Intergovernmental Oceanographic Commission

Workshop Report No. 100

IOC-SOA-NOAA Regional Workshop for Member States of the Western Pacific - GODAR-II (Global Oceanographic Data Archeology and Rescue Project)

World Data Centre D, Oceanography
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1. OPENING AND WORKSHOP ARRANGEMENTS

The GODAR-II Workshop for the Western Pacific was opened by the GODAR Project Leader, Director of WDC-A, Oceanography, Dr. S. Levitus, at the National Marine Data and Information Service (NMDIS) of China, Tianjin, 8 March 1994. He welcomed the participants to the Workshop and expressed thanks to the local organizers for the provided facilities and all necessary preparations for the Workshop. Dr. Levitus then focused attention of the participants on the objectives of the GODAR project as presented in Recommendation IODE-XIV.3, adopted by the IOC Assembly at its Seventeenth Session and stressed the importance of applying regional specifics for meeting those objectives in the Western Pacific.

On behalf of the State Oceanic Administration, Prof. Xu Yukun, Deputy-Director of the International Co-operation Department, SOA, extended his warm welcome to the participants. He emphasized the importance of the GODAR Project for rescuing historical oceanographic data and enabling the international community to use these data in different fields of application, including global change studies and climate research. China attaches great importance to the project as an important opportunity not only to facilitate ocean data management activities but also to improve co-operation between the counterparts at home and abroad. Prof. Xu Yukun wished the Workshop a full success and a pleasant stay in China.

Dr. I. Oliounine, speaking on behalf of the Secretary IOC, Dr. G. Kullenberg, joined the previous speaker in wishing every success to the meeting. He expressed special pleasure at seeing experts from data centres, and lecturers representing 15 Member States united by a common goal - to see IOC and its IODE programme strengthened. He extended his thanks to the representatives of UNESCO and ICSU, and the US Government for their support in making the meeting possible, and to the Director and staff of NMDIS for arranging the meeting. NMDIS of China is well known in the region and around the world for its role in facilitating principles of international ocean data exchange. The GODAR project was launched to develop and demonstrate the importance of international co-operation in providing valuable information to different user groups which will help them to meet national and IODE needs in science, technological development and economy. Dr. Oliounine called on the participants to concentrate efforts on the promotion of principles, outlined in the ocean data management policy statement adopted by the IOC Assembly at its Seventeenth Session, of the full and open sharing of a wide spectrum of global international datasets for all ocean programmes. Efforts should be strengthened to facilitate exchange of data and information, and to widen co-operation with a view to developing standard procedures, measuring techniques, data storage and management capabilities for research on, and systematic observations of the marine environment. In closing, he expressed the hope that the Workshop would help Member States to improve their data management infrastructures and increase data input to the IODE system.

Prof. Hou Wenfeng, Director, NMDIS, SOA, welcomed the participants to China and to his Institute. He spoke of the role of the ocean in global climate change, and in national economic development. He described the efforts made by marine scientists and data managers in collecting ocean data and making it available to the international community. He expressed concern that in many countries ocean data still exist in manuscript form, or on out of date data carriers and stated the importance of the rescue component of the GODAR project. He noted that the search for historical data and its rescue is a huge task which cannot be implemented by an individual country, and that joint efforts and co-ordination are required. He reviewed the NMDIS functions and the role of his Institute in promoting national and international co-operation in ocean data and information exchange.

Prof. Hou Wenfeng expressed the fervent hope that the Workshop would be an important step in meeting GODAR objectives, and would help to enrich knowledge and share experience in ocean data exchange and management. He wished the participants a successful meeting and a pleasant stay in Tianjin.

Mr. S. Ruttenberg, Chairman of the International Council of Scientific Unions' Panel on World Data Centres, said that ICSU was very pleased to be a partner of IOC/IODE in the important work of GODAR. The rescue and digitization of historical environmental data are crucial to providing a reliable historical database against which the present changes in the earth's environment can be evaluated. GODAR is an outstanding model of international collaboration. ICSU wished GODAR continuing success.

Mr. Mao Bin, representative of the local organizing committee, welcomed the participants and presented information on local arrangements. A commemorative photo was taken of the Workshop participants.

The participants of the Workshop agreed on the need to have a summary report which will summarize papers presented during the Workshop sessions, as well as include recommendations and conclusions discussed and adopted by the Workshop. The Workshop deemed it necessary to keep as far as possible the full texts of national reports in order to give the reader a complete picture of the state of ocean data holdings and of the problems the countries of the region face in preserving and rescuing these data.

The opinions expressed in the Workshop report are those of the participants and do not necessarily coincide with those of respective governments or international organizations.

2. SUMMARY OF SCIENTIFIC PRESENTATIONS

IOC AND ITS ROLE IN MEETING UNCED OBJECTIVES IN THE FIELD OF OCEAN DATA COLLECTION AND MANAGEMENT

I. Oliounine, Head, Ocean Services Unit, IOC

Since its foundation in 1960, IOC has had as its main goal, the promotion of marine scientific investigations on the nature and resources of the oceans, and the provision of necessary data collection and management services for this purpose.

After 3 decades IOC can be considered as one of the most respected international organizations charged with ocean research and monitoring. IOC has promoted a number of scientific initiatives aimed at improving the basis of knowledge of the ocean's environment, its state of health and biodiversity, and how oceans interact with land and drive the global and regional climate; among these can be mentioned the Indian Ocean Expedition, Studies of the Kuroshio Current, TOGA and WOCE to name a few. The joint programmes with other international organizations, such as GIPME (UNEP and IMO), GEBCO (IMO), OSLR (FAO), IGOSS (WMO) and others have gained wide recognition.

The progress in the knowledge of the global climate system, and of climate-change processes and impacts culminated in 1992 with the adoption of the Framework Convention on Climate Change and the atmospheric, oceans and climate sections of Agenda 21 adopted by Governments at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil.

In Chapter 17 of Agenda 21, the Rio Conference states that

"the marine environment - including the oceans and adjacent coastal areas - form an integrated whole that is an essential component of the global life support system. In the framework of identified goals and topical areas, IOC can play a leading role, and make particularly important contributions. Major foci of IOC in global change studies are to observe and record what is happening to the marine environment, to understand the reasons of changes and ensure that the oceans provide environmental and economic benefits for the well being of mankind".

Chapter 17, Part E of Agenda 21 specified as overall objectives:

(i) promotion of scientific research and systematic observations;
(ii) promotion of exchange of data and information;
(iii) co-operation with a view to the development of standard intercalibrated procedures, measuring techniques, data storage and management capabilities for scientific research on and systematic observations of the marine environment.

As part of its mandate to provide "ocean services", IOC has been very active in promoting the collection, management and international exchange of ocean data through the IGOSS, IODE and GLOSS networks.

The goals identified by UNCED and by the global climate change programme, in particular, will urge scientists and data managers to change their traditional data management strategies underpinned by essentially discipline-based or mission-project data collection and management requirements, by an attitude which regards data as a by-product, into the understanding that the data and information management challenge in the coming years will be not only to archive, preserve and make data available for research activities, but also to combine data from various disciplines and disparate sources.

At the same time, the international rules for data collection and management, such as those to cover access, cost, exchange, standards and distribution which have been tested and proved valuable by time, should not be barely rejected but modified to meet new requirements.

IODE AND GLOBAL OCEANOGRAPHIC DATA ARCHAEOLOGY AND RESCUE PROJECT

S. Levitus, Director, WDC-A, Oceanography, GODAR Project Leader

Approximately 1.2 million temperature profiles and 300,000 salinity profiles have been archived at WDC-A as a result of the GODAR project. A report describing project results to date was available from the Project Director.

As part of its commitment to the GODAR project WDC-A is processing all data gathered as part of this project. These data and all oceanographic profile data archived at WDC-A and the US NODC will be made available internationally without restriction on CD-ROMS as well as other media. In addition to the profile data, objective analyses of these data will be made available. These GODAR products are expected to be distributed by December 1994.

RESULTS OF THE FIRST WORKSHOP ON THE GLOBAL OCEANOGRAPHIC DATA ARCHAEOLOGY AND RESCUE PROJECT (GODAR-I)

N. Michailov, Director NODC, Russian Federation

The first Workshop on the GODAR Project for the Member States of Northern and Eastern Europe was held at the NODC, RIHMI-WDC-B, in Obninsk, Russian Federation, 17-21 May 1993, with the support of IOC, CEC, ICSU, WMO and ICES.

The Workshop involved 41 participants, NODC directors and leading specialists from Bulgaria, Germany, Lithuania, Latvia, Poland, Russia, Turkey, the United Kingdom and the Ukraine, together with representatives of international organizations - IOC, ICES, WMO,CEC. Sweden submitted a report.

The Workshop considered the state of data holdings in the region for different types of observations: coastal, hydrology, hydro-chemistry, current meter, pollution, biology, geology/geophysics. Data available in national data archives cover a vast area of observations: the Black and Baltic Seas, the Atlantic, Indian and Pacific Oceans. The amount of data exceeds 3 million observations. However, 50-60% of these data are still not digitized and can be lost.

The Workshop formulated a number of important conclusions and recommendations targeted at meeting GODAR objectives effectively. The Workshop agreed on the list of criteria which can be used to identify priorities in data rescue operations. It includes:

(i) data types - T, S, O_2, NO_2, NO_3, pH, Alk, CO_2. Primary production, chlorophyll and also - meteo, secchi disk data, etc.;

(ii) space-time distribution: open sea - Southern, Indian, South Pacific and Atlantic Oceans for periods exceeding one decade.

The Workshop participants agreed that GODAR data should be available free of charge for international exchange and recommended that special measures should be taken to protect data from commercial usage.

The Workshop recommended that the GODAR Project in the region should be implemented in 3 stages:

(i) preliminary stage: presentation of data holding descriptions by Member States;

(ii) stage of data search: preparation of national inventories; verification of national inventories with WDCs/ICES inventories; estimation and planning of data digitizing;

(iii) stage of data rescue: data digitizing and their submission to WDCs.

The Workshop considered the following types of assistance necessary to successful implementation of the Project in the region: technical support (CD-ROM readers, PCs, consumables, etc.); financial support to prepare datasets for international exchange; support in training.

The Workshop adopted the list of requirements for hardware, software and resources needed and the GODAR implementation plan for 1993-1995.

THE IMPORTANCE OF OPEN ACCESS TO DATA OR WHY GEOPHYSICAL DATA SHOULD BE OPENLY AVAILABLE

S. Ruttenberg, Chairman, ICSU Panel on World Data Centres
Hou Wenfeng, Director, WDC-D, Oceanography

It has been ICSU's policy on data that there should be no restrictions on access to basic geophysical data needed for research on the larger-scale earth, atmosphere, ocean and land processes. The data from ICSU sponsored programmes should be collected in the ICSU World Data Centres and available to any user at a cost no more than the actual cost of making a copy.

This open-data policy has served research well and has helped to support the development of much improved understanding of how the earth's many processes work together to control the climate system. Open sharing of environmental data is called for by the various agreements reached at UNCED, Rio de Janeiro, 1992, by many resolutions of the IOC and by the Second World Climate Conference, co-sponsored by ICSU and WMO.

Recently however, budgetary pressures have caused some nations to consider selling basic observational data, or otherwise restricting access to these data, as a means to help pay for the cost of making the observations. Such practices, if they spread, can cause serious harm to the studies of the earth's environment and its variability. Firstly, the costs of national observing systems are large compared to the possible commercial value of data. Secondly, any initial success in raising even a small percentage of operational costs may cause national budget planners to decrease base budgets even further, thus weakening national environmental agencies. Also, if more nations require purchases of their data, neighbouring nations will need to purchase data, thus reducing their budgetary gains achieved by their own data sales. The net result will be to cause increased costs everywhere and to inhibit the useful increase of scientific progress on understanding the variability in the earth's climate and environmental system. First of all, this practice would have a harmful effect on developing countries, as the main data producers are developed countries.

Moreover, there are new challenges and opportunities for improved data systems, using new global communications systems, and new data storage systems, and using the improvements of the long-term historical databases being created by data rescue and digitization of older data holdings. The IOC/IODE GODAR programme is an outstanding example of how rescue of older data is increasing information on the variabilities which have been occurring in the climate system. The open access to environmental data, a basic principle of the ICSU and IODE systems, is considered fundamental to the success of meeting the global environmental needs of the future.

An all WDC Technical and Scientific Workshop is being planned to:

(i) to improve the global environmental data services to meet new needs to better understand how the earth and climate systems respond to changes in internal and external facings;

(ii) to ensure optimal use of new technologies;

(iii) to see how the present World Data Centre System can be improved to serve both research and applications, and to play a role in providing access to data from the new observing systems being planned, such as GOOS and GCOS.

This Workshop may take place in the next year or two.

