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C I C
NEWSLETTER

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

Tetsuya Hirano
Director of The Ocean Research Institute
The University of Tokyo

The Director's Introduction

Role of The Center for International Cooperation in the future of marine sciences

The Ocean Research Institute (ORI) of the University of Tokyo was established in 1962 as an institution whose purpose is to carry out the basic research of marine sciences and whose facilities are available to national academic community.

Since then, the institute has been acting as a key organization in promotion of marine sciences in Japan.

The ocean is an important part of the Earth system.

Interaction of seafloor process, physico-chemical conditions of seawater and organisms living within impacts significantly to the global material cycles and environmental changes. Recognition of needs for better understanding of the Earth system guided marine sciences to become more global, more integrated and more interdisciplinary in nature.

The Center for International Cooperation (CIC) of ORI was established in 1994 in order to further enhance international cooperation activities in the field of marine sciences.

The center has two basic functions: one is to support planning, operation and promotion of international scientific projects and the other to develop cooperative research and man-power development exchange program with Asian countries.

The center's commitment to the international projects includes Ocean Drilling Program (ODP), Global Ocean Observing System (GOOS), joint Global Ocean Flux Study (JGOFS), Japan-France KAIKO-Tokai Project, Global Ocean Ecosystem Dynamics (GLOBEC) and others. Regarding the research and information exchange programs with Asian countries, ORI has been engaged with the promotion of these activities for last ten years through funds supported by Japan Society for the Promotion of Science (JSPS).

The establishment of the center will provide a firm base for this increasingly important cooperation and exchange activities.

It is our hope that this center plays a key role in international cooperation of marine sciences toward the 21st century, challenging to find solutions for harmonious co-existence of the man-ocean-earth system.

We appreciate your continuos encouragements and support in the past and in the future.

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Function and start of CIC

Keisuke Taira

Director of The Center for International Cooperation, The Ocean Research Institute, The University of Tokyo

Keisuke Taira
Director of CIC

The Center for International Cooperation (CIC) was established in 1994 to plan and coordinate international cooperative studies in ocean sciences, and to coordinate academic exchange programs. The center is composed of two divisions, research planning division with one professor and two associate professors, and the research cooperation division with one professor and one associate professor. Two visiting professors (foreign and domestic) stay for cooperative studies at the center.

Function and management of the center were discussed by the Advisory meeting for the Director of the Ocean Research Institute. The Faculty has determined the institutional rules for managements of the Center for International Cooperation. Although a new building was not constructed due to limitation of the campus space, seven rooms were prepared by rearranging laboratories in the institute.

Scientific activities are carried out in five major fields or disciplines, namely physical oceanography, chemical oceanography, biological oceanography, geological and geophysical oceanography, and fisheries science at the Ocean Research Institute, which has been established in 1962 for basic research on the ocean. Domestic and international cooperative networks have been established in each field, and they are to be fully utilized for the activities of the International Cooperative Center. Professors and Associate Professors of the center are assumed to have one of the major disciplines. Dr. Asahiko Taira and Dr. Makoto Terazaki were appointed as the professors for the Research Planning Division and for the Research Cooperation Division respectively in 1994 Fiscal Year. Their major fields are geological oceanography and biological oceanography, respectively. Dr. Toshiyuki Hibiya was appointed as the Associate Professor of the Research Planning Division to be in charge of physical oceanography. Chairs of associate professors are to be transferred from those of research associates of the institute.

The essential role of an university professor is research and education and the professors of the center are faculty members of the graduate schools of the University of Tokyo. However, space for the center is limited and laboratories are to be shared with existing divisions of the institute. Ocean Research Institute plans to have a large division with several full professors instead of a single professor at present day to realize much adaptability and flexibility for progress of ocean science. The function of center can be achieved not only by the center staff but also by the all staff of the institute. These show that activities of the center are closely cooperated with the institute.

Administrational and technical supports for the center are made mainly by Mr. Mitsuji Ikeda, the International Liaison Officer, General Affairs Division, and by Ms. Hiroko Fukui of the center.

Among the on-going international cooperative projects, Ocean Drilling Program (ODP) and KAIKO-TOKAI (Japan-French Project on Nankai Trough) are dealt by Dr. Asahiko Taira, and Global Ocean Observing System (GOOS) and UNESCO IOC (Intergovernmental Oceanographic Commission) Subcommission for WESTPAC are dealt by Dr. Keisuke Taira and Dr. Toshiyuki Hibiya. Planning of Global Biological Ecosystem (GLOBEC) is carried out by Dr. Makoto Terazaki.

The research cooperation with the East Asian Countries is funded by Japan Society for Promotion of Science. Ocean Research Institute is acting as Core Universities of Marine Sciences for cooperation with Indonesia, Thailand, and Malaysia. The coordinator of the cooperation is Prof. Tetsuya Hirano, Director of Ocean Research Institute. The subcoordinators are Prof. Katsumi Tsukamoto for Indonesia, Prof. Kouichi Ohwada for Thailand, and Prof. Makoto Terazaki for Malaysia.

