

CIC NEWSLETTER

*Center for International Cooperation (CIC)
Ocean Research Institute
The University of Tokyo*



Activities of CIC



Makoto TERAZAKI

Professor

Director of Center for International Cooperation

The Center for the International Cooperation was established in June, 1994 in order to enhance international cooperation in marine science. Human society is facing crucial problems relating to its future such as global environmental deterioration and crisis in marine resources. Marine science should provide important guidelines for the future of the global community and the needs for international cooperation in this field thus become increasingly large.

The Ocean Research Institute, the University of Tokyo has a long tradition of participation in various international cooperation research programs since its foundation in 1962. At the same time, we have contributed to promote exchange programs between various research institutions, especially within Asian countries through funding provided by the Japan Society for the Promotion of Science. It is our recognition that we have to enhance these activities toward the 21st century. This is the main purpose of the establishment of the center.

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 studies includes Ocean Drilling Program (ODP), Inter Ridge, Global Ocean Observing System (GOOS), Joint Global Ocean Flux Study (JGOFS), Global Ocean Ecosystem Dynamics (GLOBEC) and etc.. The research cooperation division tries to coordinate academic exchange programs and to establish networks among various countries. The Ocean Research Institute is acting as the core university of the collaboration in the field of marine science with Indonesia (since 1988), Thailand (since 1989) and Malaysia (since 1991). More than 400 Japanese scientists were dispatched to carry out their cooperative researches to these countries and we also invited same number of Asian scientists by JSPS Core University Program.

Our center has invited Prof. X. Le Pichon (France), Dr. John R. Paxton (Australia), Prof. Nail Hazon (United Kingdom), Prof. Ian S. F. Jones (Australia), Prof. Roger L. Larson and Dr. V. R. Nair (India) as foreign visiting professor and Prof. Yasuhiko Naito (National Inst. Polar Res.), Prof. Kunio Rikiishi (Hirosaki Univ.), Prof. Itaru Koizumi (Hokkaido Univ.) and Prof. Masao Minagawa (Hokkaido Univ.) belonged to the center as domestic visiting professor.

The center contributed to the management and operation when the Third Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-III) was held in February 1996 in Tokyo and the Fourth WESTPAC International Scientific Symposium titled "Role of Ocean Sciences for Sustainable Development" was held in February 1998 in Okinawa. The center made our efforts to establish the Academic Exchange Agreements with Southampton Oceanography Center, the University of Southampton in January 1998 and Lamont-Doherty Earth Observatory, the Trustees of Columbia University in New York in March 1999.



From ODP to IODP -a new era of ocean drilling-

Asahiko TAIRA

Professor

Center for International Cooperation



The natural rhythms of Earth's climate, biogeochemical cycles, plate motions and volcanism vary on a variety of time-scale influenced by the causes both from the exterior and the interior of Earth. Understanding of this dynamic system poses an urgent challenge in order to obtain scientific guidance toward sustaining our society in the next century. Ocean Drilling Program (ODP) took this challenge.

For the last 15 years, ODP has provided excellent scientific achievements that are impressive by any standard. From 1999 to 2000, ODP delivered a new scientific direction toward one of its important goals: understanding of plate subduction dynamics and seismogenesis. This goal also has been a major concern for the Japanese scientific community for a long time and it is natural that we took an initiative in advancing our stride toward this goal. On Leg 186 in the Japan Trench forearc drilling, two long-term geophysical monitoring systems including seismo-, strain- and tilt-meters were installed for the first time in the history of earth

science. Leg 190 drilled six sites in the Nankai accretionary prism and revealed astounding rapid growth of the prism and phenomenal stratigraphic control of the plate boundary horizon. Furthermore, three legs are now planned in 2000 to 2001 to concentrate our effort on subduction dynamics and mantle tomography of the western Pacific.