SCIENTIFIC RESULTS MADE POSSIBLE BY GODAR

S. Levitus, Director, WDC-A, Oceanography, GODAR Project Leader

A direct result of the GODAR project has been the creation of datasets that allow the international research community to describe the inter-annual variability of upper ocean thermal structure. For example, we now have available a 44-year record of upper ocean thermal observations for Ocean Weather Station 'C'. This record indicates that the sub-arctic gyre of the North Atlantic Ocean has experienced a linear cooling trend during the 1966-1990 period. In addition, the record indicates the existence of a quasi-decadal scale oscillation of annual mean temperature with a range exceeding 1.0°C. The time and space scales associated with this oscillation indicate that this feature is highly correlated with an oscillation of the surface pressure field over the North Atlantic known as the East Atlantic oscillation.

In addition to the creation of this (and other) time-series, enough data are now available to begin construction of yearly upper ocean thermal anomaly fields for large parts of the world ocean for selected time periods. The creation of such fields has occurred, the analysis procedures are being refined. This product will be available for international distribution and is expected to be frequently used in studies of air-sea interaction.

THE ROLE OF HISTORICAL DATA IN GOOS AND GCOS

J. Merle, ORSTOM Representative for the South Pacific

New operationally oriented observing systems are now being developed. The Global Ocean Observing System (GOOS) is dedicated to continuous observation of the ocean to meet different possible objectives including climate studies. The Global Climate Observing System (GCOS) is dedicated to climate monitoring and forecasting for all the components of the system, including the ocean.

GOOS and GCOS were created in 1992 in response to the recommendations of the Second World Climate Conference (SWCC) held in 1990 and the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992. GOOS and GCOS were established by 4 sponsoring organizations, namely the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC), the United Nations Environment Programme (UNEP), and the International Council of Scientific Unions (ICSU).

GOOS has been developed in five modules: (i) coastal zone management; (ii) living marine resources; (iii) ocean services; (iv) health of the oceans; and (v) climate.

GCOS has 4 components: (i) Atmosphere; (ii) Cryosphere; (iii) Land and biosphere; and (iv) Ocean.

The climate module of GOOS is identical to the ocean component of GCOS, and the Climate of the Ocean is developed jointly by the two programmes.

The strategy of GOOS and GCOS, is also similar. Both systems will develop from existing observing systems and services like World Weather Watch (WWW) of WMO and IODE, IGOSS, GLOSS of IOC.

GOOS and GCOS will also be founded on scientific research programmes. For example, the ENSO monitoring and forecasting system will be developed from the observing systems put in place during the TOGA research programme.

Historical data of the most important oceanic parameters are needed in GOOS and GCOS to meet the following objectives:

(i) Climates changes detection. We need sea surface temperature (SST) data and the largest possible time-series of sea-level, temperature and salinity profiles of the upper layer of the ocean. In this respect, the oldest observations (19th Century) are of the greatest value.

(ii) Models initialization and validation - SST; surface fluxes including wind stress, heat and moisture; full depth temperature and salinity; tracers.

(iii) Environment of oceanic living resources - SST; upper ocean temperature and salinity; upper ocean nutrients; chlorophyll; productivity; CO_2.

(iv) Health of the ocean - various pollutants and chemical substances.

It was noted and explained that for the prediction of ENSO oscillation, historical data are necessary to: (i) establish a precise climatology; (ii) reconstruct ENSO time-series; (iii) model initialization and validation. The list of the most important parameters include: (i) SST; (ii) surface fluxes; (iii) upper ocean T (and S); (iv) sea level; (v) surface velocity field.

For the detection of the global warming, the most important parameters are: (i) SST; (ii) sea level; (iii) upper ocean T (and S); (iv) coastal observations; (v) sea ice extent.

THE PICES PROJECT AND RESULTING DATA REQUIREMENTS FOR HISTORICAL DATA

Dequan Yang, Representative of PICES Data Management Committee

PICES is a North Pacific marine science organization created by an international treaty between Canada, China, Japan and the USA in 1992. The purpose of the organization is to promote and co-ordinate marine scientific research in order to advance scientific knowledge of the North Pacific Ocean and adjacent seas and of its living resources. Its focus includes, but is not limited to, research with respect to the ocean environment and its interactions with land and atmosphere, its role in and response to global weather and climate change, its flora, fauna and ecosystems, and impacts upon it from human activities, including pollution. The organization is principally interested in the North Pacific Ocean and adjacent seas from 30°N including the Bering and Okhotsk seas. PICES promotes the collection and exchange of information and data related to marine scientific research.

PICES is a broad, multi-disciplinary organization involving scientific interests in oceanography, ocean chemistry, modelling, marine environmental quality, climate and fisheries. There are 4 standing committees: Biological Oceanography, Fisheries Science, Marine Environmental Quality and Physical Oceanography and Climate.

The tasks of the Working Group on Data Exchange to achieve one of the primary goals of PICES include:

(i) the identification of existing international programmes and standards relevant to data exchange within the PICES regions;

(ii) the identification of datasets which are available and suitable for exchange and which would contribute to PICES goals;

(iii) recommend on exchange protocols for these datasets and for datasets generated by new programmes related to PICES objectives;

(iv) advise on quality control procedures and production of reference datasets in support of the scientific objectives of PICES.

The Terms of Reference of the Working Group permit discussions of many disciplines including physical, chemical and biological oceanography, meteorology, remote-sensing, fish biology, and ecosystems.

In the realm of physical oceanography and meteorology, the international standards and mechanisms for exchange of data are established and it is inappropriate for PICES to develop further standards. PICES recommended that scientists use existing standards when available and practical.

Few, if any, international standards are recognized for the exchange of biological and fishery data. The PICES members recognized that it would be more productive to encourage scientists and data managers to produce comprehensive data dictionaries than to prescribe protocols and formats for the collection and dissemination of biological and fishery data.

One of the biggest impediments to data exchange is an individual scientist who knows what data are available. PICES recommended that individual scientists be pushed to add to the list of databases available for exchange.

PICES agreed that its focus should be to facilitate data exchange and not to create administrative roadblocks. Whenever possible, requests for exchange of databases maintained by individual scientists or laboratories should go directly to the scientist or institution involved.

PICES recommended that a catalogue of databases be developed. To determine the resource requirements necessary to developing a catalogue, a questionnaire requesting information about databases has been circulated to PICES scientists. The magnitude of the response will determine the resource requirements to build and maintain the catalogue.

PICES encourages the free exchange of scientific data, information and research plans among its members and other Pacific rim countries with a view to facilitating data exchange.

Among other things PICES encourages: (i) the preparation, update when appropriate, and distribution of inventories of physical, chemical and biological datasets held by Member States and other countries pertaining to the area of interest; (ii) encourage and facilitate deposition in international archives of unclassified and non-routine datasets with special attention to regions where data are now scarce.

THE UNITED STATES EXPERIENCE IN GODAR AND NODC/WDC-A HOLDINGS AND OVERVIEW ON BIOLOGICAL AND CHEMICAL DATA

R.D. Gelfeld, US NODC/WDC-A, Oceanography

In 1990, the US National Oceanographic Data Centre (NODC) and the co-located World Data Centre A for Oceanography (WDC-A) initiated the project, which later, in 1993, became an international project and is now known as the Global Oceanographic Data Archeology and Rescue (GODAR).

Experience gained during the first years of implementation showed that perhaps the most valuable technique to quickly describe data holdings is to produce data distribution plots and tables of the number of profiles on a year-by-year basis for each major measurement type. Levitus and Gelfeld, (1992) have done this for each of the major NODC/WDC-A digital archives. This work showed the distribution of NODC holdings for all countries. NODC/WDC-A has prepared similar plots on a country-by country basis and distributed such summaries to data centres, scientists and institutions in approximately 20 countries as of December 1993. These summaries have generated much interest and have resulted in the following datasets received through the NODC and IOC Data Archeology and Rescue Projects (see following Table).

These data, plus all the data in the NODC/WDC-A archives, will be issued as ASCII files on CD-ROM as well as magnetic media by the end of 1994. This provides the least expensive and most efficient means of distributing these large datasets. WDC-A Oceanography, has volunteered its services to co-ordinate this activity.

The newly formed Ocean Climate Laboratory of the US NODC is assembling databases of biological and biochemical parameters, to complement the databases of physical and chemical parameters. This will allow the process of describing the spatial and temporal variability of the biological and biochemical parameters.

Currently, the biochemical parameters being assembled are measurements of primary productivity and chlorophyll concentration. The biological parameters being assembled are measures of plankton biomass and counts of taxonomic groups. The number of observations for most of these parameters are extremely low when compared to the physical oceanographic parameters. This reflects the greater difficulty and extra time required to collect these data as compared to physical and biochemical parameters and highlights the necessity of identifying and acquiring all historical data.

The US NODC has devised a taxonomic code system. The NODC taxonomic codes contain a maximum of 12 digits. The code numbers are partitioned into a series of 12-digit couplets, each of which represents one or more levels of taxonomic hierarchy.

DATASETS RECEIVED THROUGH NODC AND IOC DATA ARCHEOLOGY AND RESCUE PROJECTS

Country/ Institution	Data Type	Number of Profiles	Period of Observations	Remarks
Australia CSIRO	OSD	22,190	1929-1990	
Canada MEDS	XBT DBT MBT	46,658 11,563 145,286	1968-1988 1982-1981 1943-1988	Approximately 26,000 of these are "new" to the NODC/WDC-A archive. The rest replace existing profiles because the "new" ones are digitized at observed levels rather than at 5m intervals
China WDC-D	OSD	8,053	1958-1990	
France	MBT	2,791	1964-1972	MBT + Surface Salinity
Iceland	OSD	7,311	1938-1988	

A new release of the NODC Taxonomic Code (version 7.0), which now contains approximately 206,000 records was recently completed and now for the first time this data product is available in CD-ROM.

EXISTING REFERRAL SYSTEMS AND CATALOGUES OF OCEAN DATA HOLDINGS

I. Oliounine, Head, Ocean Services Unit, IOC

For international exchange purposes, data are divided into the following 3 categories:

(i) open data: data collected from international waters, i.e., beyond the Exclusive Economic Zone;

(ii) restricted data: data collected within the Exclusive Economic Zone;

(iii) classified data: certain types of data, depending upon their nature, may be classified as sensitive, and such data would not be available for exchange or dissemination purposes.

Open data, and to some extent, restricted data, are made available to users according to existing national or international guidelines.

The GODAR project identified as a matter of high priority the need to prepare catalogues (inventories) of available data in manuscript and analog forms. In this regard a need for an effective referral system requires special attention. This system should be able to provide information on existing environmental data collections and their accessibility and availability, answer enquiries concerning data, refer users to sources of information.

At the end of the seventies a referral service was created by IOC to meet the needs and demands of the marine community. This service is known as the Marine Environmental Data Information Referral System (MEDI) and was designed and developed as the sectorial sub-system of UNEP/INFOTERRA for marine science.

The MEDI of today is an automated, systematic method for recording and retrieving information on environmental data files that exist in international centres and national centres associated with an international network. MEDI is designed as an internationally accepted means of cataloguing such data as may be required by scientists and decision-makers.

The third edition of the MEDI catalogue, published by IOC in May 1993, contains almost 250 file descriptions from 35 institutions in 24 countries. The institutions provided information on the categories of data, their availability, location and characteristics. The MEDI information which is available now, contains short, plain text entries that can be transferred easily through communication networks on floppy disks, on magnetic tape or on paper. By the end of 1996, IOC plans to provide all its Member States with a copy of the MEDI diskette, to produce a parameter/geographic index for the MEDI catalogue, and an in-house log to keep track of MEDI submissions and requests.

In the middle of the 1980s, IOC carried out a survey and published a specialized catalogue of remotely sensed oceanographic data entries in MEDI. The purpose of this catalogue was to facilitate the use of MEDI by those concerned with remotely-sensed oceanographic data. Later, this catalogue was used for the development of Chapter 4 of the European Compendium on Remote Sensing of the Marine Environment published by CEC in 1992.

The format of MEDI entry forms and of the catalogue was also used for the development of some regional directories the most known of which is a European Directory of Marine Environmental Data (EDMED), developed by the British Oceanographic Data Centre (BODC), under the contract with CEC. The EDMED Directory being produced by BODC as a PC-based system will be made available on floppy disk, complete with user-friendly software interface.

The Committee on Data for Science and Technology (CODATA) of ICSU compiled a Directory of Data Services for Science and Technology which includes a chapter on oceanography. The CODATA Directory serves as a prime source of summary information as to where to find reliable, time- and space- independent data in physical, chemical, dynamical, geological, geophysical and biological oceanography.

At the end of the eighties, in the framework of the World Climate Data Programme, WMO started the INFOCLIMA project which comprises referral information on station networks and climate system datasets with the purpose of providing concise information on data resources available for climate research, and the sources from which they can be obtained. It is expected that finally, the INFOCLIMA inventory would contain information on about 40,000 stations worldwide, which would be available on a computer-compatible media. At present, the INFOCLIMA catalogue includes primarily references to meteorological data, but also to maritime and ocean data.

The existing and future referral systems will not be effective unless all centres holding data provide well-documented information on the extent of their holdings and the accessibility of such data.