The director of the center is to be elected by the Faculties of the institute, and Prof. Keisuke Taira services as the director. The center is now started for promotion of ocean science in the new era of international cooperation.

International Symposium for Celebrating the Establishment of CIC

February 16, 1995, a symposium celebrating the inauguration of the Center for the International Cooperation was held at the Sanjyo Auditorium, Hongo Campus of the University of Tokyo. About 160 participants enjoyed presentations by 5 distinguished scientists, Drs. X. Le Pichon (France), N. Handa (Japan), M. Hungspreugs (Thailand), T. M. Joyce (USA) and Y. Naito (Japan). The symposium was followed by a ceremony at which commemorative addresses were given by Dr. K. Yoshikawa, the President of the University of Tokyo, Mr. M. Inoue, the director of the international division of Monbusho, and Dr. Y. Kozai, the Chairman of the Geodesy Council.

In this newsletter, the abstracts of 5 presentations given during the symposium are printed.

Snap shots of the inauguration symposium

What will sea based data provide for the study of subduction earthquakes?

Xavier Le Pichon in cooperation with Jean Paul Cadet, Pierre Henry, Siegfried Lallemant, Fred Pollitz, Frederic Thoue and S. Saito at Ocean Research Institute, Tokyo

I thank the staff at the Institute and specially Jiro Segawa, Kensaku Tamaki and Asahiko Taira for help and discussions. I also thank Manabu Hashimoto, Hakuyu Okada and Seiya Uyeda for providing helpful information.

Introduction

The stay of the first author in the Ocean Research Institute during January to March 1995 was the occasion to enlarge the sea-based research carried within the Kaiko-Tokai program to its regional environment on land as well as at sea and these studies have led to the writing of several papers. A first paper now accepted in Earth Planetary Science Letters is entitled " Distribution of shortening landward and oceanward of the Eastern Nankai trough due to the Izu-Ogasawara ridge collision. " by X. Le Pichon, F. Pollitz, M. Fournier, J.P. Cadet and S. Lallemant. A second paper will be shortly submitted as an " Inaugural Year Article " in the Proceedings of the National Academy of Sciences of the USA at the occasion of the election there of the first author. This paper proposes a simple plate tectonic model of the deformation of Japan which enlarges the previous approach to relate the Okinawa opening to the new Japan Sea trench formation. Finally, a new approach to the Sagami Trough tectonics led the same group of workers to propose the existence of a Boso Transform Fault (Paper submitted to Geophysical Journal International by S. Lallemant, X. Le Pichon, F. Thoué, P. Henry and S. Saito: " Shear partitioning near the Central Japan triple junction: the 1923 Great Kanto Earthquake revisited, Part I ") and to investigate its role during the 1923 Great Kanto Earthquake (Part II submitted to the same journal by F. Pollitz, X. Le Pichon and S. Lallemant).

Plate tectonic framework

It is shown that Kyushu Rift (the Beppu-Shimabara Rift) and the Japan Sea Trench both started near the Mio-Pliocene boundary and both accelerated to their present regime 1.8 My ago. The link between these two systems is made by the Nankai Sliver, which is the portion of Japan below the Median Tectonic Line (MTL) which extends all the way to southern Kyushu and finally to southern Okinawa. The Recent tectonic pattern of deformation has given to Japan its present morphology and to its tectonics its present character.

A simple kinematic quantitative model is made, using the triangulation data in Kyushu to obtain a motion of the Nankai sliver along the MTL at 10.5 mm/y. It is assumed that the shortening motion across the Fossa Magna is presently small and thus that Northern Honshu also moves at 11 mm/y to the west (as in Hashimoto and Jackson). Rotations of blocks in Central Honshu deactivate strike-slip along the MTL (as in Kanaori). Compression dominates on their southern boundary.

Deformation of Central Japan

The Central Portion of Japan, which is the most active tectonically and which has the highest topographic relief, is actually greatly affected by the convergence of the Philippine Sea plate with Japan because this convergence, east of 137.3°E, is accomodated not only by subduction, but additionally by broadly distributed onland and offshore deformation. Central Japan has consequently developed as a mechanically highly coupled region since the collision of the Izu Peninsula in Middle Pleistocene and the unusual coupling is obviously related to the presence of the thick and hot crust of the Izu-Ogasawara Ridge. It is consequently impossible to study the deformation of Central Japan independently at sea or on land. Both type of studies must necessarily be carried simultaneously.

The sea portion of the Tokai area

In the Tokai area, a very important point concerns the amount of deformation absorbed at sea along the Zenisu Ridge and further south. We tentatively estimate that up to 1 cm/y may be absorbed there and that another 1 cm/y may be absorbed on land in Central Japan. Thus, the amount of motion along the Eastern Nankai

Subduction zone may be about 2 cm/y.

