algae and hydroids.

4) A shortened generation length of ca. 1 to 3 months, with lack of planktonic larval stages.
5) High biomass in algal communities and in aquaculture constructions.

Concentrations of BTs in seawater samples indicate the presence of "hot spot" with higher values of BTs than closed areas in a small distance. The high concentrate accumulations of BTs were found in certain lower trophic level of the food web; BTs accumulated in plankton (mostly phytoplankton), *Caprella* spp., and some of smaller fish such as gunnels were estimated up to 70,000 times higher than seawater. However, no considerable biomagnification was observed for BTs through higher rophic level. The comparison of BTs profiles between *Caprella* spp. and gammarid amphipod that *Caprella* spp., which indicated higher concentrations of BTs, accumulated TBT at the predominant compound among BTs. These results lead a hypothesis that *Caprella* spp., have a less capacity to degrade TBT and therefore accumulate BTs at elevated levels.

The experiments on the acute toxicity of TBT to *Caprella* spp. and gammarid amphipods from Otsuchi Bay were conducted. The results indicate 48 hour LC_{50} of *Caprella* spp. in 1.2 to 6.6 μg TBT/L, are significantly lower than gammarid amphipods in 17.8 to 23.1 μg TBT/L. The analysis on the specimens which were collected together with individuals for the experiments shows that *Caprella* spp. contain more than 65% of TBT which is close to TBT content of the seawater collected from the hot spot, while gammarid amphipods do less than 30% of TBT. Thus, the results support the above hypothesis.

The characteristics, especially reduced movement ability and a shortened life-span of less than 3 months, indicate that *Caprella* spp. may be well-suited for monitoring butyltin residue changes over small spatial and temporal scales. Two groups of organisms, mussels and neogastropods, which have been predominantly used for monitoring butyltin in shallow water ecosystems, mainly inhabit the intertidal zone where the butyltin levels vary widely depending on the immersion period and exposure to the sea surface microlayer. Moreover, monitoring using neogastropods has a possibility of over estimation after the restrictions on TBT, since neogastropods show an irreversible response to residue changes owing to their long life-spans. Thus, we propose the suitability of using *Caprella* spp. to monitor temporal and spatial changes in baseline concentrations of butyltins.

Activities of the Center for International Cooperation

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Our Ocean Research Institute, the University of Tokyo has a long tradition of active participation in various international cooperation research program since its foundation in 1962. The Center for International Cooperation belonging to the Ocean Research Institute, was established in 1994 in order to enhance international cooperation in the field of Marine Science. The center is composed of two divisions: research planning division and research cooperation division. The main task of the research planning division is to plan, coordinate and manage international cooperation programs such as JGOFS (Joint Global Ocean Flux Study), ODP (Ocean Drilling Program), GLOBEC (Global Ecosystem Dynamics), GOOS (Global Ocean Observing System), WESTPAC (IOC Sub-commission for the Western Pacific) and etc. The research cooperation division tries to coordinate academic exchange programs and to establish networks among various countries. There are many on-going international projects related Living Marine Resources such as HAB (Harmful Algal Bloom), Global Coral Reef Monitoring Network, Biodiversity and Large Marine Ecosystem in the WESTPAC area. Utilization of IODE (International Oceanographic Data & Information Exchange) system is necessary in order to advance efficiency these projects.

The Japan Society for the Promotion of Science carries out a variety of international and domestic programs. The Core University System is one of major international program and includes Scientist Exchanges, Cooperative research and Scientific Joint Seminar. Our Ocean Research Institute is Core University in the field of Marine Science, and 20 cooperating universities from all over Japan and National Science Museum support this program. The Core University System between Indonesia, Thailand, Malaysia and Japan was launched in 1989, 1989 and 1991, respectively. More than 300 Japanese scientists visited to Indonesia, Thailand and Malaysia by this program and the same number of scientists invited from these countries during the past 10 years. The Marine Pollution and Red Tide are major research topics in each country. In the case of Biodiversity, we stared two cooperative researches titled "Biodiversity Studies in the Eastern Indonesian Waters" and "Studies of coral reef ecosystems biodiversity in the Malaysian waters" from this year.

The Fourth International IOC/WESTPAC Scientific Symposium was held in Okinawa, Japan, February, 1998 as the first big event of the International Year of the Ocean. About 180 scientists from 14 countries participated in the symposium. A total of 80 papers were presented in the symposium and 20 papers in the Chemistry and Biology Sessions were mainly concerned with the Pollution.