OCEANPC AND GODAR

R. Harger, Scientific Adviser, UNESCO/ROSTSEA

OceanPC consists of two main modules. One to record existing data in digital form and to verify the input and a second to plot and display such data in essentially geographical form using a global map extraction routine together with a graphics editor and overplot routine. In its present form OceanPC can be used to digitize data and overplot any form of co-ordinate-related data. A number of special graphics are also available to represent oceanographic and other forms of environmental data on the resulting displays.

The output can be encapsulated in document form using any one of the popular screen-capture programmes available with most modern word processors. The availability of effective display software is a major factor in promotion of analytical results arising from examination of material arising out of data rescue operations.

Along with the discovery and rescue (digitization) of oceanographic and environmental data, which is the primary goal of GODAR activities, analysis and assessment of data also plays an important role.

An example relating to the assessment and prediction of ENSO-related droughts obtained from recovered air-temperature and rainfall data associated with a limited amount of sea-level information was presented for Indonesia

and the Philippines. Reduced lead-times in predicting ENSO-induced droughts can be effective in limiting crop loss and in promotion of mitigation programmes. In particular, the use of OceanPC map-based graphics evaluates ready production of high impact assessment and warning documentation.

The importance of analysis of both atmospheric and oceanographic data in combination was stressed and the use of microcomputers as a distributed digitizing capability to rescue manuscript-based data was recommended.

MANAGEMENT OF BIOLOGICAL DATA AND THE INDIAN NODC

J.S. Sarupria, IODE National Co-ordinator, NIO, India

Description of the structure and activities of the Indian NODC was given and detailed information on biological data holdings was presented.

The main objective of the INODC is to acquire, store, and disseminate entire spectrum of oceanographic data and, thereby, satisfy, as far as possible, the needs of marine scientists and user communities with respect to oceanographic data. The data centre ensures that the user gets good quality and accurate data which can generate useful information. The INODC has been recognized as a national facility to manage oceanographic data pertaining to the Oman Sea, Bay of Bengal, Laccadive Sea, Andaman and Nicobar Seas, and the Indian Ocean.

The INODC holds the data collected by NIO and other marine data-generating organizations and also holds data collected during the International Indian Ocean Expedition. In addition, the database of the centre has been enriched by acquiring data from Data Centres of other countries. The quantum and type of data available at the INODC is given in the table below:

Type of data and Information	Number of Records
1. Station inventory information	9,644
2. Time series inventory information	2,739
3. Bathythermograph (BT)	4,388
4. Nansen cast data	46,301
5. CTD	37,070
6. Wave records	1,431
7. Surface meteorology	3,312
8. SST (sea truth data)	4,922
9. SST (remote sensing data)	1,079
10. Chemistry	23,588
11. Primary production, chlorophyll	4,745
12. Zoo benthos (biomass)	844
13. Zoo plankton (biomass)	2,458
14. Geochemistry of sediments	720
15. Geophysical data	117,739

The data submitted to INODC are reviewed to ensure that it is accurately described to characterize the data type and to determine if it is suitable for processing. Analogue charts are screened for obvious errors or omissions and then digitized for computer storage.

The Data Centre, at present, does not have an absolute check on data accuracy. However, certain methods are employed to point out coding errors and suspect data. Quality control programmes are being used to check for completion of mandatory fields, expected ranges for fields and similar items. The suspect or erroneous data are flagged and in some cases even omitted. The datasets are assigned INODC reference numbers that are recorded in an inventory database. INODC identified oceanographic information at 4 levels:

(i) inventory level information
(ii) parameter level information
(iii) documentation information
(iv) actual numerical data.

Inventory level information includes geographic location of the stations, cruise details and INODC numbers. Parameter level information includes various parameters observed at each station along with their respective ROSCOP codes which are accepted internationally. Data level information includes processed numerical data and INODC number as reference key field.

The inventory and parameter information is stored in the Station Inventory Information System (SIIS) developed by using the INGRES RDBMS database package available on AViiON 4000 mini-computer working under UNIX environment. Numerical data are stored as individual tables using INGRES RDBMS adopting the Integrated File System structure (IFS).

On-line SIIS also provides an easy and user-friendly access for selecting inventory information in conjunction with users' demands.

A PC-BASED EXPERT SYSTEM FOR THE IDENTIFICATION OF MARINE BIOTA

S. Lelekov, Head of Laboratory, Institute of Biology of the South Seas, Ukraine

One of the GODAR objectives is the search for and rescue of biological data. Biological data occupies a special place among other types of oceanological data. Due to the form's diversity of the animate nature in comparison with inanimate ones.

Today biological monitoring for different groups of objects (bacte-, rio-, phyto-, zoo-, ichthyoplankton, phyto- and zoobenthos, cephalopods, crustaceans, fish, sea birds and mammals) is implemented by measuring such parameters as biomass, productivity, species.

A PC-based expert system for species structure was presented. The term "species structure" designates the enumeration of species of the objects present in a sample. If the claims for analysis are less stronger or the execution of such analysis is very difficult, then the objects belonging to the high taxons (genus, family, order, etc) are determined.

The process of species identification has a number of special features:

(i) At present there are no reliable automatic species identifying devices;

(ii) Identification of biological objects is a time-consuming job requiring expert knowledge. It is considered that to enable a good specialist to identify the species of object, experience of approximately 10 years is necessary. However, this experience would not be universal and this could be used only in certain regions of the world ocean. A specialist would be faced with a lack of internationally agreed standards on terminology and estimation procedures, with superfluous information and contradiction of facts;

(iii) There is no agreed system of units of measure for species identification, which are available for other oceanological parameters. Discovery of new species, forming of new genera, families, etc. as well as classification of biological objects is a continuous process.

Species identification is a very subjective process. Its results completely depend on experience and knowledge of researchers.

To implement biological data rescue operations within the GODAR project, it is necessary to rescue biological knowledge.

In 1993, a computer system - TAXEX - based on experts knowledge was developed in Ukraine. It is based on the assumption that the knowledge and experience of high level professionals should be used by less experienced specialists to solve analogous problems with the same speed and quality.

The TAXEX system consists of 3 parts:

(i) An expert system provides assistance for the identification of the biological object and species. The system puts questions about different features of the examined object. The user answers these questions. As a result, little by little, the system forms its own hypothesis about the object. The merit of the system lies in the fact that almost all questions are expressed in graphic form and the text for them has a subsidiary character;

(ii) The knowledge base includes information about biological objects presented in table and text forms, and many illustrations. Relevant to biological objects it may have a form of: a) taxonomic descriptions; b) information about physiology, biology, ecology, etymology, parasites, diseases; c) maps of distribution; d) bibliography, etc;

The user can request information from the base of knowledge by means of a plain language. For example, "*Find me all species having the callus*" and the system will find names of these species. The results of this search may be taken into consideration during the object identification.

(iii) The training system permits the use of databases and bases of knowledge for increasing the professional degree of users' knowledge. A teacher or student chooses some species for training and starts to use the system; if he gives a wrong answer to the system question; in other words, if his answer does not correspond to meanings of the character included in the database, the system stops, reports the correct answer and gives him time to analyze the situation and give a correct answer. Information on results of the training is reported to the trainees upon completion of the exercise.

The success of the GODAR project in search and rescue of biological data will depend on the efforts made by the world community in rescuing biological knowledge.

3. NATIONAL REPORTS

AUSTRALIA

Australian marine science organizations with national or international responsibilities are co-ordinated by the Commonwealth, Heads of Marine Agencies (HOMA) Committee. The major organizations involved in oceanography include:

- CSIRO Division of Oceanography;
- CSIRO Division of Fisheries;
- Australian Institute of Marine Sciences;
- Great Barrier Reef Marine Park Authority;
- Bureau of Meteorology;
- Royal Australian Navy (operating the Australian Oceanographic Data Centre);
- Bureau of Resource Science;
- National Resource Information Centre;
- Environmental Resource Information Network;
- Australian Geological Survey Organization;
- National Tidal Facility;
- Defence Science and Technology Organization.

In addition to these agencies, there are a large number of state and local government agencies and academic institutes with a marine science component.

The Heads of Marine Agency Committee have recently expressed increasing interest in the management of oceanographic data. They held a Workshop in early March 1994, to address a number of issues in relation to data management, particularly the co-ordination of data exchange and management. The Workshop strongly endorsed the concepts of data exchange and supported the operations of the Australian Oceanographic Data Centre. To facilitate improved co-operation with the AODC, the HOMA Workshop recommended the creation of a Steering Group to address important data management issues such as standards, formats, timeliness of data submission etc, and to provide guidance to the AODC to improve data communication and support to the scientific community. The creation of this Steering group has provided much needed endorsement and future direction for the activities of the AODC.

Australian GODAR-related Activities

(i) The Australian Institute of Marine Sciences is undertaking an internal data rescue project to protect data in danger of being lost through the deterioration of magnetic tapes. This activity will also result in the development of a detailed data inventory.

(ii) CSIRO, the Division of Fisheries is undertaking a project to catalogue their data holdings which cover a wide range of data types including biological, chemical and oceanographic. This project will produce a comprehensive data inventory.

(iii) A data inventory of oceanographic observations in the Southern Ocean and Antarctica is being prepared by personnel from the Antarctic Co-operative Research Centre.

(iv) AODC has established a co-operative project with the Environmental Resource Information Network to undertake an extensive survey of marine science data holdings within Australian agencies. AODC is presently seeking funding to undertake this activity which will be spread over 3 to 4 years. An indirect result of this survey will be the identification of datasets in need of rescue.

The Australian Government, through the Commonwealth Spatial Data Committee is in the process of finalizing policy on the management and exchange of spatial datasets which include oceanographic data. This policy will result in the creation of the Commonwealth Spatial Data Transfer Standard. Within this Standard, a number of agencies are identified as "data custodians" and are responsible for safeguarding specific data types in the national interest. (For example, AODC is the recognized data custodian for physical oceanographic data). The custodians maintain the datasets on behalf of the Commonwealth Government ensuring appropriate standards are met and providing the data only at a cost of copying the dataset.

The Royal Australian Navy is one of the few navies in the world that provides its oceanographic data to the civilian community with little or no restriction. In fact, since the mid 1980s, the Royal Australian Navy has input much of its oceanographic data to IGOSS in real-time. The AODC wishes to encourage other countries to explore the possibility of having their navies release oceanographic data to the scientific community.

Australia in general and the AODC in particular strongly endorse and support the GODAR project. APDC will endeavour to improve the flow of data into IODE from Australian sources and will also provide support to other countries in the region. This support will include missions, data management consultancy and assistance with digitizing appropriate datasets.

CHINA

Introduction

The China National Oceanographic Data Centre (CNODC) is a component of the National Marine Data and Information Service (NMDIS). It is a comprehensive oceanographic data service sector, which takes responsibility for the collection, processing, management of marine environmental data, and provides services to users.

The World Data Centre-D (WDC-D) was established in China in 1989 on the basis of the CNODC.

Data Sources

(i) CNODC periodically receives data collected at 53 coastal observation stations along the coast of China and the islands concerned. These stations operate under the State Oceanic Administration (SOA), and conduct long-term and continuous observations of sea water temperature and salinity, sea wave, tide level, sea ice and meteorological elements, etc;

(ii) CNODC regularly receives data from oceanographic sections made in the coastal waters of China. These sections are implemented 4 times a year in the Bohai Sea, the Yellow Sea, the East China Sea and the South China Sea by the 3 branches of SOA. These observations include data on marine meteorological, hydrological and chemical parameters;

(iii) CNODC also receives oceanographic data from the ocean investigations carried out under Chinese Science Research Projects and International Co-operative Oceanographic Research Projects, such as TOGA, WOCE, TOGA-COARE and the joint Sino-Japanese Investigation and Research of Kuroshio. The projects are organized mainly by the First, Second and Third Institutes of Oceanography and the Institute of Marine Environmental Protection, SOA. After the completion of each project, the institutes send the oceanographic data collected in the framework of a project to CNODC.

The National Marine Environmental Forecasting Centre receives ship report data from the China Meteorological Administration through GTS. The National Marine Environmental Forecasting Centre uses these data for forecasting services in real-time. This Centre provides CNODC with ship report data on magnetic tapes every year.

(iv) CNODC also obtains oceanographic data from oceanographic institutes of Academia Sinica, Qingdao Ocean University of the State Education Commission, Marine Fishery, Institutes of the Ministry of Geology and Mineral Resources and the Hydrographic Service of the Navy. In turn, CNODC provides them with complete datasets and products on request.

Data Holdings

After receiving various kinds of oceanographic data, CNODC conducts data processing in the Computer Support Centre of NMDIS using quality control procedures set up by CNODC and establishes the related data files. CNODC provides users from China and abroad with data and data products on request.

Part of the CNODC data holdings are available for the International Oceanographic Data Exchange. In order to facilitate the international exchange of these data, two volumes of "Catalogue of Internationally Available Oceanographic Data in the possession of CNODC" have been published. The third volume "Catalogue of Oceanographic Data in the possession of CNODC" describing data which have not yet been internationally available is planned for publication.

International Co-operative Activities

Since its establishment, CNODC, as the Chinese IODE contact point, actively participates in IODE activities and co-operates closely with other NODCs and RNODCs in the field of oceanographic data exchange which is one of the important data sources for China.