We show on the basis of magnetic anomalies that a former Zenisu ridge is now buried below the limit of the backstop of the accretionary wedge. Thus, the distributed ocean deformation appears to be steady state.

Fluids and active faults at sea

The existence of a buried Zenisu ridge below the limit of the backstop should play a major role in the mode of fracturing during the large earthquakes. Submersible dives along the cliffs, lining the limit of the backstop, demonstrate the presence of active deformation. A significant amount of fluids, which are probably related to the seismic plane at depth, have been found to outflow there. We suggest that the monitoring of the outflow of these fluids, if possible through shallow drillings, may provide important information on the build up of overpressure at depth, and possibly on the preseismic deformations.

Another important target in this context is our proposed Boso Transform Fault, east of the Boso peninsula, in the Sagami area. We have evaluated its slip velocity at 16 mm/y. Thus it appears to be very active and it should also be rooted on the seismogenic part of the Wadati plane in a zone of high elastic slip potential.

We consequently suggest that detailed high resolution seismic reflection across the faults and studies of fluid coming from the faults using sea floor and drill hole observatories are essential to an understanding of the great earthquakes periodically affecting these areas.

Organic Matter and Marine Carbon Cycle

Nobuhiko Handa
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Ocean is one of the determinative factors to control the abundance of atmospheric carbon dioxide, so that carbon cycle in the marine system as well as carbon dioxide transfer through the air-sea interaction has been focused on drawing its chemical and biological processes. The processes consist of mainly production of organic matter by phytoplankton photosynthesis, vertical transport of organic matter from the surface to deep waters and its degradation to regenerate carbon dioxide which is carried back to the surface water by upwelling of the deep waters. Organic matter accumulated to the bottom of the ocean however is always trace in quantity although the organic matter gives us invariable information on the past global change of the earth environments as a biomarker.

Organic carbon (POC) and nitrogen (PON) of the suspended particles collected from various areas of the North through South Pacific were determined with considerably high variabilities in their concentrations. Higher values of POC and PON with several tens to hundreds $ugC1^{-1}$ and several to several tens $ugN\ 1^{-1}$ respectively were obtained in the surface water of the higher latitudinal areas of both northern and southern hemispheres and the equatorial areas, while much lower values of these organic elements were measured in the middle latitudinal areas, resulted in relatively low C/N values ranging from 6 to 8 which were almost same with these of phytoplankton inhabiting in the euphotic layer. These facts clearly indicate that the system for inorganic nutrient supply to the surface water from the underlying water is primarily determinative factor to govern the concentration of POC and PON in the euphotic layer. POC and PON concentrations tended to decrease with steep gradient toward deep in the intermediate and reach to the values ranging from 10 to 20 $ugC1^{-1}$ in the Pacific, indicating that extensive degradation of organic matter occurs in the intermediate through deep waters (Tanoue and Handa, 1979).

Carbohydrate, free and combined amino acids and lipid materials were major organic constituents and accounted for 34.8-44.6, 11.2-18.5 and 13.2-17.3% of POC of the surface samples collected in the tropical through Antarctic areas in the South Pacific respectively. Rather low values of the percentage were obtained in amino acids and lipid materials, but high values in carbohydrate in the Equatorial Pacific, while low values of carbohydrate were obtained in the Antarctic areas. Vertical change in the organic composition of the suspended particles was considerable. This is also indicating the degradation of the suspended organic matter in the

intermediate through deep waters (Tanoue, Handa and Kato, 1982).

To determine the consumption rate of organic matter in the deep water, one dimensional diffusion -advection model was applied to the vertical distribution of dissolved oxygen in deep waters of 1 to 4.5km deep in the North Pacific from 50°N to 3°S and then 13.6 to 65.8 $mlO_2m^{-2}day^{-1}$ which were almost comparable to the dissolved oxygen consumption rate calculation in the eastern Central Pacific (32.9 $mlO_2m^{-2}day^{-1}$, Munk, 1966), North Pacific (18.9 $mlO_2m^{-2}day^{-1}$, Arons et al., 1967) and Eastern North Pacific (5.7-9.2 $mlO_2m^{-2}day^{-1}$ Kroopnick, 1974). These values can be converted to 5.6 to 27.0 $mgCm^{-2}day^{-1}$ for the biological degradation rate of organic matter in the deep waters on the basis of Richards-Ketchum-Redfield model. Horizontal distribution of the degradation rate of organic matter clearly indicated that low values of the rate were found in low latitudinal areas being oligotrophic, while the value tended to rapidly increase toward the subarctic region of the North Pacific where is eutrophic and much abundant in chlorophylly *a*. These findings obviously indicate that the primary productivity must be the most important factor to determine the dissolved oxygen consumption rate of organic matter in the deep waters.

