a specially developed method, therefore, the author computed the volume of the 200-mile zones of the world's countries, and then attempted a systematic analysis of their spatial characteristics. Although several studies already exist that calculate the volume of a particular country's 200-mile zone or analyze its characteristics in terms of depth, the present study is probably the first in the world to compare the countries of the globe in this regard.

Brief description of the method of calculation used

In calculating the area and volume of a 200-mile zone, several factors interplay: legal conditions, geodetic considerations, the question of the accuracy of the data, and so forth. The truth of the matter is that there are as many potential outcomes as there are combinations of givens. It should therefore be kept in mind that the results presented below were achieved only under a specific set of conditions. The conditions under which the calculations were made were as follows.

• For EEZ boundary data, the Global Maritime Boundaries Database (Aug. 2004) of US company General Dynamics was used; this contains point sequence data on geographical coordinates representing a wide range of boundaries. Data on depth were taken from ETOPO2 [3], a highly advanced two-minute worldwide dataset issued by the National Geophysical Data Center in the United States.

• The geodetic reference system used was WGS84, the Earth being viewed as a rotating ellipse. To obtain area, the surface of the ellipsoid was repeatedly triangulated to the maximum extent possible, and the area of the resulting tiny triangles was then added up. To obtain volume, the cones formed by the tiny triangles and the center of the Earth were used.

• The study covered all member states of the United Nations; for each, a calculation was made for the zone within 200 nautical miles of the baseline as based on its own claims. Claims with respect to overseas territory out-

■Table 1. The world's top ten countries by area and volume of 200-mile zone

Rank	Area of 200-mile zone	(m km²)	Volume of 200-mile zone	(m km³)
1	United States	10.7	United States	33.8
2	Russia	8.03	Australia	18.2
3	Australia	7.87	Kiribati	16.4
4	Indonesia	6.08	Japan	15.8
5	Canada	5.8	Indonesia	12.7
6	Japan	4.46	Chile	12.5
7	New Zealand	4.4	Micronesia	11.7
8	Brazil	3.638	New Zealand	11.4
9	Chile	3.635	Philippines	10.7
10	Kiribati	3.43	Brazil	10.5

(Rankings and figures were obtained under specific conditions.)

side the country's jurisdiction were however ignored.

Because this study concerned itself with the maximum area claimed by each country, waters where several countries' claims overlap were not treated exclusively; rather, waters claimed by (say) two different countries were counted in the totals for both. Thus the figures here presented do not seek absolute consistency in terms of international law.

Japan ranks fourth in the world in the volume of its 200-mile zone

When area and volume were computed under the stipulated conditions, the top ten ranking countries were found to be those listed in Table 1.

Japan ranks sixth [4] in the world for area, but jumps to fourth in terms of volume. This indicates that Japan possesses an extensive area of extremely deep ocean waters. When volume of ocean waters by depth is compared as in Table 2, Japan ranks first in the world in volume of ocean waters over 5,000 m deep. A calculation was also made of the area and volume of ocean that would be lost should Japan's EEZ around Okinotorishima not be recognized. The results were 0.41 million km² of area and 2.05 million km³ of volume. In other words, overall area would shrink by 9% and overall volume by 13%; and while Japan's rank by volume would remain unchanged, it would slip to seventh place in terms of area.

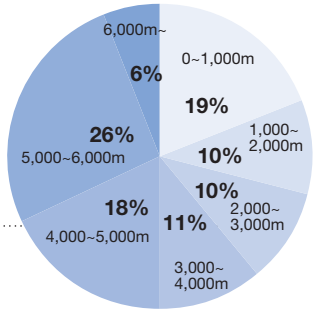
Figure 2 presents a breakdown of Japan's 200-mile zone by depth. As this shows, Japan possesses a nice balance of waters of all depths, from the shallow to the very deep; but also distinctive is the fact that over 60% of those waters have a depth of more than 3,000 m. It is particularly noteworthy that waters deeper than 6,000 m make up 6% of the total; in area of these, the calculations reveal, Japan easily ranks number one in the world, with over twice the area possessed by second-ranking Russia.

What do the characteristics of Japan's 200-mile zone tell us?