WDC-D for Oceanography has established close bonds of co-operation in data exchange with WDC-A and B for Oceanography and WDC-A and B for Marine Geology and Geophysics.

CNODC has experience in the organization of training courses in marine data processing and marine information retrieval techniques for developing countries.

CNODC also takes an active part in ASFIS activities and provides ASFA with abstracts of Chinese publications in the field of marine sciences and fishery.

Data To Be Rescued

(i) CNODC has finished the standardized processing of the major part of historical data held in CNODC and stored them on magnetic tapes. In the 1970s and early 1980s, CNODC has received a big volume of BT profile data in analogue form, and also data from routine observation sections in the coastal waters of China. There are more than 14,300 stations which have not yet been digitized. These data are in danger of being lost and the necessary measures need to be implemented to rescue them. CNODC plans to give priority to digitizing sections data and then BT datasets. These data will be made available for international data exchange;

(ii) There are many ship report data on paper sheets stored in the 3 branches of SOA. These data have been received from Chinese Voluntary Observing Ships (VOS). They contain about 400,000 observations. CNODC is now considering the development of a plan to rescue these data. The first step will be to set up a standard data form and digitize data using data quality control procedures, and then set up a ship report dataset. Since this is a huge task, there will be a need for significant financial support.

FRANCE

French oceanographers started observations in the South Equatorial Pacific more than 50 years ago. Tide and surface hydro-meteorological observations were made in several places along the shores of islands and territories dependant on French Administration, namely: French Polynesia, New Caledonia and some isolated islands like Wallis and Futuna.

In addition to these coastal observations, several categories of offshore oceanic observations started in the 1960s with the settlement of two oceanographic research centres in Tahiti (French Polynesia) and Noumea (New Caledonia) under the sponsorship of ORSTOM, a French research institute with responsibility for tropical research.

These offshore oceanic observations include:

(i) surface T - S observations;
(ii) XBT/MBT sections;
(iii) Hydrological cruises including observations of T,S, O_2, nutrients, chlorophyll and productivity;
(iv) moorings (TAO type) including T and velocity sensors;
(v) surface drifting buoys.

These observations are components of several international programmes: TOGA, TOGA-COARE, JGOFS.

Most of the data collected have been sent to the US NODC or the French NODC. Two main oceanographic centres in Noumea and Tahiti, are responsible for detecting any data which have been neither recorded on magnetic tape, nor sent to international or national data centres.

INDONESIA

Introduction

Indonesia is well known as a maritime country. The first modern oceanographic expedition in Indonesia, the Challenger Expedition, was implemented in 1876. After this expedition, other well known expeditions were carried out in Indonesian waters by "VALVADIA" (1898-1899), "PLANET" (1906-1907) and others. Two expeditions were implemented by the Dutch in order to study the Indonesian waters known as the "Siboga Expedition" (1899-1900) and the "Snellius Expedition" (1929-1930). During these expeditions many data were collected and until today a big volume of this data is available only in manuscript form. This old data could be valuable for the study of environmental changes in general, and of Indonesian waters in particular.

Marine Research Activities in Indonesia

Today marine research activities in Indonesia are conducted by various organizations. The type of data collected depends on the institutional mission. The agency names and type of collected data are given in the following table:

Agencies	Type of Data
Research & Development Centre for Oceanology (RDCO) - LIPI	Physical, Chemical, Biology, Pollution
National Hydrographic Office - NAVY	Tide
Marine Fisheries Research Institute	Fisheries including Acoustic Data
Assessment & Application for Technology (BPPT)	Oceanography
National Co-ordination Agency for Survey & Mapping	Tide & Remote-Sensing
National Institute of Aeronautics & Space (LAPAN)	Oceanography (satellite observations)
Meteorological & Geophysical Agency (BMG)	Meteorology
Research Centre for Marine Geology	Marine Geology & Geophysics

It can be seen that RDCO is the institute which conducts research on most marine science disciplines. In fact, this institute has a long history in marine research activities.

In 1990, RDCO established a marine data centre within the institute through a project named the "Establishment of National Oceanographic Data Centre". Some activities have been carried out under this project, such as purchasing equipment, system development and training. In 1993, a new building was also provided by the Government to accommodate the activities of the centre. Although the centre has not yet been registered as a member of IODE, RDCO has actively participated in programmes conducted by IOC/IODE, such as training courses and workshops on data management.

Types of Data

Most oceanographic cruises including those to study marine biological and coastal living resources in Indonesia were organized by RDCO. Historical data from the early 19th Century can be found in this Institute. Unfortunately, these historical data are still in manuscript form, so there is a risk of losing it.

At present, data managed by RDCO come from cruises and surveys made by this Institute. Data can be divided into 3 categories, i.e., oceanographic cruise data, tidal data, coastal living resources and marine pollution data.

Category	Discipline	Parameters
Oceanographic Cruise	Physical Oceanography	Temperature, salinity, STD, MBT, current, surface meteorological data
	Chemical Oceanography	Oxygen, diss. oxygen, nutrient
	Biological Oceanography	Chlorophyll, seston, plankton
Tide Data [1]		
Coastal Living Resources	Flora and fauna	Abundance, biomass, diversity, density, growth rate, etc.
Marine Pollution	Chemical	Trace element, pesticides
	Biology	Microbiology, red tide

Data Management System

In order to manage data efficiently, the Centre has developed a PC-based information system using the commercial software package dBase-IV. The Centre is also considering the use of OceanPC for managing oceanographic cruise data, by developing a conversion programme.

Two database management systems have been developed in the Centre, namely OCR (Oceanographic Cruise) and CLR (Coastal Living Resources) and one database is on system testing, namely MARPOL (Marine Pollution).

OCR Database

This database consists of six database files:

(i) CRUINFO database file with general information on cruises e.g., project name, institute which conducted the cruise, start date, end date, area, chief scientist, total number of stations, data type according to IODE data type identifier, etc;

(ii) STAMET database file which contains descriptions of stations and surface meteorological data, (e.g., station number, date, time, depth, latitude, longitude, weather condition, wind direction, wind speed, air temperature (wet and dry), air pressure, etc;

(iii) HIDRO database file which contains observation data, (e.g., depth, temperature, salinity, oxygen, phosphate, nitrate, silicate, ph, etc);

(iv) PIGMENT database which was created to manage chlorophyll and seston data;

(v-vi) ZOO-VOL and FITO-VOL database files which contain zooplankton and phytoplankton volume data respectively.

CLR Database

This database system was developed under the ASEAN-Australia Co-operative Project on Marine Science: Coastal Living Resources. The database consists of 4 major components of studies, i.e., coral reef ecosystem, mangrove ecosystem, seagrass ecosystem and softbottom communities. The amount of data collected since the project began is considered to be important for the assessment of the impact of global climate change on coastal living resources.

[1] This is a special project under the ASEAN-Australia Co-operative Project on Marine Science.

The State of Oceanographic Data

Oceanographic surveys and marine living resources studies have been started since the early 19th Century. To rescue this historical data, RDCO through its data centre has started to digitize data in readable format using the software package mentioned above. As a starting point, the centre has digitized oceanographic data (OCR database) from the cruises made in 1970 up to 1992. In addition to this, a set of oceanographic data (3,328 stations, for the period 1949-1975) is available from the US NODC, as well as from ICES.

The Indonesian coastal living resources data have been collected since 1987 from 3 areas, i.e., Seribu island; (a coral reef archipelago in Jakarta Bay), Ujung Kulon in West Java and Grajagan in East Java. More than 70,000 records have been included in the CLR database.

Marine pollution data were collected in order to monitor the environmental conditions of Indonesian waters especially in coastal areas. More than 2,000 stations of observations have been digitized into computer readable format.

The Need for Data Rescue

Substantial amounts of oceanographic and marine living resource data still exist at RDCO which are at risk of being lost due to media degradation, and they need to be rescued. Below is a list of data which are still in manuscript form.

Location	No. of Cruises	No. of Stations	REMARKS
Jakarta Bay	16	168	MLR [2]
North Coast of Java	15	96	MLR
West Java	3	20	MLR
Banka Strait	4	96	MLR
Malacca Strait	2	28	MLR
South Kalimantan	8	65	MLR
East Java	3	23	MLR
Central Java (Southern)	2	12	MLR
Batam Island	2	42	MLR
Eastern Indonesia	*)	*)	O, MLR This region was the main region of interest for: Rumphius Exp. Snellius Exp. Corindon King Memorial (period: before 1960)

Because of budget limitations, it will be difficult for the marine data center at RDCO to implement a data rescue project, unless there is external support provided.

[2] O = Oceanographic Data; MLR = Marine Living Resources; *) = still in the identifying process.

JAPAN

Introduction

JODC has been the National Oceanographic Data Centre (NODC) of Japan since 1965 and plays the role of the RNODCs for MARPOLMON, IGOSS, WESTPAC and ADCP to support the activities of IODE.

JODC has 26 staff members and 4 sections, namely: administration, information management, data management and marine consultation service.

The NODC of Japan is implementing the following functions:

data management;
data collection, archive and exchange;
development of Data Format;
data management in the projects (KER, WOCE, JGOFS, IGOSS);
information management (CRS, NOP);
dissemination of data and information;
operating marine consultation service;
participation in International Oceanographic Data Exchange (IODE);
provision of training in ocean data management.

Data Management Policy

(i) JODC acquires data which are observed from sea surface to sea bed and from coastal areas;

(ii) all digital data are permanently archived at JODC in the JODC format, but some of them in the data originator format;

(iii) the data available in manuscript form will be digitized by JODC;

(iv) JODC guards all acquired data by storing copies off centre;

(v) No changes are made to the original data;

Data Distribution Policy

(i) Data is available free of charge for users on a mutual data exchange basis;

(ii) Requests from non-mutual data exchange or commercial users will be charged by the Japan Hydrographic Association under a cost-recovery basis, this is cost-related to the labour and materials; there is no charge for actual data;

(iii) JODC does not allow users to transfer data received from JODC to third parties;

(iv) If data obtained from JODC is used in a publication, JODC would request the following acknowledgement, "These data were supplied by the Japan Oceanographic Data Centre" and one copy of reprint;

(v) Data acquired by JODC are forwarded to World Data Centres with the permission of the originator of the data;

(vi) JODC develops data products, such as inventories, statistics and atlases and distributes them to users.

Data Holding

The volume and type of data available at JODC are presented in the table below:

Serial station	301,027 stn since 1906
CTD	14,250 stn 1983-
XBT	40,994 stn 1974-
IGOSS (Bathy/Tesac)	420,234 stn 1982-
Ocean current	219,952 stn 1977-
MARPOLMON	131,840 stn 1975-
Wave	394,099 stn 1978-
Sea-level	89 stn 1961-
Tidal current	13,664 stn 1923-
Marine biology	30,000 stn 1975-
MGD77	1,400 crs 1953-
Bathymetry (J-BIRD)	1,150,000 stn 1920-

These data were collected mostly from Japanese marine data collection organizations and WDC-A, Oceanography.

Data Archeology and Rescue at JODC

Since its establishment, JODC has made efforts to collect and digitize data in analog form, manuscript form, and digital form from the Maritime Safety Agency, Meteorological Agency, Fishery Agency, Geological Survey Institute, Self-Defence Force, Japan Marine Science and Technology Centre, Metal Mining Agency, universities and the private sector. Today, JODC collects data generated by on-going international and national projects from the above organizations with the exception of some universities and private sectors.

Historical Data

These data, which need to be digitized, are in the possession of a few national agencies. Some examples are given below:

Maritime Safety Agency

No oceanographic data presented in log books and observation reports have been digitized for 1943 and 1944 including about 2,000 stations observed by the Imperial Navy. Digitization will be done by JODC within two years.

Fishery Agency

Part of the oceanographic data presented in publications was digitized by JODC (OSD, DBT, MBT, XBT respectively 254,846 stns, 23,452 stns, 60,764 stns, 1,774 stns for 24 years from 1963 to 1985) and submitted to WDC-A. Subsequently, data for 1986 to 1988 was received by JODC from the agency and will be digitized.

Japan Fishery Information Centre (JAFIC)

Nearly 100,000 stns of SST observed by fishing vessels, commercial vessels and research vessels were collected by JAFIC which include IGOSS log tables and ship reports. An agreement for data exchange will be signed soon between JAFIC and JODC.

CTD Data Collected by Mie University

JODC received 309 stations of CTD data from Mie University on magnetic tapes in 1992. CTD data was stored on tapes by the software written in Tectronics basic language on a Tectronics computer. Unfortunately, this data can not be used as JODC could not read the data for technical reasons and lack of the necessary documentation.

MALAYSIA

Introduction

Malaysia by virtue of its long coast is essentially a maritime nation. With the implementation of the 200 mile Exclusive Economic Zone (EEZ) under the Convention on the Law of the Sea Conference, the Government is committed to support the exploitation, management and control of offshore resources in the zone and the country's territorial waters.