Much higher values of the dissolved oxygen consumption rate were calculated in the intermediate through deep waters by also applying the one dimension diffusion-advection model to vertical distribution of dissolved oxygen in the northwestern North Pacific (45°N, 155°E). Total consumption of dissolved oxygen in the water column from 48 to 4,775m deep was 447.3 $mlO_2m^{-2}day^{-1}$, which consisted of 290.8, 88.4 and 68.1 $mlO_2m^{-2}day^{-1}$ for 48-321, 321-855 and 855-4,775m deep respectively, indicating that 85% of total consumption of dissolved oxygen were consumed within the intermediate water, while only 15% in the deep water (Matsunaga and Handa, 1980). These facts strongly suggest that intensive studies on the degradation processes of organic matter is needed with focusing on the intermediate waters for further understanding of the carbon cycle in the ocean.

To elucidate the degradation rate of organic matter in the deep water which was calculated by applying the one dimension diffusion-advection model on the vertical distribution of dissolved oxygen, vertical flux of organic carbon to the deep water below 1 km deep was measured by sediment trap technology. A series of sediment trap was deployed in the northern North Pacific (47°57.7'N, 176°28.8'W) for one month in summer. Organic carbon flux at 1.1 and 5.25km deep was 7.27 and 2.38 $mgCm^{-2}day^{-1}$ respectively, which accounted for 2.2 and 0.71% of average daily primary production of the surface water during the period of time respectively. Difference of the vertical organic carbon fluxes at 1.1 and 5.25km deep is assumed to be the organic matter degraded in the deep water during the sinking of the particles (sinking particle) and calculated to be 4.89 $mgCm^{-2}day^{-1}$ (Tanoue and Handa, 1980). This value is rather smaller relative to the organic carbon calculated from the dissolved oxygen consumption rate of this oceanic area, this must be due to the trap experiment conducted in summer when phytopklankton is much less abundant because of the suppress of the nutrient supply to the euphotic layer from the underlying water.

Time series sediment trap experiment was extensively conducted in the site located in 0.13°N, 32°N and 48°N on 175°E of the North Pacific and the traps were deployed at 0.5km above the bottom sediment. Organic carbon flux values were corrected by following equation,

$$1n\ C = 1nCo - 0.34 \quad \text{..... (1)}$$

where, C and Co are organic carbon flux at Z-1 and 1 km deep respectively, and Z is the depth of the trap deployed.

The corrected values of the organic carbon fluxes on 175°E were almost comparable to the degradation rate of organic matter in the deep water of the North Pacific, although relatively low value of the carbon flux was obtained in the sediment trap experiment comparing to the data obtained by the calculation using one dimension diffusion-advection model in the trap site of 48°N (Handa and Hayakawa, 1996). These facts clearly indicate that systematic monitoring of the organic carbon flux in the various marine environments are extremely important to deduce seasonal, annual and decadal change of carbon dioxide input into the intermediate through deep waters through vertical transport of organic matter from the surface to the underlying waters.

It has been shown that organic carbon flux in the deep waters of the North Pacific determined by the sediment trap experiment is almost comparable with those

calculated from the dissolved oxygen consumption rates, however vertical flux of organic carbon in the intermediate water is not much determined to validate the dissolved oxygen consumption rate especially in the northwestern North Pacific. This must be one of the most important problems to be solved in future for better understanding of the carbon cycle in the marine environment.

References

Arenas, A.B. and H. Stumble, 1967, On the abyssal circulation of the world ocean-III, an addiction-lateral mixing model of the distribution of a tracer property in the ocean basin. Deep-Sea Res., 14, 441-457.

Handa, N. and K. Hayakawa, 1996, Vertical flux of organic carbon determined in four sediment trap sites from 0 to 48°N on 175°E in the North Pacific. (to be submitted).

Kroopnick, P., 1974, The dissolved O2-CO218 system in the eastern equatorial Pacific. Deep-Sea Res., 21, 211-227.

Matsunaga, K. and N. Hanada, 1980, Consumption of dissolved oxygen in the northern North Pacific. Res. Organic Geoche., 3, 10-12.

Munk, W.H., 1966, Abyssal recipes. Deep-Sea Res., 13, 707-730.

Tanoue, E. and N. Handa, 1980, Vertical transport of organic materials in the Northern North Pacific as determined by sediment trap experiment. Part 1. Fatty acid composition. J. Oceanogr. Soc. Japan, 36, 231-245.

Tanoue, E. and N. Handa, 1980, Vertical transport of organic matter in the northern North Pacific. Geochemistry, 14, 16-20.

Tanoue, E., N. Handa and M. Kato, 1982, Horizontal and vertical distribution of particulate organic matter in the Pacific Sector of the Antarctic Ocean. Transaction of the Tokyo University of Fisheries, 5, 65-83.