The results reviewed above reveal much about Japan's topographical characteristics. We will us leave the geological details to the experts; but what implications do these characteristics have for Japan as a maritime nation? First, there is the potential for tapping the ocean for resources. Interest is focusing particularly on seabed mineral resources like manganese nodules, cobalt-rich crust, and submarine hydrothermal deposits, virtually all of which are found at depths of over 1,000 m. Then there is the possibility of exploiting the space available below the ocean surface. For example, deep-ocean storage of the greenhouse gas CO_2 is gradually becoming a realistic prospect, but it will only be possible at depths of over 3,500 m. In other words, for Japan the attractions of the ocean lie to a large extent in its deeper waters; it would therefore be wise to put more effort into developing the technologies needed to exploit these. Again, few countries in the world can compare to Japan for the sheer depth range of its 200-mile zone, which feature will, one hopes, be taken advantage of in planning various oceanographic surveys.

Given that Japan possesses such a large volume of ocean water, it will also be important to develop ways to utilize seawater as a resource in its own right. Greater attention should focus on technologies, for example, for harnessing differences in seawater temperature to generate power, using deep sea water as a coolant, desalinating seawater, and extracting metals and minerals from seawater. The United Nations Convention on the Law of the Sea, which defines the scope of a country's EEZ, not only grants coastal states the right to exploit waters under their jurisdiction; it also vests them with the duty to manage them. In light of that fact, perceiving the ocean in spatial terms is surely also indispensable to the task of conserving the ocean that now faces humankind. ■

■Figure 2.
Breakdown of
Japan's 200-mile zone by depth



■Table 2. The world's top five countries by volume of 200-mile zone in waters of different depths

Rank	0-1,000m	1,000-2,000m	2,000-3,000m	3,000-4,000m	4,000-5,000m	5,000-6,000m	6,000m-
1	United States	United States	United States	United States	United States	Japan	Japan
2	Australia	Australia	Australia	Kiribati	Kiribati	United States	Tonga
3	Indonesia	Kiribati	Kiribati	Australia	Japan	Kiribati	Russia
4	Japan	Japan	Chile	Japan	Australia	Philippines	Philippines
5	New Zealand	Chile	Japan	Chile	Marshall Islands	Marshall Islands	New Zealand

This paper presents some of the results of the author's research at the Ocean Policy Research Foundation (the Ship & Ocean Foundation).

1) In this paper the term "200-mile zone" is used to refer to the waters between the baseline and the outer perimeter of the EEZ.
2) See http://www1.kaiho.mlit.go.jp/JODC/ryokai/ryokai.html.
3) http://www.ngdc.noaa.gov/mgg/fliers/01mgg04.html.
4) The figure released by the Japan Coast Guard is 4.47. The difference is attributable in part to the fact that our calculations exclude inland waters.

Tsunami-Caused Damage and Restoration

—referencing to the cases of Okushiri Island, hit by the 1993 Hokkaido SW tsunami and Banda Aceh, Sumatra, by the 2004 Indian Ocean Tsunami—

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(Ship & Ocean Newsletter No.129 December 20, 2005)

It is important, when carrying out restoration and reconstruction projects after a disaster, to avoid future ones by including a long-term perspective in planning and implementing preventive measures.
This article introduces restoration works from tsunami-caused disasters and preventive measures against future tsunamis, seeing examples of restoration works from the Hokkaido Nansei-Oki Earthquake of 1993, as well as the ongoing restoration work in Banda Aceh, Sumatra, an area devastated by the Indian Ocean tsunami of 2004.

Introduction

Due to mantle convection in the earth's interior, some plates on the earth's surface move at varying with each speed but slow rates. There are also places as plate boundaries where one plate slips under another plate, so that distortion energy is easily accumulated along the corresponding borders. As a result, marine earthquakes, volcanic activity and landslides occur frequently, directly or indirectly generating tsunamis, causing great damage along coastal areas. Japan is located along such a border. As the result, the country accounts for only two percent of the entire globe, but the number of felt earthquakes accounts for more than twenty percent. Moreover, forty percent of major tsunamis with fatalities in excess of a thousand have actually occurred in Japan. That is why the Japanese word "tsunami" is used worldwide.