The current phase of the ODP extends to 2003. Beyond this, international communities are planning to initiate a new, extended and powerful drilling program called IODP (Integrated Ocean Drilling Program). Central to this new program is a riser-equipped super drilling vessel. The construction of this vessel started this year under the funding of Science and Technology Agency and will be operated in the future by Japan Marine Science and Technology Center (JAMSTEC). The leadership provided both by JAMSTEC and Ocean Research Institute of the University of Tokyo thus will steer the program into a new era of scientific ocean drilling in which the role of this center will become significantly larger.



ODP's drilling vessel JOIDES Resolution at the Nankai Trough on Leg 190 (June, 2000).
Photo shot by A. Taira

My Impressions of Ocean Research Institute and Japan



Vijayalakshmi R. NAIR

Visiting Professor (June - August, 1999)

National Institute of Oceanography

Regional Centre, Mumbai-400 061, India.

I joined Ocean Research Institute (ORI) on 1 June 1999 to begin my term as a Visiting Professor for three months under the International Cooperation Scheme. I could profitably utilize my tenure to do productive research on Chaetognaths, a very common constituent of marine zooplankton. The collections of ORI from the Indian Ocean taken by RV Hakuho Maru during the World Expedition in 1989 – 90 and those from the Rodriguez Triple Junction Expedition in 1993 were placed at my disposal. The research plan involved mainly an evaluation of the community structure of chaetognaths in the Indian Ocean. The distributional range of different species of chaetognaths in the tropical and subtropical realm of the Indian ocean, stratification, effect of mesh on catch efficiency were a few other aspects which gave convincing information on the group.

The excellent facilities at ORI with good quality microscope, a well equipped laboratory and computer provided a very congenial environment for conducting research. The pleasant and calm atmosphere helped me to devote the time exclusively on problems I was pursuing without any distraction. The library has very good collection of books, journals and reports on different disciplines of Oceanography. Freedom to come and work any time was an added attraction. All these facilities collectively helped me to achieve maximum output within a short span of three months.

During my stay I could travel around Japan and visit some of the leading research institutions. I visited the University of Tokyo at Hongo Campus, University of Kyoto, University of Hiroshima and University of Mie. These visits provided an opportunity to meet and discuss current problems in marine biology, to get acquainted with the ongoing projects, and above all benefit by way of exchange of ideas. I could meet scientists and graduate students. Some graduate students approached me for getting information and suggestions on the themes currently handled by them. It was a

pleasure to go through the results of some of the investigations carried out by the graduate students and suggest suitable improvements.

The problems relating to accommodation, banking and travel faced by me during my stay, were deftly solved by the staff of ORI. Also, I found the Japanese to be very polite, considerate and hospitable. Though a vegetarian, I could find a variety of food items and enjoyed eating outside. I had also the privilege and opportunity to relish the typical Japanese food especially from the mountainside of Kyoto and Hiroshima. During the period of my stay I met many people, learned a lot about Japanese culture and society. The National Museums in Tokyo and Kyoto have collections of archaeological items, sculptures, paintings, textile art, lacquer ware, metal work, ceramics, etc. from ancient to early modern period. The National Science Museum exhibits the scientific achievements of the world and Japan in particular.

The Government of Japan has been magnanimously providing opportunities to scientists from other countries to visit Japan and undertake research. Some scientists from The National Institute of Oceanography, India, the Institute to which I belong, had utilized such opportunity to obtain doctorate degree from ORI. The Center for International Cooperation is playing a significant role in improving international relations towards the cause of advancement in marine scientists. I wish and hope that such joint international collaborations in various fields of Oceanography between ORI and Institutions in India and other countries will be continued to attain excellence in ocean sciences.

I am grateful to The University of Tokyo for offering me this opportunity to do collaborative research at ORI. I thank Prof. K. Taira, Director of ORI for extending all help and facilities. I am indebted to Dr. M. Terazaki, Director of The Center for International Cooperation for his kind help and support during my tenure at ORI and also to make my stay very comfortable in Japan.