Marine Science Education and Research in Thailand- Case Study for Japanese Asia Cooperation

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Although Degree Programme in Fisheries has been offered over 50 years ago but the emphasis was only on the biological aspects. No physical or chemical aspects of the sea was taught at the university until the Marine Science Department was established in the Faculty of Science, Chulalongkorn University in 1968. Two options of B.Sc. programmes in Marine Science were offered: one in Physical and Chemical Oceanography and the other in Marine Biology and Fisheries. In 1971, an M.Sc. programme was opened while a Ph.D. Programme will start in 1996. The Faculty of Fisheries at Kasetsart University offers a B.Sc. programme in Marine Science too, but is biologically oriented. Two other universities offer biologically oriented Aquatic Science Degree. The trend is similar in other Southeast Asian countries so there is a serious lack of Physical and Chemical Oceanographers in this region. Students who like mathematics prefer to do Engineering, rather than sciences because of better paid jobs.

The first record of marine research in Thailand was that of a Danish scientist, Johannes Schmidt, in 1889 when he studied phytoplankton and seaweeds off Chang Island, Trad Province. Later on, there were the Carlsberg Round the World Expedition (1928-1930) and the Galathea (1950-1952) when the carbon-14 method for determination of the primary productivity was used.

The most extensive survey in physical oceanography was done by Scripps Institution of Oceanography in cooperation with Vietnam and Thailand during 1959-1961. This oceanographic survey, Code Name 'The NAGA Expedition' had a strong impact on the Thai scientific community which led to the establishment of the Department of Marine Science. After that time, there has not been such an extensive survey of the Gulf of Thailand again due to the unfavorable political atmosphere until now. Some surveys in the Thai and Malaysian territorial waters had occasionally been done with the Japanese

research vessels, for example, the Nagasaki Maru. On the national scale, the Hydrographic Department of the Navy and the Fisheries Department made mostly routine surveys. The Southeast Asian Fisheries Development Council (SEAFDEC) research vessel also made several regular training cruises in the past 20 years or so and with its new and very well-equipped research vessel 'M.V.SEAFDEC', the prospect is good for cooperative oceanographic research in the region.

Thai scientists have been participating in several cooperative projects under the ASEAN Marine Science Programmes (Australia, Canada, U.S.), UNEP Regional Seas Programme, UNESCO/IOC Projects on River Inputs to the Seas and Mussel Watch, UNESCO/COMAR Mangrove project, SEAPOL, and more recently JSPS (Japan Society for the Promotion of Science) Joint Research. JSPS Marine Science Programme has been active in scientific exchange since 1981 and the cooperative projects are becoming more and more important. Other current projects of significance are the IAEA Project on Marine Contaminants and Sediment Transport and the Thai-Swedish Programme on Marine Pollution Monitoring and Training which includes some researches in the Gulf of Thailand.

Overall, it can be said that Thailand, and indeed SE Asian countries are quite competent in marine biology and fisheries but are lacking in physical and chemical oceanography. A lot more incentives are needed in building up capabilities in these fields.

The World Ocean Circulation Experiment

Terrence M. Joyce

Woods Hole Oceanographic Institution

The primary goal of the World Ocean Circulation Experiment (WOCE) is to develop ocean models useful for predicting decadal climate change and to collect the data necessary to test them. WOCE scientists will meet this goal through measuring and understanding the following aspects of the global ocean and their relationship to world climate:

-the air-sea fluxes of heat, freshwater and momentum in the global ocean over a period of 7 years, and their annual and interannual changes

-the dynamical balance of the world ocean circulation and its response to changing surface fluxes

-ocean variability on timescales of months to years and space scales greater than a few thousand kilometers, as well as statistics on smaller scales

-the formation, ventilation and circulation of water masses that influence the climate system on timescales from ten to one hundred years

I have been associated since the early stages of the planning for WOCE with one of the measurement programs designed to address the above: the WOCE Hydrographic Programme (WHP). When one considers the scope of the total number of hydrographic stations planned by all the nations participating in the WHP, it more than dwarfs all previous oceanographic efforts. With an order of magnitude more stations than collected in the International Geophysical Year(s) and more than a hundred times more stations than made in the GEOSECS expedition, the WHP encompasses the following sampling rationale for the ocean:

-one time survey: this is essentially a global group of long sections made to the best measurement standards now achievable, with the inclusion of selected tracers such as CFCs, radiocarbon, and tritium/helium-3.

-repeat hydrography: some sections will be repeated in selected areas to measure the seasonal and interannual variability that is not sampled by the one time survey. These measurements may not include the tracers mentioned above.

-time-series stations: recognizing that time-series stations such as the one at Station "S" near Bermuda, have provided a unique window into annual and interannual variability in the past, these stations will be augmented by new sites during WOCE. It is expected that these will continue into the future beyond WOCE.

Figures showing the national contributions to each of the above portions of the WHP effort are shown as well as the actual statistics on flow of data to our WHP Office in Woods Hole, which has the responsibility to assemble all of the data

from the WHP. Clearly, data flow rates have not been as hoped, with many nations lagging behind in their data submissions. Efforts need to be made on a national level to better support this activity.