Approximately two hundred tsunamis have occurred in coastal area in Japan over the past thirteen hundred years, which were documented in the historical records and books. During that period, a major tsunami recorded in historical documents occurred once every five to six years. The frequency of occurrence of tsunamis is very small in comparison with flooding and earthquakes, therefore it is hard to say that people have a high awareness in regard to tsunamis. We should be reminded that a tsunami is a low-frequency disaster, it is not easy to take measures against it. And, closer look reveals that, in a disaster-stricken area, the wisdom and ingenuity gained from experience with the disaster have been passed on to succeeding generations. These days, highly systemized, modern measures against disasters may be the mainstream, but we should not forget the culture of disaster prevention among people who have been stricken by disasters and lived with the suffering that ensued.

We should also note that a response to disasters develops in a disaster cycle from the time a disaster strikes, proceeding to restoration and reconstruction, and that this cycle results in deterrents against damage and mitigation. In other words, though restoration and reconstruction measures must be taken immediately after the occurrence of a disaster, we can at the same time prevent subsequent disaster-caused damage by planning and implementing measures from a long-term perspective.

An Abrupt and Unpredictable Catastrophic Disaster

A catastrophic disaster occurred suddenly, destroying the peacefulness of life on July 12, 1993. A big earthquake measuring M7.8 occurred to the immediate west of Okushiri Island, Southwestern part of Hokkaido. Five minutes after the occurrence of the earthquake, as people tried to recover from the jolt and shock, a tsunami at least ten meters in height hit various places along the coast of the island. Life became the nightmare of a major earthquake, with landslides, tsunami, fires, and the number of dead and missing reaching 198 on the island alone. At that time, the Japan Meteorological Agency issued a tsunami warning, but only those who had evacuated upland with only the barest necessities right after the jolt were saved, because the earthquake and tsunami occurred almost simultaneously.

The Sumatra Offshore Earthquake of December 26, 2004 was a much worse disaster. The coastal area in the Indian ocean had been struck by earthquakes and accompanying tsunamis, but nobody could remember that a great earthquake measuring M9 and a massive tsunami causing damage to the entire Ocean, like the Sumatra Offshore Earthquake, had previously occurred. It was reported that the first tidal wave struck the northern coast of Sumatra Island within ten to twenty minutes after the strong ground-quake. The tsunami run-up height was thirty meters or more along the western coast, and five to ten meters in Banda Aceh city, a plat area in the northern region where its destructive energy was beyond imagining: A run-up area of ten kilometers or more, a vanished coastline of one to two kilometers in width. The total casualties of more than 150,000 in Indonesia, and the complete destruction of residential areas. Banda Aceh–where 70,000 people out of a popula-

tion of 260,000 were victimized–suffered the worst damage.

What is restoration?

There are four major stages for recovery from a disaster: the provision of a shelter for the reconstruction of one's life; the establishment of connections for independence and cooperation; the construction of a community; and the recovery and improvement of mental and physical health. To accomplish a recovery, a well-thought out plan and concrete supportive measures are essential. On Okushiri Island, recovery was implemented from an individual basis on up to a community basis, and from an industrial basis to the basis of daily activities. The man-made ground (see photo at right) has attracted attention as a multipurpose facility. It is a flexible facility because it can be used as a parking space, a place to store fishnets, an assembly place open to the public at normal times, and as a shelter in the event of an emergency.

Donations from all over the country, Japan, served as a major driving force in the restoration and reconstruction. For the Sumatra Offshore Earthquake and Tsunami, enormous amounts in donations and contributions were sent from volunteers in countries around the world, but it is said that only a limited amount was available for local communities to use freely and independently. It seems that the situation of the countries affected by the Sumatra Offshore Earthquake and Tsunami differed significantly from that of Okushiri, in that they had to accommodate the wishes of the donor countries.