There are many departments and agencies in Malaysia involved in the collection and analysis of oceanographic data. As a result, the possibility for one agency to overlap the interest of another in oceanographic work is great. Data collected by different national institutions are either retained by the respective agencies or in some cases destroyed or lost due to lack of archiving facilities. One of the identified remedies to this situation is to have a co-ordinating body to compile all oceanographic data at the national level and this may be in the form of a National Oceanographic Data Centre.

The Royal Malaysian Navy (RMN) being the national authority in hydrographic surveying has taken the first step towards the establishment of an Oceanographic Data Centre within the Hydrographic Directorate which is known as RMNODC. With the recent purchase from Australia of a Geographical Information System (GIS) based on HydroComp System, the capability of the RMNODC in the management and analysis of oceanographic data is further enhanced. This system is similar to the HydroComp system in use at the Australian Oceanographic Data Centre (AODC).

Availability of Ocean Data and Plans for the Future

One of the problems faced by RMNODC is the acquisition of data from other national governmental or non-governmental agencies. There is no information on who did what or where and what type of oceanographic activities were carried out. There is also no national policy on participation in international oceanographic data exchange. There is a tendency to value data in monetary terms which makes it difficult to have data from national agencies involved in data collection.

RMNODC is aware of the existence of ocean data in the databases of oil companies operating in Malaysian waters and at educational establishments. With the new HydroComp system already in operation at RMNODC, work is in progress to acquire all these data and to archive them in the national database. There are also plans to increase a number of XBT observations by Royal Malaysian Navy ships in Malaysian waters, and make them available to RMNODC.

Matahari Expedition

Several scientific expeditions have been carried out in Malaysian territorial waters and one of the major ones is the Matahari Expedition. This is a joint project between the Agriculture University of Malaysia and Kagoshima University of Japan to study the offshore waters of the Malaysian EEZ. It started in 1985 and ended in 1989. A total of 4 expeditions have taken place where hundreds of oceanographic stations have been implemented and a considerable volume of data were collected. Most of the data are now presented in manuscript form and if urgent action is not taken to rescue them, they may be lost or destroyed.

Status of Data

Most of data available at RMNODC were received from the AODC through the Malaysia/Australian Joint Defence Programme (MAJDF). They have been included in the HydroComp database and covers the Malaysian area of interest, especially the South China Sea, the Strait of Malacca and a portion of the Andaman Sea. Summaries of the data available are shown in the tables below:

Summary of Temperature Profile Datasets

Ref. No.	Dataset	Data File	Format	No. of Obs.
1.1	NODC	MBT, SBT, XBT	NODC (XBT)	620,000
1.2	ROD	CTD	ROD	35
1.3	RMN	XBT	NODC (XBT)	45
1.4	RAN	XBT	AODC (XBT)	-

Summary of Station Datasets

Ref. No.	Dataset	Data File	Format	No. of Obs.
1.1	NODC	SD	NODC (SD)	80,000
1.2	ROD	-	-	-
1.3	RMN	-	-	-
1.4	RAN	-	-	-

Summary of CTD/STD Datasets

Ref. No.	Dataset	Data Files	Format	No. of Obs.
1.1	NODC	C/STD	NODC (FO22)	4,000
1.2	ROD	CTD	ROD	35
1.3	RMN	-	-	-
1.4	RAN	-	-	-

Besides these data, those on CD-ROMs distributed by the US NODC, NGDC and NASA-JPL are also available:

(i) NODC1, NODC2, NODC3;
(ii) TOGA (Tropical Ocean Global Atmosphere);
(iii) Global Relief Data.

KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF

Oceanographic data in the possession of different national institutions include:

(i) coastal oceanographic data;
(ii) oceanographic data from ships;
(iii) marine meteorological data;

(iv) oceanographic data collected by satellites.

Oceanographic data for the period before 1900, are available in manuscript form on paper, and after 1900, in different types of digitized forms. These archives include unique, historical records of "Koryosa".

At present the project is under preparation concerning the classification, rescue and use of historical oceanographic data based on the following principles and methodology:

(i) collection of oceanographic data known to be available on magnetic tape and diskettes;
(ii) quality control of collected data (syntaxis examination);
(iii) digitization of data and gradual advance of data by uniform progressive model;
(iv) formation of a database of oceanographic and marine meteorological data;
(v) formation of digitized fields of ocean parameters;
(vi) formation of service models based on oceanographic data.

NEW ZEALAND

The Royal New Zealand Navy has been releasing oceanographic data via the AODC for a number of years. These data are forwarded to the US NODC and made available for international exchange.

The New Zealand Oceanographic Institute has recently made internationally available a small quantity of data (approx. 150 XBT and 2,000 hydrographic stations) as a result of an internal data rescue activity. This data will be forwarded via AODC through IODE mechanisms. NZOI also holds about 3,000 MBT slides that require digitization. While the majority are on the continental shelf, it is a valuable dataset that should be transferred to more modern media.

PHILIPPINES

Background

In 1966, the National Committee on Marine Sciences (NCMS) designated the then Bureau of Coast and Geodetic Survey (now the CGSD of NAMRIA) to serve as the National Oceanographic Data Centre (NODC). The Philippine became a participating member of the IODE system in 1968.

The Philippine NODC, a unit within the Coast and Geodetic Survey Department (CGSD) of the National Mapping and Resource Information Authority (NAMRIA) was established to acquire, process, store, archive and disseminate oceanographic data.

1 full-time and 5 part-time experts are all permanent employees at the CGSD. Four have been trained at the JODC in oceanographic data management, two have attended training courses at the Flinders University, Australia in the field of collection, processing and archiving of tidal and sea-level data.

For 1994, the NODC budget was P29,000 (US$ 1,050) for maintenance of computer facilities and operations.

Information and Referral Services

Due to the NODC's limited budget and personal, the mandatory request to all government and private agencies, universities and institutions involved in marine science to submit oceanographic data to the Centre, was held in abeyance until such time that the NODC is capable of taking the full responsibility. For types of data and information not available at NODC, NODC can provide service to users by referring them to other agencies and organizations which possess this data. NODC products and services are provided free of charge on a mutual exchange basis, or on a cost recovery basis in accordance with guidelines and policies established by NAMRIA.

NODC Oceanographic Data Holdings

The following are the sets of data available in the NODC:

(i) oceanographic data collected by Filipino scientists during the implementation of co-operative projects;

(ii) data acquired through direct bilateral exchange with other countries and through the IODE system;

(iii) data observed by NAMRIA in the performance of its function as a national hydrographic and oceanographic office.

NODC data holdings include: measurements of sea temperature, salinity, chemical analysis, marine meteorology, bathymetry, sea-level, tidal and ocean currents, BT data, etc. More detailed information is presented in the table below.

Data Type	Data Attribute
Tidal Current	Latitude, Longitude, direction at rising tide & direction at falling tide.
Tide	Latitude, Longitude, Tide station name, datum below BM, zero of tide staff, number of tidal components, amplitude & delay angle of each tidal component.
Ocean Meteorology	Latitude, Longitude, data observed, wind direction, wind force, atmospheric pressure, atmospheric temperature, visually observed wind direction & wave height.
Water Temperature	Latitude, Longitude, depth, date observed, number of layers observed, depth & temperature of each layer.
Surface Water Temperature	Latitude, Longitude, data observed, water temperature.
Ocean Current	Latitude, Longitude, data observed, observation instruments, current direction, current velocity, northward & eastward components of current velocity.
Salinity	Latitude, Longitude, depth, date observed, number of layers observed, number of standard layers, depth & salinity of each layer.
Water Analysis	Latitude, Longitude, depth, date observed, number of layers observed, depth, DO, PO_4, total P, NO_2, N, Si & pH of the layer observed, depth, DO, T, thermostatic anomaly, specific volume anomaly, dynamic depth anomaly & speed of sound of the standard layer.

Aside from being a participating member of the IODE system since its establishment, the NODC has been involved in the collection of data from the following ocean research and monitoring programmes.

Data are available in the form of log books, reports, publications and/or floppy disks.

(i) Co-operative Study of the Kuroshio Current and Adjacent Regions, Summer 1968 and Winter 1969 Cruises (CSK);

(ii) ASEAN-Australia Co-operative Programme on Marine Sciences:
- Tides and Tidal Phenomena (TTP) Project,
- Regional Ocean Dynamics (ROD) Project;

(iii) Global Sea-Level Observing System (GLOSS/PSMSL);

(iv) Integrated Global Ocean Services System (IGOSS)/IGOSS Sea-Level Project in the Pacific (ISLPP);

(v) Tropical Ocean and Global Atmosphere (TOGA);

(vi) World Ocean Circulation Experiment (WOCE);

(vii) Pacific Tsunami Warning System (PTWS).

In 1988 and 1989, JODC assisted the NODC by providing computer equipment and developing software on oceanographic data processing and management. Other software and equipment were also provided by the ASEAN-Australia Co-operative Programme on Marine Science Projects Tides and Tidal Phenomena (TTP) and Regional Ocean Dynamics (ROD). Further development of software are being undertaken by the NODC personnel.

Activities of the Philippine NODC in Data Archeology and Rescue

In 1988, the Philippine NODC tried to collect marine information/data from some of the NCMS member agencies. However, due to limited resources (financial, manpower, hardware/software, etc.) it has not been possible to effectively implement this objective. Although data are readily available from these agencies, most data have never been deposited in to the IODE system, and the risk of loosing them is very high.

At the NODC, there are less than a hundred MBT profiles; there are marine meteorological datasets observed hourly on board NAMRIA (formerly Bureau of Coast and Geodetic Survey) research/survey vessels for a long period of observation, and time-series of sea surface temperature and salinity at tidal/coastal stations. All this data are in manuscript form and need to be rescued.

RUSSIAN FEDERATION

General Information

Several centres and institutions in the Russian Federation are involved in the accumulation and management of oceanographic data for the Pacific Ocean and adjacent seas (Bering, Okhotsk, Japan, Yellow, East China, South China):

(i) All-Russian Research Institute of Hydro-meteorological Information - WDC-B-RIHMI-WDC (NODC);

(ii) Far-East Research Institute of Hydro-meteorological Information - Far-East RIHMI;

(iii) Hydro-meteorological departments (4) of the Federal Service of Russia for Hydro-meteorology and Monitoring of the Environment;

(iv) Pacific Research Institute for Fishery and Oceanology - PRIFO;

(v) Pacific Oceanographic Institute of Far-East Science-Research Centre of Russian Academy of Science;

(vi) Naval Oceanographic Data centre of the Ministry of Defence;

(vii) Far-East State University.

The above-mentioned institutes/organizations have 19 small (for seas) and large (for oceans) vessels for sea investigation.

There are 67 coastal stations around the Bering, Okhotsk and Japan seas.

Oceanographic Data Holdings in the Russian NODC (RIHMI - WDC-B)

In 1993 the Russian NODC finished the updating and checking of cruise reference databases with cruise descriptions which are held at RIHMI-WDC. There are two types of oceanographic data from the North Pacific area.

(i) data from foreign sources as WDC-B holdings;
(ii) national data.

Number of R/V Cruises for Countries and Observation Type

Country	Period of Obs.	No. of Cruises	T/S	MBT	Current	Hydro-chem.	Pollution
Australia	1957-82	15	15	0	3	9	0
China	1959-82	20	15	0	0	12	0
Indonesia	1975-83	31	29	0	0	27	0
Japan	1925-87	3,471	3,022	130	107	633	28
S. Korea	1962-87	383	70	0	0	59	0
Malaysia	1970-71	2	2	0	0	2	0
New Zealand	1965-67	3	27	0	0	1	0
Philippines	1969-79	2	1	0	0	1	0
Thailand	1967-69	8	15	0	0	6	0
USA	1908-91	1,059	863	33	12	565	7
Russia	1907-92	3,877	3,532	826	746	1,727	229
		8,871	7,591	865	865	3,042	264

At present, WDC-B holds oceanographic data from 4,500 cruises made by 12 IODE Member States (approximately 400,000 oceanographic stations) from the North Pacific area (65000 N-0000 N), including the Bering, Okhotsk, Japan, Yellow and China seas. Half of the WDC-B data belongs to 1960-1980. More than 50% of data have been obtained from two countries - Japan and the USA.

At present, about 30% of data are in a manuscript form:

(i) data from Australia - 5 cruises;
(ii) data from China - 8 cruises;
(iii) data from Indonesia - 16 cruises;
(iv) data from Japan - 680 cruises;
(v) data from S. Korea - 85 cruises;
(vi) data from New Zealand - 7 cruises;
(vii) data from USA - 306 cruises.

The major part of non-digitized data includes special oceanographic observations, as well as pollution data which are very difficult to digitize without serious preliminary processing.

RIHMI-WDC holds national data from about 4,000 cruises (more than 350,000 oceanographic stations). About 30% of these data are from the Bering, Okhotsk and Japan seas. The greater part of the data is for the years 1970-1980.

Depending on data types, different amounts of oceanographic data are stored on technical carriers (computer readable form):

(i) coastal hydro-meteorological data - observational data only for 1977-1993 are on magnetic tapes;

(ii) hydrology/hydro-chemistry - 80-85% of data, MBT data - about 80% of data are on technical carriers. It is expected that during 1994 all data of these types will be transferred from manuscripts on to technical carriers;

(iii) current meter data - only 55-60% of such data are on technical carriers;

(iv) pollution data - only 10-15% of such data are on technical carriers. Work has been started on the transfer of these data to technical carriers in 1993.