The Global Investigation of Pollution in the Marine Environment which we call GIPME, is an international cooperative program of scientific investigations focused on marine contamination and pollution. GIPME was established in 1976 in response to the recommendation of the United Nations Conference on the Human Environment in Stockholm in

1972. Regional Programme for the prevention and Management of Marine Pollution in the East Asian Seas, is important in the framework of the GIPME. This Programme has supported over 1000 scientists from the 11 countries since 1995. Over the past five years a total of twenty-five training courses and workshops related to the Marine Pollution, have been organized.

The East Asian Seas is recognized as having the world's richest biodiversity, supporting one-third of the world's coral reefs and mangroves and producing 40% of the world's fish catch. However, it is becoming increasingly evident that these valuable resources are threatened by pollution and other economic activities.

Environmental governance for marine and coastal issues

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There is a complex relationship between human activities and the marine and coastal environments. A number of human activities and economic ventures have a strong reliance on the marine and coastal resources. Conversely, a vast majority of anthropogenic activities impose a burden on the global marine resources. On the whole, oceans and seas have numerous functions that are essential to both ecosystem health and human society.

Our priorities and actions in the field of coastal and marine issues are guided by Agenda 21, which was adopted at the United Nations Conference on Environment and Development (UNCED—Rio de Janeiro, June 1992). It provides a blueprint for the international community to chart its way towards sustainable development of marine and coastal resources. The Agenda 21, Chapter 18 on '*Protection of Oceans, All Kinds of Seas, Including Enclosed and Semi-Enclosed Seas, and Coastal Areas and the Protection, Rational Use and Development of Their Living Resources*' starts with the following statement:

> "The marine environment—including the oceans and all seas and adjacent coastal areas—forms an integrated whole that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development"

The items covered under Chapter 18 are typically divided into two broad categories: coastal issues and marine/ocean issues. In some cases—such as for small island states—the two may be indistinguishable. This chapter also identifies the difficulties and obstacles in achieving this integrated approach. For example, it pinpoints the potential problems in the management of high-seas fisheries, including the adoption, monitoring and enforcement of effective conservation measures. Fishing fleets operating in international waters are utilizing inappropriate and indiscriminate fishing methods resulting in over-harvesting of living marine resources, frequently species, such as dolphins, that were not targeted. Similarly, monitoring and preventing marine pollution at high seas from sea-based sources, including dumping of hazardous wastes, is very difficult.

Coastal zones the world over, approximately 40,000 km in length, are particularly vulnerable to human influences. These are the areas where urban growth is the fastest, resulting in excessive stress on the natural resources. Encroachment of human activities by way of building, changing land-use, tourism, and pollution from both industry and agriculture all strain the natural coastal ecosystems. In particular, these developments are rapid and difficult to manage in the developing countries due to relatively uncontrolled population growth and limited infrastructure, financial and manpower resources.

In marine issues, the most significant and long-term threat from human activities is to the marine living resources, which include fisheries, mammals and coral reefs. Fish account for about 20 percent of the protein in human diet and about 80 million metric tones are used for human consumption each year. Fishing and related industries are an important component of the global economy. However, over-fishing has placed most of the world's fishing stock under high stress. Marine mammals are particularly threatened as a result of increased levels of pollution in seawater. It is found that various persistent organic pollutants have been accumulated through the food chain to a great extent in the marine mammals. Another component of the delicate marine ecosystem are coral reefs, which play an important role as carbon dioxide sinks and provide habitat for a wide variety of fish and marine fauna. High pollution levels and increasing water temperatures have led to bleaching of the coral reefs and their ultimate death. This effect is also indirectly linked to the global warming as a result of increase in greenhouse gases and stripping of the ozone layer.

Until the recent past, oceans were considered to be inexhaustible sinks, where wastes and other pollutants could safely be dumped without any concerns about significant adverse effects. However, it has been duly recognized that marine and coastal environments are strongly impacted by human activities and that the substances released into oceans through anthropogenic sources can unfavourably alter the chemical composition of seawater. Although "intentional" pollution poses a severe threat to coastal and marine environments, accidents have also made a very significant contribution to deterioration of coastal zones. Examples of large-scale oil spills, like the *Exxon-Valdez* spill in Alaska have become quite commonplace. Unfortunately, Japan has also suffered its share of oil spills in its territorial waters. The worst accident was in January 1997, when the Russian tanker, *Nakhodka*, broke up in the Sea of Japan and the fuel oil present on the vessel polluted the coast of nine Japanese prefectures.