Restoration of Banda Aceh

Currently, a restoration project is under way based on a basic plan issued by the Indonesian Government in April 2005. Though great support has been provided domestically and globally, there is a long way to go in terms of recovery. It is said that foreign aid decreased drastically six months after the occurrence of the disaster. It will take several years to several decades for residents' lives and communities to be restored, so long-term support is essential. We would like to mention that the following emergency support has been provided from Japan through the Japan International Cooperation Agency (JICA). First of all, as an effective tool with which to formulate restoration and reconstruction plans, a database was established through the use of a GIS (Geographic Information System). Detailed data and information on land and geographic conditions, the conditions of the approaching tsunami, and the conditions of damage caused by the tsunami are being added to degital maps in cooperation with Syiah Kuala University in Banda Aceh. Lastly, emergency measures

Conditions of the Banda Aceh coastal area (photo taken on September 23, 2005). Rubble and debris still remains, and people live amid it.

Man-made ground constructed at the port of Okushiri Island (The man-made ground can be used for parking and events activity in ordinary day as well as for evacuation from tsunamis.)

have been taken. In Banda Aceh, the system for water supply and distribution has been restored, as have two public orphanages, and the suspended function of radio stations and equipment due to the earthquake was restored. In July 2005, a support was provided for a regular radio program concerning disasters awareness and prevention. In the program, experts provided appropriate information and consultations for the community, and replied to the questions of residents who felt insecure amid the aftershocks.

Disaster prevention plan in harmony with the environment

In the future, it will be essential to devise means of improving local capabilities for disaster prevention by making use of the inherent functions of nature. In fact, we can draw a lesson from the disaster control projects implemented by our predecessors in Japan. Measures that consider coexistence with nature without controlling the natural forces are effective even now. Particularly in terms of countermeasures against tsunamis, flood-control forests found in various coastal areas are widely used. Vast flood-control forests in a belt-like configuration have been created as a result of our predecessors' long years of hardship and efforts. For instance, in 1667 trees were planted by Mokunosuke Kanno for Takatamatsubara in Rikuzentakata City, Iwate Prefecture, Japan. Later, in 1896, when the Meiji-Sanriku Tsunami occurred, and in 1933 when the Showa-Sanriku Tsunami occurred, the flood-control forest was effective in limiting the area of flooding and damage to buildings and in saving lives. Similarly, it was reported that mangrove forests helped mitigate damage to areas behind the forests in Indonesia and Thailand, in the case of the 2004 Indian Ocean tsunami. ■

Further Recommendations for a Japanese Ocean Policy

Tadao Kuribayashi
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(Ship & Ocean Newsletter No.130 January 5, 2006)

Major countries throughout the world have begun formulating and implementing ocean policies as a means to deal with the new international ocean regime that is centered on the U.N. Convention on the Law of the Sea.
To rectify the negative effects of a compartmentalized decision-making process (which is the underlying cause of Japan's conspicuously obvious delays) and to conceive the structure of an administrative agency for comprehensive, systematic policy making, Japan's basic policy should be based on the concept of ocean governance.
This article introduces the major points in the recent recommendations by the Ocean Policy Research Foundation (OPRF).

Ocean and Japan–Proposal for a 21st Century Ocean Policy

OPRF's Ocean and Coastal Zone Research Committee compiled "Ocean and Japan: Proposal for a 21st Century Ocean Policy," and published it in November 2005. The proposal integrates the findings of research conducted successively following "Ocean and Japan: Proposal for Japan's 21st Century Ocean Policy," which was prepared and published in 2002 by the Ocean Management Study Group (Nippon Foundation).

The latest document proposes that Japan should elaborate upon the content of the National Ocean Policy Guideline for the promotion of a comprehensive ocean policy, doing so based on the proposal made in 2002, and that it should promptly initiate the formulation and implementation of Japan's integrated ocean policy according to a basic philosophy consisting of three concepts: "sustainable ocean development," "leadership in the international ocean regime and international coordination," and "comprehensive ocean management."

The proposal includes the formulation of a new Basic Ocean Law that has not yet been formulated in Japan, as well as the fundamental provision of administrative organizations that would take charge of formulating and implementing a comprehensive ocean policy (specifically the provision or appointment of ocean-related ministerial meetings, an Ocean Minister, a section for controlling the ocean policy in the Cabinet Office–with an officer in charge of ocean policy–and an ocean council). The proposal also identified various important issues that Japan should work on, such as the establishment of a framework for the management of exclusive economic zones (EEZ) in seas around Japan; the continental shelves; the establishment of ocean security; the protection, conservation, and regeneration of the marine environment; the development of ocean resources in consideration of ocean ecosystems; more efforts for the establishment of a comprehensive coastal management system; the prevention and mitigation of disasters; the provision of information for ocean management; and the promotion of research, training, and outreach efforts. (Please refer to the opening article of this Number for an outline of the proposal.)