Oceanographic Data Holdings in other Marine Institutes from the Far East

Information on databases and archives received from 4 principal data holders reflects the following general picture of the present situation:

(i) the Naval Centre in St. Petersburg now holds about 326,000 oceanographic stations and about 200,000 MBT profiles for the geographical area of interest. Volume of data transferred to technical carriers about 60% and 25% respectively;

(ii) Far-East RIHMI estimates its data holdings as 200,000 oceanographic stations, 75,000 in digital form;

(iii) PRIFO holds about 84,000 oceanographic stations (35,000 in digital form) and 100,000 MBT profiles all in manuscript form;

(iv) POI has about 25,000 oceanographic stations of which 15,000 are in digital form.

Implementation of Oceanographic Data Search and Rescue

The first steps have been taken to search and rescue oceanographic data available only in a manuscript form:

(i) the National Oceanographic Committee decided to start the national GODAR project in 1994. Now this project (programme and implementation plan) is considered by the Ministry of Science of Russia for financial support;

(ii) procedures and rules have been developed for the search of oceanographic data in the country, by comparing data holdings in NODC and other marine institutions. The data holdings of NODC, the Naval Centre, the Far-East RIHMI, PRIFO and POI have duplicate cruises. It was hoped that there would be the possibility to begin the work during 1994;

(iii) PC software has been developed for key-entry, checking (including QC procedures) and formatting the cruise oceanographic data (meteo, hydrology/hydro-chemistry, MBT, pollution);

(iv) during 1993, data from 125 cruises (WDC and national data) were transferred from manuscripts to technical carriers.

KOREA, REPUBLIC OF

The Republic of Korea possesses long time-series of ocean data over a period of 50 years along its coastline and at sea. They include sea surface temperature observations at fixed coastal stations and vertical profiles of temperature and salinity obtained at fixed oceanographic stations. There were 41 SST coastal stations

and 15 oceanographic observation lines around the Korean peninsula before 1945. These data are in manuscript form and rescue activity is urgently needed. Since 1945, ocean data holdings at the Korea Ocean Data Centre are limited to the South Korea region.

In South Korea, the scheme of traditional oceanographic observation lines was maintained until 1960 and new observation lines have been introduced since 1961. At present 80 SST coastal stations and 22 oceanographic observation lines are being operated by the Division of Oceanography of the National Fisheries Research and Development Agency. Recently KODC has completed data rescue activity for oceanographic data since 1961 and floppy disk service is available for personal computer users. SST data are slowly being digitized from existing manuscripts. The main time-series data originator in South Korea is the National Fisheries Research and Development Agency.

The longest time-series of SST data in South Korea since June 1915 are available for Busan. During a period of almost 80 years, only about 30 months are missing: March to December 1920, August to December 1938, August to December 1950 and January to October 1951. Measurements were made at intervals of ten days for 1915-1920, every five days from 1921-1924 and every day since 1925. Monthly means of SST since June 1915 and 10 days means of SST since January 1925 have been compiled by Dr. S.D. Hahn recently. Daily SST values since 1967 are being rescued by KODC.

The longest time-series of oceanographic data along observational lines (mainly vertical distribution of temperature and salinity) can be found for Busan - Tsushima Line in the Korea Strait since 1912. Data since 1961 are on magnetic tape and floppy disks; data for Ulsan-Kawajirimisaki Line have been collected since 1915, and for Jeju Strait Line since 1918.

Some Important SST Historical Datasets in Korea (Manuscript Form)

Station	Location	Monthly Mean	10 Days Mean	Daily SST	Remarks
Busan	35-05, 129-02	since 1915	since 1925	since 1967	digitized
Jumunjin	37-53, 128-50	since 1915	since 1953	since 1953	
Wonsan	19-13, 127-28	1915 - 45	1928 - 45	1934 - 45	after 1945 unknown
Chongjin	41-46, 129-50	1915 - 45	1928 - 45	1924 - 45	after 1945 unknown
Kumundo	34-01, 129-19	since 1916	since 1926	since 1933	
Changkigab	36-05, 129-34	since 1916	since 1928	since 1934	
Jukbyun	37-03, 129-26	since 1916	since 1928	since 1955	
Suwondan	38-41, 128-22	1916 - 45	1928 - 45	1934 - 45	after 1945 unknown
Musudan	40-50, 129-42	1916 - 45	1918 - 45	1918 - 45	after 1945 unknown
Maengoldo	34-14, 125-51	since 1916	since 1926	since 1934	
Ochongdo	36-07, 125- 59	since 1916	since 1926	since 1933	
Kyukyolbido	36-37, 125-33	since 1916	since 1926	since 1933	
Sochongdo	37-45, 124-44	since 1916	since 1926	since 1933	
Daehwado	39-26, 124-35	1916 - 45	1926 - 45	1933 - 45	after 1945 unknown
Chungmu	34-50, 128-25	since 1921	since 1926	since 1933	

Station	Location	Monthly Mean	10 Days Mean	Daily SST	Remarks
Yosu	34-44, 128-44	since 1921	since 1926	since 1933	
Kampo	35-48, 129-31	since 1921	since 1928	since 1967	
Marado	33-07, 126-16	since 1923	since 1923	since 1923	digitized
Jeju	33-31, 126-33	since 1923	since 1923	since 1923	
Pohang	36-03, 129-26	since 1923	since 1947	since 1947	
Mayangdo	40-00, 128-15	1924 - 45	1928 - 45	1934 - 45	after 1945 unknown
Huksando	34-06, 125-06	since 1925	since 1926	since 1933	
Budo	37-09, 126-21	since 1926	since 1926	since 1933	
Sodo	38-33, 124-46	1924 - 45	1926 - 45	1933 - 45	after 1945 unknown
Sorido	34-24, 127-48	since 1929	since 1930	since 1933	
Ullungdo	37-29, 130-55	since 1931	since 1931	since 1952	
Hongdo	34-42, 125-13	since 1933	since 1933	since 1952	
Rando	42-14, 130-32	1935 - 45	1935 - 45	1935 - 45	after 1945 unknown
Ulsan	35-29, 129-27	since 1939	since 1939	since 1939	
Songjin	40-40, 129-13	1929 - 45	1929 - 45	1929 - 45	after 1945 unknown

Observed Data of Line B (207 Line, Busan - Tsushima)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1911	-	-	-	-	-	-	-	-	-	-	-	-	0
1912	-	-	-	-	-	-	-	-	-	8,12	-	-	2
1913	-	-	-	-	-	-	-	-	-	-	5	-	1
1914	-	-	-	-	-	-	-	-	-	-	-	-	0
1915	-	-	-	-	18	-	-	-	-	-	-	-	1
1916	-	-	-	-	-	-	-	9	-	-	6,12	-	3
1917	-	23	-	-	-	-	-	6	19	-	14	19	5
1918	-	-	-	-	3	-	-	-	-	10	-	5	3
1919	-	-	-	21	-	20	-	-	19	-	25	-	4
1920	21	-	-	-	-	19	-	23	-	22	-	-	4
1921	-	-	-	-	5	-	-	-	-	-	5	-	1
1922	-	-	-	-	5	8	7	4	8	12	25	18	8
1923	13	23	15	4	9	4	4	4	18	22	8	18	12
1924	10	16	19	5	1	9	7	7	13	9	11	1	12
1925	9	3	4	7	1	1	4	3	12	2	3	14	12
1926	12	3	7	5	7	5	8	7	4	18	4	27	12
1927	11	9	5	9	2	1	16	5	16	4	2	4	12
1928	13	10	3	5	4	5	3	3	4	2	4	13	12
1929	11	3	9	4	4	15	9	5	3	6	4	6	12
1930	9	10	10	9	4	3	10	5	6	7	18	3	12

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1931	19	9	3	4	5	4	15	6	7	8	1	14	12
1932	6	3	14	13	9	5	4	19	10	4	4	6	12
1933	9	4	8	1	8	5	12	10	6	2	8	6	12
1934	8	10	6	7	2	9	6	7	11	4	6	12	12
1935	8	5	2	2	3	8	3	5	3	4	3	5	12
1936	9	8	10	1	2	5	9	8	7	7	7	7	12
1937	8	15	16	9	10	14	2	9	4	4	11	10	12
1938	10	4	4	6	3	4	21	12	2	4	7	8	12
1939	7	4	8	4	4	-	6	10	8	9	20	-	10
1940	16	5	4	10	2	6	10	2	-	6	1	3	11
1941	9	4	-	11	12	2	-	1	4	4	5	-	9
1942	-	-	-	-	5	4	8	5	17	12	2	-	7
1943	18	-	12	-	31	-	-	2	-	-	-	-	4
1944	-	-	-	-	-	-	-	-	-	-	-	-	0
1945	-	-	-	-	-	-	-	-	-	-	-	-	0
1946	-	-	-	-	-	-	-	-	-	-	23	-	1
1947	-	-	-	-	24	-	-	12	-	-	27	-	3
1948	-	-	-	-	-	-	-	4	-	-	23	11	3
1949	-	-	-	15	18	-	12	-	-	-	-	-	3
1950	9	-	-	3	-	-	-	-	-	-	-	-	2
1951	-	-	4	-	-	-	-	-	-	-	-	-	1
1952	10	-	-	-	-	16	6	4	13	12	-	13	7
1953	9	10	13	-	26	-	-	-	-	19	-	13	6
1954	-	-	-	10	-	-	26	-	16	-	10	21	5
1955	14	10	3	-	6	-	5	3	12	13	17	-	9
1956	10	18	-	-	17	14	12	-	13	9	7	21	9
1957	20	15	24	4	18	19	15	14	9	5	12	8	12
1958	9	6	10	8	14	16	18	16	11	9	17	5	12
1959	11	4	9	14	10	8	9	18	6	9	14	15	12
1960	29	18	15	9	-	18	-	-	-	-	1	-	6
1961	29	-	9	-	-	17	22	25	-	23	6	11	8
1962	29	-	5	5	17	17	27	-	-	3	24	25	9
1963	-	2	7	4	19	27	9	24	-	-	5	19	8
1964	-	-	-	11	8,24	-	24	14	2	1	19	30	9
1965	14	-	5	-	5	-	9	14	22	9	6	21	9
1966	-	-	21	21	12	14	28	-	-	-	7	-	6
1967	20	-	9	-	4	27	-	12	-	28	15	-	7
1968	12	17	-	25	-	13	4	14	12	12	7	12	10
1969	18	8	5	12	17	8	18	7	4	14	11	24	12
1970	-	4	11	8	18	22	29	26	6	7	-	6	10
1971	-	24	-	11	10	10	14	8	-	13,1	-	15,	10
1972	-	11	-	11	-	14	-	24	-	7	-	19	6
1973	-	16	-	20	-	23	-	25	-	16	-	25	6
1974	-	16	-	-	8	16	-	7	-	21	-	20	6
1975	-	15	-	14	-	14	-	7	-	14	-	22	7
1976	-	22	-	17	-	20	-	-	5	4,6	-	8	6
1977	-	14	-	11	-	25	-	12	-	16	-	21	6
1978	-	11	-	10	-	5,7	-	7	-	24	-	15	7
1979	-	7	-	9	-	12	-	6	-	17	-	13	6
1980	-	14	-	7	-	15	-	16	18	10 7	-	6 10	7

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1981	-	12	-	6	-	18	-	21	-	12	-	7	6
1982	-	4	-	6	-	18	-	4	-	5	-	10	6
1983	-	5	-	12	-	8	-	3	-	19	-	6	6
1984	-	16	-	12	-	12	-	10	-	20	-	10	6
1985	-	3	-	15	-	11	-	16	-	15	-	19	6
1986	-	6	-	9	-	10	-	12	-	15	-	21	6
1987	-	8	-	15	-	5	-	13	-	23	-	3	6
1988	-	9	-	9	-	6	-	8	-	10	-	6	6
1989	-	11	-	4	-	7	-	6	-	5	-	-	5
1990	-	10	-	5	-	4	-	19	-	11	-	4	6
1991	-	2	-	3	-	15	-	8	-	12	-	-	5
1992	-	14	-	21	-	17	-	23	-	16	-	-	5
1993	-	3	-	9	-	5	-	11	-	9	-	2	6
1994													
1995													

THAILAND

Introduction

Marine research and monitoring activities in Thailand are undertaken by various groups from local universities and government agencies. Oceanographic studies in offshore areas are mostly carried out by the Hydrographic Department of the Royal Thai Navy and the oceanographic section of the Department of Fisheries which have research vessels with satisfactory position-fixing systems, and laboratory facilities on board. The work carried out by other institutions is mainly related to estuarine and coastal areas.