ICIWP'99

-International Conference on IODE (International Oceanographic Data and Information Exchange) in the Western Pacific -

ICIWP'99 (International Conference on IODE in the Western Pacific) was held in Langkawi, Malaysia, November 1-4, 1999. The conference was jointly coordinated by IOC (Intergovernmental Oceanographic Commission), JODC (Japan Oceanographic Data Center), and related organizations in Malaysia and Japan, with a view to enhancing the IODE activities in the regional basis of the Western Pacific, being attended by more than 130 participants from 14 countries (Australia, China, France, Indonesia, Japan, Malaysia, New Zealand, Philippines, Rep. of Korea, Russia, Singapore, Thailand, U.S.A and Viet Nam).

A scientific seminar was convened for the first two days of the conference to review needs for oceanographic data and the current situation in the region with regard to oceanographic data exchange, followed by a workshop for the latter two days to discuss on the future actions to improve the data system in the WESTPAC region.

Prof. Terazaki of CIC was invited to the

conference as an expert of marine biology. He chaired a session for 'Living Marine Resources – Data Requirements, needs & Products' and presented a paper entitled 'Utilization of Biological Data for IODE system in the WESTPAC area' as the keynote speaker of the session. In his paper, he reviewed the recent progress in marine biological studies in the WESTPAC region, summarized growing needs for oceanographic data and encouraged WESTPAC member countries to establish more workable data exchange system, particularly for marine biological data which was not well exchanged. He also reported to the plenary session of the workshop on a recommended data system for marine biology, stressing the importance of capacity building activities in the region.

The conference was successfully concluded, with adopting recommendations with regard to the ways to enhance oceanographic data exchange in the WESTPAC region.



Research topics



Makoto TERAZAKI

Professor

Director of Center for International Cooperation

1. The role of carnivorous zooplankton, particularly chaetognaths in marine ecosystems

The phylum Chaetognatha consists of some 100 species arranged in 22 genera. Chaetognaths are found in every marine habitat, from the benthos to all zones of coastal waters and the open oceans. Although small (2-120 mm long), they are often abundant and play an important role in the food web as the primary predators of copepods. The biomass of

chaetognaths has been estimated as 10-30 % of that of copepods in the world oceans, and they are therefore of great significance in transferring energy from copepods to higher trophic levels. The distribution, life history, feeding habits and population dynamics of key species and their roles in regional ecosystems are studied.

2. Automated identification of plankton utilizing an image processor

Since traditional techniques for the enumeration and identification of plankton are time consuming and expensive, many studies are based on a small number of plankton samplers, or such gross parameters as total volume. Automated counting, sizing and

identification of specimens in plankton samples on a routine basis are goals for the future. Since 1984, we have examined automated identification of phytoplankton (Dinophysis), copepoda (Acartia), chaetognaths and bivalve larvae.

3. Development of plankton sampling systems

Various types of opening and closing nets have been used to study the vertical distribution of zooplankton and micronekton. For example, the MTD horizontal net is closed by a messenger. The multiple rectangular midwater trawl (RMT1+8) are opened and closed acoustically using a telemetering net monitor which activates a mechanical release mechanism. The MOCNESS and BIONESS are operated their opening and closing by commands through a conducting cable from the surface. These net or sampling systems are operated by horizontal and oblique tows at the ship speed of 2-3 knots but the damage of samples having soft body (especially, gelatinous plankton) is not neglected. On the other hand, vertical tows are excellent in

collecting living or little damaged samples for experiments and chemical analyses. Since 1985, we have developed and operated the vertical multiple plankton sampler (ORIVMPS) equipped with 4-10 nets, 1m x 1m (or 0.5m x 0.5m) in mouth opening in various waters of the world oceans. The opening and closing system of this sampler is operated by commands given through a conducting cable on the vessel, and is light weight than the previous samplers such as the RMT1+8, MOCNESS and BIONESS. The towing from 2,000 m depth requires about 90 minutes. Therefore, it is possible to collect more than ten time-series samples from the deep sea in a single day.