That hydrography can provide a clear measure of climatic change can be seen in the 1500-2500 dbar temperature record at Bermuda, which has been extended back to 1922 with the addition of hydrographic stations made near the island. The deep temperature in this kilometer thick layer has been undergoing a secular, long-term increase at a rate of 0.5 deg. C / 100 yrs over the period of 1922-1990, inclusive. As most of the water in this interval originates in the ventilation of the N. Atlantic Ocean, this secular increase might be associated with long-term changes in water mass conversion in the northern parts of the ocean basin. Study of this phenomenon will necessarily extend beyond WOCE, which officially ends its field phase in 1997, and brings us to future programs like GOOS and CLIVAR to provide the justification needed for continued measurements.

It is my personal hope that the new center will help lead the way into the future. I can see several areas where an international center, such as the one we are celebrating today, can aid in our pursuits.

-providing support for the continued analysis and quality control of much of the N. Pacific data coming to the WHPO by a secondment of an 'expert' from Japan to visit WHOI for a period of a few months

-taking the lead to see that remaining WHP work planned by Japan occurs, with special attention to the one time survey completion

-hosting a meeting/workshop to further the analysis and understanding of the Pacific Ocean Basin

-provide a scientific focus for GOOS and CLIVAR efforts in Japan needed beyond the lifetime of WOCE

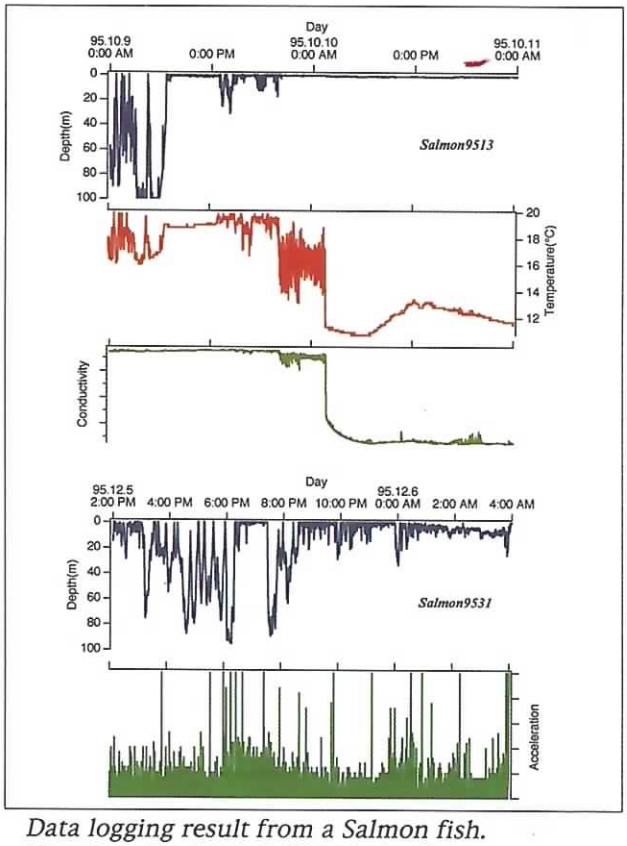
I want to conclude by expressing my thanks for the opportunity to be here to speak with many of my colleagues in Japan and to give my best wishes and support for the success of the new center at ORI to its Director, Keisuke TAIRA.

Development of micro data logger for study on free ranging marine animals

Yasuhiko Naito
National Poler Research Institute

Despite modern technological achievement in ocean science, the underwater world still remains remote with regard to free ranging marine animals due to difficult access to the animals. In this context, studies on behavior, ecology and physiology of the animals under natural conditions are strongly restricted due to limited available techniques to obtain information from the animals by means of direct observation and measurement.

To obtain such information, we first developed a miniaturized mechanical Time Depth Recorder (TDR, 25mm in diameter, 85mm in length) in mid 1980s which were successfully used for measuring long and continuous dive behavior of northern elephant seal, several penguins and flying bird, blue eyed shag. However this was almost limit in its miniaturization as analogue type recorder. Yet, much more down sizing was required to achieve above purpose. To develop further miniaturized and high utility data recorders, we adopted digital data recording system in 1990s



Data logging result from a Salmon fish. Note Oct. 10, 1995, 2:00 AM, this fish came back to its native river.

because of recent advancement of the technology on micro electronic devices. By this we can broaden size range of the target species to study from marine mammals to fishes and others. Beside smaller instrument give lesser pain and effect on animal behavior. It is also able to collect simultaneously more variety types of data with higher resolution.

We developed a micro data logger to obtain data on behavior, ecology and physiology of free ranging marine animals. In development our first effort emphasized miniaturization of the data logger to broaden the range of selection of target species. The size of the newly developed data tags were 19.0mm and 13mm in diameter, 75mm in length (cylindrical form) and 30g and 20g in weight in air. As memory size it can record 512,000 bits of data in total within 8 and 4 channels and with 12 and 8 bits resolution. We successfully obtained data on swim depth, water temperature, core body temperture, swim velocity, heart rate and others from marine mammals, diving birds, reptiles and fishes.