Hydrographic Department, Royal Thai Navy

Sea-level measurements were first made in the Gulf of Thailand in 1936. However, oceanographic studies were only started in 1956, covering the upper and western parts of the Gulf of Thailand. During 1956 to 1962, a total of 39 surveys were made in the Gulf of Thailand, however on an irregular basis. A more systematic collection of data was carried out from 1967 to 1989, which included 40 surveys and 3,500 stations in the Gulf of Thailand and the Andaman Sea. Basic oceanographic parameters measured during these surveys include temperature, salinity, DO, nutrients, current measurements and XBT data.

The Hydrographic Department has made at attempt to digitize some of the historical data (about 20%) from about 3,500 stations, which have been collected during the last decade. Other data are still in manuscript form.

Department of Fisheries, Oceanographic Section, Phuket Marine Biological Station

The Department of Fisheries has started collecting oceanographic data in the Gulf of Thailand and the Andaman Sea since 1963. Initially, manual instruments, such as the Ekman current meter, were used for current measurements. Since 1982, automatic equipment for current measurement, using magnetic tape for recording, has

been used in the Gulf of Thailand and the Andaman Sea. Since 1992, seven drifting and fixed buoys have been deployed for oceanographic studies.

From 1977-1986, 19 cruises were undertaken in the Gulf of Thailand. Basic oceanographic parameters were observed which include temperature, salinity, DO, pH, nutrients, chlorophylls, phyto- and zoo-plankton, current speed and direction and some trawling data.

Since 1987 the oceanographic section of the Department of Fisheries has been collecting data in the Eastern Indian Ocean (1987-1992) and the Western Indian Ocean (1993-1996). Observed data include basic oceanographic parameters, CTD and XBT data. Fifty stations are implemented during each cruise.

Scientists at Phuket Marine Biological Station have been collecting physical, chemical and biological data around Phuket Island in the Andaman Sea since the establishment of the station in the 1960s.

The observed data at the Department of Fisheries are available in different forms (manuscript, log books, diskettes, magnetic tapes, etc.).

Meteorological Department

Climatological data from Thailand have been collected since 1951. In addition, the Department of Fisheries and Meteorological Department have also monitored six climatological stations in the Gulf of Thailand since 1956. The observed data include solar radiation, relative humidity, air pressure, rain fall, air temperature and wind speed and direction.

Data are archived in digital form.

Chulalongkorn University, Department of Marine Science and Aquatic Resources Research Institute

Marine data in coastal and estuarine areas have been collected by the Department of Marine Science since 1968. Pollution data were collected in the Gulf of Thailand and the Andaman Sea in co-operation with the Department of Fisheries during 1977-1986, at approximately 400 stations. Parameters observed include basic oceanographic physical and chemical parameters, heavy metals, pesticides and petroleum hydrocarbons.

The Aquatic Resources Research Institute has monitored sea water quality around Si Change Island since 1989. Oceanographic studies in the upper Gulf of Thailand has also been conducted.

The Institute has recently established the Aquatic Resources Data and Information Centre one of the responsibilities of which is to transfer all data available at Chulalongkorn University into a digital form. Today, most of the data are still in manuscript form.

Office of the National Environment Board

There are two marine science projects under the auspices of the ASEAN-Australia Economic Co-operative Programmes - Co-operative Programmes on Marine Sciences (AAECp-CPMS), 1986-1994, co-ordinated by the Office of the National Environment Board.

Project 1: Regional Ocean Dynamics Project which deals with the measurement and modelling of large-scale water movement driven by tidal effects. The project was set up to provide basic data on the manner in which tidal cycles vary throughout the region in terms of timing and amplitude. The data bank which was created as part of the project, holds sea-level data for 58 tidal stations from the participating countries, namely, Indonesia, Malaysia, Philippines, Singapore and Thailand.

Project 2: Living Coastal Resources Project (LCR), is biologically oriented and aims to make an inventory and establish a regional database of the present status of the important coastal ecosystems of the region (coral reefs, seagrass beds, mangroves and soft bottom benthic systems). During the last eight years, extensive data have been gathered on the status of coral reefs, mangroves, seagrass beds and soft bottom benthic communities over an area of 47° longitude and 32° latitude. More than 50 sites in the 5 participating countries, Indonesia, Malaysia, Philippines, Singapore and Thailand have been surveyed.

Tidal data and some of the biological data are archived in digital form.

National Research Council of Thailand (NRCT)

NRCT and OCEANOR (Norway) have developed a 3-year project (1991-1994) called "Seawatch" which is an environmental monitoring and forecasting system. The system integrates data collection, data analysis, environmental modelling and forecasting for the Gulf of Thailand. A near real-time data coverage is provided by a network of 7 moored data collection buoys (called TOBIS buoys) with the measurements of meteorological (wind speed and direction, air temperature and pressure) and oceanographical parameters (oxygen/algae/nutrient contents, waves, currents, salinity/temperature profile and radioactivity).

Data are archived in digital form.

VIETNAM

Introduction

Oceanographic investigation in Vietnam has a long history. The most ancient coastal stations are Hon Dau, Vung Tau and Mui Nai that began their activities probably in the first 3 decades of our century.

In the twenties, the Institute of Oceanography (IO) was founded in Nha Trang. This was the first large marine research institution in South-East Asia at the time. From its foundation to the end of the thirties, the activities of the IO were aimed at supporting the development of marine fishery industry in the Trung Bo region. Each year the R/V DE LANESSAN made several cruises in order to investigate sea bottom topography, to collect sea organisms (fish, plankton, coral) and to study hydrological regime of the Vietnamese and adjacent waters.

The most important oceanographic expeditions such as the Challenger (1872-1875), Gazelle (1875), Valdivia (1889), Siboga (1889-1890), Planet (1906-1907), Snellius (1929-1930), Spencer F. Baird (1947-1950) and Galathea (1951) were taken in the Bien Dong Sea without the participation of Vietnamese institutions.

At the beginning of the 1960's, 3 oceanographic campaigns took place which played the most important role in the development of oceanographic investigation in Vietnam:

(i) complex investigation of Bak-Bo Gulf (1959-1962) by joint efforts of China and Vietnam;
(ii) investigation of pelagic and demersal fish (1960-1961) in co-operation with TINRO (Russia);
(iii) NAGA expedition (1959-1961) by joint efforts of the USA, South Vietnam and Thailand, sponsored by FAO.

Thanks to these projects, the IO in Nha Trang was modernized and two other oceanographic institutes were established in the North: Marine Research Institute (MRI) and Marine Production Institute (MPI). At the same time, the Hydrometeorological Service of Vietnam established its regular system of coastal marine hydro-meteorological stations.

Since 1975, national marine activities are being co-ordinated and implemented in the framework of a National Marine Research Programme. Expeditions are being carried out regularly by the R/V *Bien Dong Sea* of the MPI, the Marine Research Vessel of the IO, and the Naval Hydrographic Vessel. Simultaneously, different marine research projects in co-operation with the foreign institutions and companies, mainly from Russia, were implemented. Research fields have covered wide areas which include marine hydro-meteorology, geology-geophysics, marine biology, marine chemistry and bottom topography. Besides IO and MPI, the Laboratory of Tropical Meteorology (LTM) and the Marine Hydro-meteorological Centre (MHC) played considerable roles in the investigation of the open sea.

Since the end of the 1980's, a number of commercial projects including surveys for the installation of submarine cable systems, oil and gas exploitation has increased considerably.

MPI was probably the first Vietnamese marine research institution that, since 1989 has computerized oceanographic data using dBase1 in order to create the relational database of marine organisms.

Since 1990, JODC, as the RNODC for the WESTPAC region, has played a very important role for Vietnam in helping to solve successfully data management problems. In the framework of the IODE programme, JODC

provided the Vietnamese staff with a high quality training on oceanographic data management. The training also gave the possibility of getting closely acquainted with the NODC's activities and establishing the necessary international contacts.

On the basis of experience gained by JODC and IODE system in general, the Vietnamese National Ocean Data Centre (VNODC) was established during 1991 by the joint efforts of the National Centre for Scientific Research (NCSR) and the Vietnamese National Committee for IOC. VNODC has 3 operational branches (OB) attached to the leading marine research institutions of the country (Institute of Oceanography, Marine Production Institute, and the Marine Hydrometeorological Centre) with a central facility in Hanoi.

The VNODC operates on the basis of distributed computer network and uses the telecommunication services of the General Department of Communication. CD-ROMs have been chosen as the standard national data storage and transfer medium.

The decentralized scheme allows VNODC to involve leading experts of national marine research institutions in data management activities, as well as to increase common interest in gradually creating the national database.

Plans for 1994-1995, include: (i) establishment of national standards for ocean data collection and exchange; (ii) creation of related topical databases on marine meteorology, oceanography and marine biology; (iii) establishment of an experimental computer network, as well as further improvement of data processing capacity in order to meet increased users' demands for oceanographic data services; (iv) maintenance of a regular data exchange with the world community.

The VNODC and the operational branches are equipped with 2 PC-486 DX, 8 PC-386, CD-ROM drives, digitizers and printers. VNODC is able to share WORM techniques with the State Institute of Scientific-Technological Information and the mainframe data exchange system CIPHER-9000 with the Remote Sensing Centre. Experimental data transmission by modem and KERMIT software between Hanoi and Ho Chi Minh City has been implemented successfully. It is expected that the VNODC will be able to join GTS in 1995.

Oceanographic observations in Vietnam have resulted in 3 categories of data holdings:

(i) long time-series data;
(ii) oceanographic cruise data, and
(iii) commercial project data.

Long Time-Series at Coastal and Island Stations

In Vietnam, there are 14 regular coastal and island oceanographic stations that observe various meteorological characteristics, such as air pressure, wind, air temperature and other weather elements. Oceanographic observations usually include sea-level, waves, water temperature, salinity and special measurements. These stations belong to the General Department of Hydro-meteorology, responsible for management of this type of observation. Quy Nhon station (13° 45" N, 109° 13" E) is a part of the GLOSS system.

List of Coastal Oceanographic Stations

No.	Station Name	Position	Beginning of Activities in SRV
1.	Cua Ong	21° 02 N, 107° 22 E	1960
2.	Bai Chay	21° 57 N, 107° 04 E	1961
3.	Co To	20° 58 N, 107° 46 E	1959
4.	Hon Dau	20° 40 N, 106° 49 E	1954* [3]
5.	Bach Long Vi	20° 08 N, 107° 43 E	1958
6.	Hon Ngu	18° 48 N, 105° 46 E	1961
7.	Con Co	17° 10 N, 107° 22 E	1974
8.	Son Tra	16° 07 N, 108° 13 E	1977*
9.	Quy Nhon	13° 45 N, 109° 13 E	1986*
10.	Phu Quy	10° 32 N, 108° 56 E	1979
11.	Vung Tau	10° 20 N, 107° 04 E	1979*
12.	Con Dao	08° 41 N, 106° 36 E	1979*
13.	Phu Quoc	10° 13 N, 103° 58 E	1976
14.	Truong Sa	08° 38 N, 111° 55 E	1977

Data have been computerized only for Han Dau station. All other data are still in a manuscript form in the Table below. The volume of observations collected by coastal marine stations for some selected parameters are presented.

Element	Wind	Wave	Sea-level	Water Temp.	Salinity	Total
No. of Obs.	461,760	329,320	1,007,520	453,120	427,200	2,678,920

Oceanographic Cruise Data

Since 1930, Vietnamese marine research institutions, alone or in co-operation with foreign institutions (mainly Russian and Chinese), have produced an extensive volume of oceanographic observations.

[3] Operational activities have started earlier under other authorities.

Oceanographic Cruise Data Holdings of Vietnamese Marine Research Institutions (in a number of stations)

Data Types / Institutions	SD2 STD	MBT	Waves	Current (time-series)	Marine Meteorology	Marine Chemistry	Fish Trailing	Plankton Cast
IO	2,360	*	*	*	*	*	*	*
MPI	4,037	*	*	*	*	*	*	*
MHC	1,250	*	1,250	120	1,250	350	*	*
Total	8,647	*	*	*	*	*	*	*

Notice: * Inventory is still not done. There may be duplication in total volumes.

Because almost all the data are still in manuscript form, it is difficult to make a comprehensive inventory and apply quality control procedures, but it can be said that STD and SD2 data are of the same quality as Chinese or Russian ones. The Vietnamese marine research institutions plan to digitize available data in order to facilitate scientific and application studies on natural resources, marine environment protection and design, climatic and hydrological features of the sea. Due to a limited budget in 1994-1995 it is planned, as a first step, to prepare an inventory of oceanographic cruises and to start digitizing STD and SD2 data using OceanPC software.

Commercial Project Data

Commercial project data have been obtained by national and international companies through primarily hydrocarbon industry activities on the shelf, construction of the submarine cable systems, offshore and coastal structures building, etc. Regular oceanographic observations on oil platforms have yet to be made. Data are classified and are not freely available for international exchange.

4. WORKSHOP CONCLUSIONS AND RECOMMENDATIONS

The Workshop participants were of a general view that GODAR-II is an important turning point in facilitating co-operation between data centres in the region, and of the IODE system in general. **The Workshop recommended** that national funding agencies provide support to all national marine institutions to implement data archeology and rescue operations, and to ensure transfer of data to NODCs to meet the objectives of the GODAR project.