As one who is involved with the Committee's work as its head, having served successively since the previous research effort, I would like to take this opportunity to thank all the committee members who were actively involved in preparing the proposal, along with the OPRF staff who provided their dedicated support. Next, I would like to explain why we ventured another proposal for a Japanese ocean policy, and include my personal views as well.

Formulation of an ocean policy suitable for the twenty-first century

Concerning the international ocean regime that has developed rapidly based on the U.N. Convention on the Law of the Sea, which came into force in 1994 (agreed upon in 1982 and ratified in Japan in 1996), each country has been responding with originality and ingenuity, and the U.S. and many other countries have begun formulating and implementing their respective ocean policies. In comparison, Japan has generally lagged behind in improving its legal system and other aspects in the field of ocean policy, and it is believed that the delay has been due to the fundamental lack of a national system that can formulate a comprehensive ocean policy. As a result, Japan does not have its own comprehensive ocean policy. Ocean problems in today's Japanese society, as well as the world, are interlinked in complicated ways, so comprehensive efforts are increasingly needed.

Though the overall comprehension of ocean problems, the awareness of their interrelatedness, and the necessity for comprehensive ocean management have often been emphasized and recommended in international writing and various international forums, the vertically compartmentalized Japanese administrative system has not seriously

responded to the world's shared awareness and needs. Even now, Japan remains unable to make a sufficient response. At the time of publicizing the previous proposal, I made the following urgent statement in the *Ship & Ocean Newsletter*: "People's consciousness of the order of the sea must be reexamined in the twenty-first century, the harmful results of bureaucratic sectionalism must be remedied, and the framework for formulating and implementing ocean policy must be fundamentally reconsidered. Otherwise, Japan will fall behind the international order on the ocean and find itself unable to make an active contribution to international cooperation concerning the use of the ocean." ("Be the Country that Leads the World in the International Order on the Ocean," Ship & Ocean Newsletter No. 41, April 20, 2002). However, these issues have not been resolved; instead our concern grows more intense.

Despite the fact that efforts have been made by certain ministries and agencies in response to the era of the two hundred-nautical-mile economic zone, and some actions been taken by communicating and coordinating between related ministries and agencies in regard to specific ocean problems, Japan's decision-making process for ocean policy has not basically changed since the end of World War II. The formulation and implementation of a truly comprehensive, systematic ocean policy has been hampered by vertically compartmentalized administration, ministerial rivalries, inefficiencies such as delays and redundancy in policy making. This has been partly due to the vertically compartmentalized systems of the governmental, industrial and academic sectors, and partly due to the negative effects of the ambiguity of decision-making bodies and responsible parties. In disclosing information on ocean affairs, and by fulfilling our obligation to be accountable, we must set aside our usual practices, which are passive and conservative. For all the issues Japan is facing, including the ocean environment, resources, traffic and security, there are numerous international and domestic problems that Japan must urgently resolve. We must acknowledge that it is beyond the capabilities of the current system to thoroughly comprehend and analyze Japan's position and respond proactively to these problems within the current ocean regime, which is based on the shift from the traditional "freedom of the seas" to the new "management of oceans" paradigm. We can no longer say, "We have been able to manage somehow." Unless we change, we will be caught in our own system, and capable persons in the field of administrative practice that deal with ocean problems will be unable to exercise their abilities.