The final objectives of this study are to contribute to behavioral, ecological and physiological studies on a marine animals by developing new electronic devices which lead to a comprehensive understanding of how the animal lives keeping the physiological and ecological balance in nature through interaction with biological, chemical and physical environment over extended period.

WESTPAC-III

The only one organization of United Nations for oceanography is UNESCO IOC (Intergovernmental Oceanographic Commission), and the Subcommission for WESTPAC was established in 1990. The first session was held in 1990 in Hangzhou, China, the second in 1993 Bangkok, Thailand. The third session, WESTPAC-III, was held on 26 February- 1 March, 1996, at Olympic Memorial Youth Center, Yoyogi, Tokyo. The Center for International Cooperation hosted the session with National Committee for IOC, and the Ministry of Education Science, Sports and Culture.

WESTPAC is in charge of promotion of services, research, education and training for the Pacific Ocean to the west of the international date line. WESTPAC has eleven scientific projects and cooperative research is carried out by program coordinators and project leaders. The general session is held every three years to review the scientific projects and regional development of IOC programs such as Global Ocean Observing System (GOOS) and so on.

The participants were about 74 from Australia, China, Democratic Peoples's Republic of Korea, France, Indonesia, Japan, Malaysia, Philippines, Republic of Korea, Russian Federation, Thailand, United States of America, Vietnam and related international organizations.

The session elected new Chairman, Prof. Keisuke Taira, Directorof the Center for International Cooperation, Ocean Research Institute, University of Tokyo, and the First Vice-Chairwomen, Prof. Manuwadi Hungsprugs, Department of Marine Science, Chulalongkorn University, Thailand, and the Second Vice-Chairman, Dr. Hyung Tack Huh, Korea Ocean Research and Development Institute, Republic of Korea. The WESTPAC-IV will be held in 1999 in Korea, and WESTPAC Scientific Symposium in 1998 in Japan.

Snap shots from WESTPAC-III meeting

Dr. & Mrs Paxton at an old Japanese Inn at Hakone

Activity Report by Dr. John R. Paxton

(a visiting professor during June-September, 1996)

I arrived in Tokyo on June 24 1996 to begin three months as a Visiting Professor at ORI under the Center for International Cooperation scheme. My time was mostly spent undertaking research on deepsea whalefishes of the family Cetomimidae. This bathypelagic family of some 35 species is poorly known, with specimens rare in collections. My work involves descriptions of their anatomy and ecology, with 10 new species in the family being described. The excellent facilities provided by ORI included a high quality microscope, quiet laboratory, and computer. Most importantly for me was some uninterrupted time in a good environment to think about the problems and their solutions.

In addition I was able to travel around Japan, visiting Hokkaido University School of Fisheries in Hakodate, Kyoto University main campus and their Fisheries Research Station in Maizuru, and the Fukui Prefectural University Marine Science Campus in Obama. Lectures were given on deepsea fish and fisheries and/or fish conservation at the three universities, as well as at ORI. Specimens were studied for my own research at the two university fish collections. I met many graduate students conducting research on fishes. In addition, a number of days were spent at the National Science Museum, Tokyo working on specimens in their collection and giving a lecture. All visiting researchers are asked to read over manuscripts for advice with both the science and the language. It is good for the visitor also, giving an idea of the research projects underway. I have learned much from papers being written not only at ORI, but at Hokkaido University, the National Science Museum, and even on the DNA sequence of a plant virus from a Chinese graduate student also living in the International Lodge in Komaba.

Living in a foreign country for three months involves some problems not found in one or two weeks. Kawaguchi-san and the staff and students of the Plankton Laboratory not only solved my problems with accommodation, banking, and travel tickets, but gave me help with bird watching, introduced me to the pleasures of hot springs bathing, and improved my knowledge of sake. I enjoy eating fishes as well as studying fishes, and as a taxonomist I like to know what I am eating. My computer list of fishes eaten in Japan numbers 48 different species in 34 fish families.

One of the benefits of working in science is the large number of friends on has in my different countries. Certainly ORI and Japan are no exceptions to this rule, as I have made many new friends during my three months. The animals that we study do not follow political boundaries. Scientists also tend to pay less importance to political boundaries, and help break down national barriers with their many international friendships and cooperative projects. The Center for International Cooperation is playing an important part in this area of improving international relations, and advancing science at the same time.

I am most appreciative of all the Ocean Research Institute has given me. It is a pleasure to thank Professors Tetsuya Hirano, Director of ORI, Keisuke Taira, Head of the Center for International Cooperation, and the many students I have come to know.