It's a SCOOP!

-Marine Atmosphere Survey by Using A Self Cruising Ocean
- Observation Platform (SCOOP) -

Mitsuo UEMATSU

Associate Professor

Center for International Cooperation



A self-cruising boat named *SCOOP* (nicknamed *Kan-chan* in Japanese) was launched in April 2000 under a project named VMAP (Variability of Marine Aerosol Properties and Its Impact on Climate Change; PI: M. Uematsu), CREST (Core Research for Evolutional Science and Technology) sponsored by JST (Japan Science and Technology Corporation).

This is the first time a self-cruising boat equipped with atmospheric sampling system was built in the world. The developed boat is made of FRP with the length of 8.0 m and the maximum width of 2.8 m. It is powered by a diesel engine, which drives DC and AC dynamos. *SCOOP* is propelled by a DC motor and travels at a speed of 2-4 knots. It provides a couple of 700-l fuel tanks that enable 700 hours continuous operation without maintenance. We can control *SCOOP* and obtain real time observing data set via a satellite communication

system (ORBCOMM).

The main task of *SCOOP* is to measure the variability of the chemical composition and amount of aerosols, which cause changes on the earth's surface temperature and variations in the marine biological activity over the oceans. For this objective, an aerosol sampling system was developed with a multi-element analyzer and an absorption spectrometer. Simultaneously, vertical profiles of temperature, salinity and chlorophyll fluorescence are obtained by a yo-yo system. *SCOOP* has also a capability to keep herself at a station stationary like a buoy. It will be possible to measure the air composition continuously over sea surface during the period of phyto-plankton bloom for days with its movement. *SCOOP* is being tested on the lake Hamana until the fall of 2000. We plan to start the first observation cruise in the spring of 2001. We will SCOOP new scientific findings between sea and air by *SCOOP*.





Looking toward "Visible Physiology"



Toyoji KANEKO

Associate Professor

Center for International Cooperation

In our laboratory, we aim to clarify ion- and osmoregulatory mechanisms in marine teleosts, using highly sophisticated techniques to visualize and image various physiological events associated with seawater adaptation. In order to adapt themselves to the "salty" environment of the ocean, teleost fishes have developed superior osmoregulatory mechanisms for salt secretion and water uptake to compensate for salt load and water loss, respectively. Excess salt is constantly pumped out through specialized ion-transporting cells, referred to as chloride cells, which are located in the gill epithelium in adult fish. During early life stages of fish, when the gills are not yet developed, chloride cells are distributed over the body surface. These chloride cells are readily visualized by immunocytochemistry with a specific antibody, as shown in Figure 1. On the other hand, marine teleosts drink ambient seawater and absorb water through the intestinal epithelium to cope with dehydration. After exposure to ambient water supplemented with a fluorescent marker, drinking can also be visualized by means of confocal laser scanning microscopy. For example, Figure 2 shows drinking of a medaka larva in fresh water and that transferred to seawater. Apparently, medaka drink more water in seawater than in fresh water. We are able to observe neither

chloride cells in the body surface nor drunk water in the intestine without appropriate treatments; however, introduction of specific markers and proper instruments makes them visible. This is also due to recent advances in the digital image technology. Moreover, in addition to the conventional morphological methods, more advanced techniques, such as confocal laser scanning microscopy and micro X-ray analysis, have enabled us to visualize and image physiological events. Observation is essential to biological researches. Having a closer look at them, we are expecting to find surprisingly informative images, which represent physiological processes of osmoregulatory mechanisms in fishes.

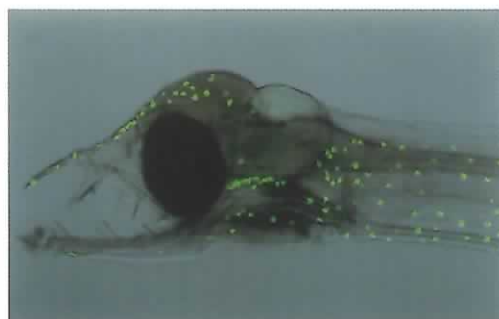


Figure 1.