To recover from this seriously backward situation, it is strongly urged that the structure of an administrative agency for systematic and comprehensive policymaking, as suggested in the latest proposal, will be promptly conceived, and that a basic policy for coexistence of mankind and the oceans will be set forth as a national goal of the twenty-first century so that Japan, as an ocean state, can respond to its domestic ocean problems and also play an active role in the formation and development of the ocean regime in international society, especially that of Asia. We expect that the national debate on the future relationship between Japan and the oceans will continue to grow. Further, it is hoped that those in charge of formulating and implementing Japan's ocean policy will value the intention of this proposal, and take the initiative on behalf of its early realization. ■

On Becoming a True Ocean State

Hiroshi Terashima
Executive Director, Ocean Policy Research Foundation(OPRF)
(Ship & Ocean Newsletter No.130 January 5, 2006)

Today, in the early twenty-first century, and in the ocean that determines the fate of maritime Japan, the ocean regime and policy frameworks that address the issues of natural resources, the environment, security and safety are experiencing major changes, and various countries around the world are steadily implementing measures for ocean management based on a new international framework. However, Japan lags behind when it comes to comprehensive ocean management. Therefore, this article proposes we promptly formulate a National Ocean Policy Guideline in order to improve our political policies and structures, including the appointment of an Ocean Minister, with the goals of establishing a Basic Ocean Law and promoting the management of Japan's expanded ocean area.

1. Structural Changes and the Ocean

Japan, which is surrounded by the ocean, enjoys the bounties of abundant marine products, along with transportation and trade routes. Moreover, the country developed with the ocean as a natural shield. Today, however, in the early twenty-first century, the ocean environment that affects the country's future is undergoing major structural changes–including natural conditions, such as resources and the environment, but also the legal system and policies concerning ocean management–and a response to these changes has become a major issue.

The ocean accounts for seventy percent of the earth's surface. It is a huge area, and 149 countries border the ocean. Additionally, the ocean is filled with water, so it is highly unified., and its phenomena are closely interrelated, so ocean problems almost invariably take on an international aspect. Accordingly, in recent years, as shared awareness increases that problems of the oceans need to be considered as a whole and managed comprehensively [1], international society has undertaken far-reaching ocean initiatives.

The U.N. Convention on the Law of the Sea, otherwise known as the "Ocean Constitution," came into effect in 1994, and typifies the change in the legal system. As part of that law, an exclusive economic zone (EEZ) and continental shelf system was established giving coastal states jurisdictional rights over a vast ocean area of two hundred nautical miles from shore. UNCLOS not only greatly increased the areas over which coastal states have jurisdictional rights, but also introduced a new framework concerning ocean resource management and the protection and conservation of the ocean environment.

At present, we are seeing the direct impact and problems of this new ocean regime through the overlapping of exclusive economic zones and continental shelves between neighboring countries. This problem can be seen around the world. A Japan-China dispute over petroleum and gas fields in the East China Sea originates from the problem of border demarcation related to the reorganization of ocean areas, and underlying this is the competition between neighboring countries that attempt to take advantage of the changes in the international framework concerning ocean area management for their national benefit. The ocean is no longer a neutral buffer zone, and we have entered a new age where we face each other directly, across a national border set on the ocean [2]. Japan needs to fully recognize these changes. It must address the issues of natural resources, the environment, security and safety in the ocean.

The structural change regarding the ocean is also apparent in policies on the environment and resources. The natural environment and resources in ocean and coastal areas have been badly damaged due to human activities supported and activated by the technologies of recent years. It is said that eighty percent of ocean contamination is land-based. Because of this, in 1992 the "Agenda 21" action plan for sustainable development was adopted and respective countries agreed to the action plan for seven program areas in Chapter 17 of the Agenda in order to promote the "sustainable development" and "comprehensive management" of the ocean. Ten years later, in 2002, the World Summit on Sustainable Development (WSSD) [3] formulated the WSSD Plan of Implementation for their further promotion, and requested that each country implement the plan.

We now frequently encounter abnormal weather and sea level rise due to global warming, natural disasters such as tsunamis and tidal waves, and man-made threats such as maritime terrorism, piracy, and spy ships. Therefore, responding to various threats in ocean and coastal areas has emerged as an urgent issue both domestically and globally.

2. Japan's Response and the Proposal for a 21st Century Ocean Policy

To deal with these structural changes, various countries across the world are now steadily implementing measures for comprehensive ocean management based on the newly established international framework. Australia, Canada, the U.S., the U.K., Korea, and China have taken the initiative

in doing so. However, Japan is unfortunately trapped by its conventional view of the ocean, as well as by a vertically compartmentalized state system based on that view. Therefore, little effort has been made in regard to comprehensive ocean management initiatives. If nothing is done, it is likely that Japan will be left out of ongoing worldwide initiatives in ocean affairs, and thereby lose a base for its development.