Ocean Drilling Program

Drilling Research Vessel JOIDES Resolution

Physical Property Lab of JOIDES Resolution
(Mr. T. Kimura, marine technician of ODP)

Prof. Y. Ogawa examines cores from
Barbados accretionary prism

A view from the derrick
Cruising JOIDES Resolution

ODP related activities in the CIC

by Asahiko Taira

The Ocean Drilling Program (ODP) is an international scientific project to explore the structure and history of the ocean basins. The Program's focus is to provide core samples and data from various downhole experiments in the ocean basins.

Study of the ocean basins will lead to a better understanding of the structure and composition of the Earth's crust, the processes of plate tectonics, environmental changes through time. This understanding will, in turn, lead to a fuller comprehension of the evolution of the Earth.

The ODP is funded by the United States National Science Foundation (NSF) together with contributions from international partner nations. International partners in the program include Japan, the Canada-Australia-Chinese-Taipei-Korea Consortium, the European Science Foundation, Germany, France, and the United Kingdom.

Japan has been a full member of ODP since October 1985. The Monbusho (Ministry of Education, Science, Culture and Sports) funds the ODP in Japan. The University of Tokyo's Ocean Research Institute (ORI) is responsible for science operation of the program. The program in Japan is administrated by ODP Japan Office stationed in the Center for International Cooperation of ORI.

ORI's ODP-related activities include the following.

1. To publish and distribute the ODP Newsletter and other information to about 700 addresses, and distribute ODP Proceedings

2. To hold workshops and symposia to discuss recent scientific results from ODP cruises

3. To ensure access to Tansei Maru and Hakuho Maru of ORI for ODP site surveys

4. To promote developments of new downhole instruments towards establishing ocean floor laboratories

There are two national committees. The ORI Director, Prof. T. Hirano chairs the National Executive Committee which has 22 members from universities, research institutions, and Monbusho. The committee meets twice a year to discuss budgetary issues and science plans. The National Planning Committee, chaired by Prof. A. Taira (ORI), meets at least twice a year to discuss scientific plans. The members are current ODP Panel representatives, liaisons to InterRidge, ION, and OD21, and other scientists to cover the broad spectrum of ODP sciences.

Five special working groups serve to discuss detailed science plans, which are:

1. Paleoenvironments
2. Subduction zone dynamics
3. Mantle dynamics
4. Seismic tomography
5. Downhole measurements

Administrative decisions for ODP are made following recommendations of the Geodesy Council, an advisory board to the Cabinet organized by the Monbusho. The ODP national program is reviewed by the Special Committee for Deep Ocean Floor Investigation (Chair: Prof. S. Akimoto), a subcommittee of the Geodesy Council.

The National Science Museum of Japan has been designated as one of the three permanent loan institutions of Micropaleontological Reference Centers to serve the international community.

ODP Japan has been actively involved with OD21 initiative which is a proposal by Science and Technology Agency of Japan (STA) to build a riser equipped drilling vessel for international scientific community to be available in the 21st Century. July, this year, an important international conference to discuss scientific objectives addressed by riser drilling will be held in Tokyo (CONCORD meeting). We envisage an increasing role of the CIC in the future activity of ocean drilling.

Global Ocean Observing System (GOOS)

The UNESCO IOC (Intergovernmental Oceanographic Commission) is promoting Global Ocean Observing System, of which objectives are for 1) Climate, 2) Health of the Ocean, 3) Living Marine Resources, 4) Coastal Zone Managements, and 5) Ocean Services. Ocean is playing an important role for human beings, and the role must be intensified for the future. Understanding and managements of ocean require a global ocean observing system which includes observation, data exchange, and prediction models. GOOS requires not only intensification of existing observation system but also development of new technology and ocean modelling. GOOS is cosponsored by World Meteorological Organization, United Nations Environmental Programme, and International Council of Science Unions.

The Ministry of Education, Science, Sports and Culture, is conducting the International Cooperative Research Programme on GOOS for five years from 1993. The programme aims to develop scientific base for GOOS, and it includes:

1) Evaluation of volume transport and heat flux of the ocean gyre in the North Pacific Ocean, at Research Institute for Applied Mechanics, Kyushu University, Ocean Research Institute, University of Tokyo, Faculty of Fisheries, Hokkaido University, and at Graduate School of Science, Hokkaido University.

2) Evaluation of surface fluxes using satellite data, at Graduate School of Science, Tohoku University, and at Ocean Research Institute, University of Tokyo.

3) Design of ocean observing system by using high-resolution numerical models, at Graduate School of Science, University of Tokyo, and Graduate School of Science, Kyoto University.

4) Methodology for monitoring of the carbon cycle in the ocean, at Graduate School for Earth Environment, Hokkaido University.

5) Development of new technology for monitoring of ocean currents and biological environment, at Faculty of Science, Hirosaki University and Ocean Research Institute, University of Tokyo.

The research results are described in annual newsletters published by Division of Physical Oceanography, Ocean Research Institute.

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