Chloride cells distributed over the body surface of a Japanese eel larva.

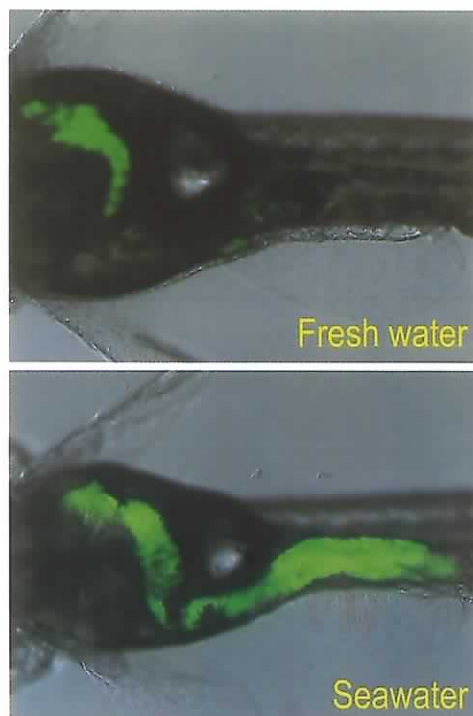


Figure 2.

Drinking of a medaka larva in fresh water and that transferred to seawater.



New Member

Yutaka MICHIDA
Associate Professor
Research Planning Division
Center for International Cooperation



Dr. Yutaka MICHIDA, newly joined the Center on April 1, 2000. Major areas of interest are physical oceanography, current structure in the surface mixed layer and its response to surface wind, current structure of the Kuroshio south of Japan, and analysis of the data obtained with surface drifters and ADCP. B. Sci., 1981; M. Sci., 1983, The University of Tokyo. Joined the Hydrographic Department of Maritime Safety Agency of Japan (currently Japan Coast Guard) in 1984 as a physical oceanographer. Worked for the department for 16 years until Mar. 2000, taking responsibilities for wind wave analysis, observational studies of the Kuroshio, and other

oceanographic activities of the department, including international affairs at Japan Oceanographic Data Center which is a division of the department. Within the 16 years, served as a programme officer at Science and Technology Agency, and participated in the Japanese Antarctic Research Expedition as a physical oceanographer in its 28th summer mission. Authored or co-authored 25 refereed publications. Member of the Oceanographic Society of Japan, AGU, and other marine societies; member of the Surface Velocity Programme, 1992-1998, and the Data Products Committee, 1997-present, within WOCE programme.

STAFF

Director of Center for International Cooperation:

Makoto TERAZAKI

Research Planning Division:

Asahiko TAIRA (ataira@ori.u-tokyo.ac.jp)

Toyoyuki KANEKO (kaneko@ori.u-tokyo.ac.jp)

Yutaka MICHIDA (ymichida@ori.u-tokyo.ac.jp)

Chiduru KINOSHITA (chizuru@ori.u-tokyo.ac.jp)

Tomiko KANEHARA (kanehara@ori.u-tokyo.ac.jp)

Masumi ARAI (masumi@ori.u-tokyo.ac.jp)

Naoko SUEDA (sueda@ori.u-tokyo.ac.jp)

Research Cooperation Division:

Makoto TERAZAKI (terazaki@ori.u-tokyo.ac.jp)

Mitsuo UEMATSU (uemastu@ori.u-tokyo.ac.jp)

Kiyoko SUZUKI (kiyoko@ori.u-tokyo.ac.jp)

Center for International Cooperation (CIC)

Ocean Research Institute

The University of Tokyo

1-15-1 Minamidai, Nakano-ku, Tokyo 1648639, Japan

Tel: +81-3-5351-6342

Fax: +81-3-5351-6530