OPRF has been concerned about this delay in Japan's comprehensive ocean management initiatives. It has been actively discussing Japan's ideal ocean policy for more than two years with experts in many fields related to the ocean, with support provided by the Nippon Foundation. OPRF compiled the results of our discussions as a "Proposal for a 21st Century Ocean Policy," submitted it to the then Chief Cabinet Secretary Mr. Shinzo Abe, and made it public. (For the proposal, please refer to http://www.sof.or.jp)

Based on the Proposal for Ocean Policy made by the Nippon Foundation in 2002, the Proposal for a 21st Century Ocean Policy integrates the subsequent progress made both at home and abroad, along with the results of research on ocean policy. It was compiled into a concrete proposal as a comprehensive policy concerning comprehensive ocean management and sustainable ocean development. I would like to express my gratitude to Dr. Tadao Kuribayashi, chair of the Council, and all the council members who put forth the hard work needed to prepare the proposal.

As a basic philosophy for Japan to become a true ocean state, the Proposal for a 21st Century Ocean Policy advocates "Sustainable development and utilization of the ocean"; "Leadership in the international ocean regime and international coordination"; and "Comprehensive management of the ocean." Moreover, it requests the formulation of a comprehensive ocean policy following the proposal and the immediate start of policy implementation. The following are the main points of the proposal:

(1) Formulation of a National Ocean Policy Guideline

To steadily promote a comprehensive ocean policy in Japan, the first thing to do is to specify the important matters to work on in the future and compile them as a National Ocean Policy Guideline. The National Ocean Policy Guideline should include the manifestation of the basic philosophy on ocean policy; the provision of a framework for promotion of the ocean policy, including the Basic Ocean Law and administrative organizations; the reinforcement of measures for resolving issues; the reinforcement of partnerships; and the promotion of understanding, research and education regarding the ocean.

(2) Provision of a promotional system aiming for the establishment of a Basic Ocean Law

In Japan, various issues concerning the ocean have been handled under vertically compartmentalized and individually purposed positive laws, so the country lacks a policy framework and legal grounds for comprehensive ocean management. To deal comprehensively with ocean problems, a Basic Ocean Law should be established promptly. Considering the present situation, in which the lack of a governmental agency responsible for promoting comprehensive ocean policy poses an impediment, the improvement of administrative organization (including the appointment of an Ocean Minister) must be made immediately.

(3) Management of Japan's Expanded Ocean Space and International Cooperation

To fulfill the rights and obligations in Japan's ocean area based on the new ocean regime, it is necessary to formulate and comprehensively and systematically implement a concrete policy regarding the management of Japan's expanded ocean space, as well as in regard to international cooperation. Therefore, the proposal proposes concrete measures in regard to eight items, including the establishment of a framework for the management of the exclusive economic zone and continental shelves, and the establishment of ocean security.

Japan should take the recent structural changes regarding the ocean seriously and immediately review its policy as an ocean state. In pursuit of its goal of becoming a true ocean state, Japan should demonstrate its leadership and establish an ocean policy in response to the needs of the times that would serve as a model to others.

I earnestly hope that this proposal will be accepted by those in charge of state affairs, related ministries and agencies, as well as by people from various fields and walks of life, and that initiatives for comprehensive ocean management and sustainable development will be undertaken as soon as possible. ■

1) Preamble of the U.N. Convention on the Law of the Sea

2) Strictly speaking, the exclusive economic zone (EEZ) is not a national territory but a ocean area falling under functional jurisdiction for a specific purpose. However, considering that wide power is given to coastal countries, the exclusive economic zone conceptually contains an element of territorialization ("Modern International Law," Tadao Kuribayashi, p. 292), and many countries are heading in that direction.

3) World Summit on Sustainable Development (WSSD): To mark the 10th anniversary of the Rio de Janeiro Earth Summit, the World Summit on Sustainable Development was held in Johannesburg, South Africa, in 2002 with the attendance of leaders from various countries and numerous nongovernmental organizations. The WSSD Plan of Implementation was adopted there.