The Workshop noted that although many common people and decision-makers have begun to understand the potential danger of climate change, there are still very few who appreciate the importance of historical data in climate studies. One of the reasons is the lack of information concerning scientific results of historical data analysis. To overcome this information gap, it was recommended that GODAR should provide the necessary information worldwide, not only for the scientific community, but also to different user groups. All NODCs should advertise the benefits of participation in GODAR at national and international levels.

The Workshop acknowledged that data rescued and exchanged under the GODAR project is invaluable to meet the decisions of UNCED relevant to sustainable development. In particular, developing countries will benefit from the existence of easily accessible marine databases which may be used to improve their economic potential and to understand the impact of environmental variability on national welfare. A knowledge of the large-scale ocean climatologies and anomalies helps describe the forcing at local and regional scales.

The Workshop recognized the importance of the man-power development issue in undergoing GODAR project and strongly urged the IOC to prepare corresponding training programmes.

The Workshop stressed the importance of the data collected in the framework of the IOC WESTPAC programme for the Member States of the region and **strongly urged** JODC to give the highest priority for digitization of data from the Western Pacific area held by the RNODC WESTPAC.

In support of the "Land-Ocean Interactions in the Coastal Zone" project, which is a core activity within the IGBP Global Change Programme, **the Workshop recommended** that all participating countries give special attention to the rescue of coastal zone data. **The Workshop noted** the importance of identifying the existence of datasets and making them known to the international community through catalogues and inventories distributed by the IODE centres. **The Workshop pointed out** the usefulness of long-term scientific coastal data, both marine and meteorological, for different types of applications, scientific and economic and recommended that Member States facilitate the preparation of digital versions of these historical time-series and make these data available internationally through the WDCs system.

The Workshop noted the progress in the development of the MEDI referral system and the value of such a system for tracing historical data. **The Workshop called on** Member States to actively participate in the MEDI questionnaire survey on the future of the system.

To avoid the duplication of effort, **the Workshop recommended** that the World Data Centers develop appropriate inventories of their manuscript data to compare with digital data inventories held by WDCs and NODCs.

The Workshop recognized the importance of building datasets of biological oceanographic data to support the concepts contained in the convention on bio-diversity adopted by UNCED and called on Member States to work together to develop systems and methodology for biological data management, such as expert systems. It was recommended that the establishment of an *ad hoc* task team be considered to deal with biological data. This task team, as a matter of priority, should consider available software for biological data classification and processing, recommend centres of knowledge and identify their terms of reference, determine priorities and recommend training in the development of databases and bases of knowledge.

The Workshop noted the recommendation of the UNESCO Workshop in Jakarta on biological data at which it was recommended to keep biological/environmental data in original form and that meta-data should be assembled in common format to describe the information. The UNESCO Workshop has also constructed a meta-data outline. **The Workshop recommended** that these decisions of the UNESCO Workshop should be taken into account by the IODE Group of Rapporteurs on Biological Data while implementing its Terms of Reference.

The Workshop noted the importance of the software developed by the Ukrainian Institute of Biology of the Southern Sea on taxonomic expert system and knowledge database, **and recommended** that IOC consider software such as this in other IOC programmes, like the Ocean Sciences and Living Resources (OSLR). **The Workshop also noted** the importance of such software as training modules in different IOC activities.

The Workshop noted the importance of efforts made by the IOC Committee on IODE in requesting IOC Member States to insure open access to historical data in possession of Navies **and welcomed** the decisions taken by Australia, Russia, USA, to declassify part of the data. The contribution of ocean data from the Navies of these countries comprises an important input to the GODAR objectives. **The Workshop called on** other countries to follow this example of international co-operation.

Recognizing the development of new observing systems GOOS (Global Ocean Observing System) and GCOS (Global Climate Observing System) **the Workshop recommended** that these organizations take advantage of the existence of GODAR for the collection and use of historical data to meet their objectives including the detection of a climate change.

The Workshop noted the importance of the efforts made by the Government of Vietnam in identifying and rescuing oceanographic long-term time-series data and recommended that the Project Leader write a letter of encouragement to the Government of Vietnam to support the IODE principle of free exchange of this data. **The Workshop further recommended** that the Vietnamese authorities, jointly with Chinese and Russian colleagues, will review the bilateral agreement on the availability of data gathered during joint ocean activities, and make this data internationally available.

The Workshop expressed concern about the tendency in some international organizations to start commercialization of environmental data. **The Workshop reiterated** the importance of following the principles presented in the statement of data management policy in global ocean programmes approved by the IOC Assembly in its Seventeenth Session. Especially the need for "*full and open sharing of a wide spectrum of global, international oceanographic datasets.*"

The Workshop strongly endorsed efforts by IOC to further develop, refine and distribute OceanPC and its associated documentation. Given the acknowledged demand for OceanPC and the increased demand for the system arising from GODAR-II, **the Workshop strongly urged** Member States and the Secretary IOC to provide the necessary financial support to increase the availability of the first OceanPC software package to Member States of the region.

The Workshop recognized the importance of creating digital records of existing manuscript data and recommended that a strong emphasis be given to the development of OceanPC data input software in accordance with international standards.

The Workshop noted that there is a danger of losing valuable remotely-sensed data from the oceans. Although the main emphasis of GODAR is on *in situ* ocean data, **the Workshop felt** it necessary to urge national and international organizations concerned to take actions for saving remotely sensed data.

The Workshop recommended to PICES that co-operation with IODE should be increased, **and strongly advised** it to adhere to the IOC-ICSU principles of ocean data exchange which recommend the distribution of data internationally, and without restriction.

The Workshop recommended to keep management/decompression programmes on CD-ROMs as floppy disks degrade quickly and are easily lost.

5. CLOSURE

In his closing remarks, the Project Leader, Dr. S. Levitus, summarized the findings of the Session and paid tribute to the constructive spirit of the experts. He expressed appreciation to the local organizers for hosting the Workshop, and for the excellent arrangements. The Workshop was closed at 17.00 on 11 March 1994.

ANNEX I

WORKSHOP PROGRAMME

8 March

9:00 - 9:30 **Registration**

9:30 - 10:20 **Official Opening**

10:20 - 12:30 **Lecture 1**
Subject
IOC and its Role in Meeting UNCED Objectives in the Field of Ocean Data Collection and Management
Speaker
Y. Oliounine, Head, Ocean Services Unit of IOC

Lecture 2
Subject
IODE and Global Oceanographic Data Archaeology and Rescue Project
Speaker
S. Levitus, Director, WDC-A, Oceanography; GODAR Project Leader

Lecture 3
Subject
Results of GODAR I Regional Workshop
Speaker
N. Michailov, Director NODC of Russian Federation

12:30 - 14:00 LUNCH

14:00 - 17:00 **Lecture 4**
Subject
The Importance of Open Access to Data
Speaker
S. Ruttenberg, Chairman, ICSU Panel on World Data Centres
Hou Wenfeng, Director, WDC-D, Oceanography

Lecture 5
Subject
Scientific Results made possible by GODAR
Speaker
S. Levitus, Director, WDC-A, Oceanography; GODAR Project Leader

Lecture 6
Subject
The Role of Historical Data in GOOS and GCOS
Speaker
J. Merle, ORSTOM Representative for the South Pacific

National Report of Australia

Evening - Social Event

9 March **Lecture 7**
9:00 - 12:30 *Subject*
The PICES Project and Resulting Data Requirements for Historical Data
Speaker
Mr. Yang Dequan, Representative of PICES Data Management Committee

National Report of China
National Report of French Activities in South Pacific
National Report of Indonesia

Lecture 8
Subject
The United States Experience in GODAR and NODC/WDC-A Holdings and Overview on Biological and Chemical Data
Speaker
R.D. Gelfeld, US NODC/WDC-A, Oceanography

12:30 - 14:00 LUNCH

14:00 - 17:30 **Lecture 9**
Subject
Existing Referral Systems and Catalogues of Ocean Data Holdings
Speaker
Y. Oliounine, Head, Ocean Services Unit of IOC

National Report of Japan
National Report of Malaysia

Lecture 10
Subject
OceanPC and GODAR
Speaker
R. Harger, Scientific Adviser, UNESCO/ROSTSEA

10 March
9:00-12:30 National Report of Democratic People's Republic of Korea
National Report of New Zealand
National Report of Philippines
National Report of Russian Federation

Lecture 11
Subject
Management of Biological Data and Information at the Indian National Oceanographic Data Centre
Speaker
J.S. Sarupria, IODE National Co-ordinator, NIO, India

Study Tour to WDC-D, Oceanography and NMDIS

12:30 - 14:00 LUNCH

14:00 - 17:30 **Lecture 12**
Subject
A PC-based Expert System for the Identification of Marine Biota
Speaker
S. Lelekov, Head of Laboratory, Institute of Biology of Southern Seas, Ukraine

National Report of Korea, Republic of
National Report of Thailand
National Report of Vietnam

Software Demonstrations

11 March **Round Table Discussions**

9:00 - 12:30 Discussions of the Composition of the Summary Report, Recommendations, First Draft of the Implementation Plan

12:30 - 14:00 LUNCH

14:00 - 17:30 **Discussions (cont.)**

Adoption of the Recommendations, Implementation Plan, and Summary Report of the Workshop

Official Closure of the Workshop

ANNEX II

GODAR PROJECT PROPOSAL

Recommendation IODE-XIV.3

DATA ARCHAEOLOGY AND RESCUE PROJECT

The IOC Committee on International Oceanographic and Information Exchange,

Noting that historical observations of oceanographic parameters are not repeatable if lost,

Acknowledging that substantial amounts of historical ocean observations are at risk of being lost due to media degradation or neglect,

Recognizing that the international scientific and engineering communities need the most comprehensive oceanographic multi-decadal databases possible for research purposes, particularly for use in studies describing the role of the world ocean as part of the earth's climate system as well as for Global Change research,

Emphasizing that in order to make sound policy decisions national governments and intergovernmental advisory groups need scientific observations of the state of the world ocean and for understanding of the role of the world ocean as part of the earth's climate system,

Recommends that:

(i) IOC establish a Global Oceanographic Data Archaeology and Rescue Project under the IOC Committee on IODE as presented in the Annex to this recommendation subject to condition that the additional funds be made available;

(ii) a project leader be designated by the Secretary IOC in consultation with the Chairman of the IOC Committee on IODE to supervise its implementation;

(iii) IOC invite Member States and International Organizations to participate in and support this project, including the possibility of direct funding ear-marked for this purpose within the IOC Trust Fund.

Annex to Recommendation IODE-XIV.3

Introduction

All countries of the world have a concern about climate change because of the global impact of climate variability, whether natural or anthropogenic,

If international agreements are to be implemented due to concern about climate change, the science on which these agreements is based must be international in scope. All data on which these studies are based must therefore be available to the international scientific community without restriction.

Historical oceanographic data is of fundamental importance to scientists studying the role of the ocean as part of the earth's climate system. Regardless of any particular view an individual scientist or nation has on these issues, it is necessary that scientific assessments and national and international actions be based on the most complete environmental databases possible.

Recognizing that oceanography is an observational science and that the world ocean is a major component of the earth's climate system it is suggested that the IOC sponsor activities that will result in more complete global oceanographic databases. These activities should be viewed as an enhancement of existing IODE activities. The new and enhanced oceanographic databases will be available without restriction to the international science community. We call this effort the "*Global Oceanographic Data Archaeology and Rescue Project*" (GODAR). To do the most

thorough job possible this project must have a lifetime of 5 to 10 years. Funds to support the activities of this project will be obtained through as many sources independent of IOC as possible, including foundations.

"Data Archaeology" is the term used to describe the process of seeking out, restoring, evaluating, correcting and interpreting historical datasets.

"Rescue" refers to the effort to save data at risk from being lost to the science community.

Physical, chemical, and biological oceanographic data as well as surface marine meteorological observations are the specific types of data this project will focus on. These are the data types of greatest concern to IODE and climate research activities. Advances in computer technology both hardware and software (e.g., Relational Database technology) now allow for the construction of integrated global oceanographic databases that include widely disparate types of oceanographic data from different oceanographic disciplines.

The data gathered as a result of this project will be of particular benefit to developing countries. The international availability of comprehensive global oceanographic datasets represent a policy of both information sharing as well as knowledge and technology transfer since the data can be used to study regional environmental oceanographic problems.

Rationale

Many oceanographic data are at risk of being lost to future use because of media degradation, hence the need for a "data rescue" effort in conjunction with the data archaeology effort. Sole copies of manuscript data are easily lost due to environmental damage or catastrophe such as fire. In addition manuscript data are of minimal use to researchers who require data in digital form with all pertinent meta-data in order to perform the most comprehensive studies possible. It is the international scientific community which must advise national and international bodies on such issues as climate change. Thus the most complete well-documented databases possible must be available to the international community. Data archaeology and rescue activities at WDC-A, Washington; WDC-B, Obninsk; WDC-D, Tianjin; ICES, Denmark; the Japanese Oceanographic Data Center, and other institutions all have identified major oceanographic databases that exist only in manuscript form. Efforts sponsored by these institutions have resulted in digitization of some of these data and further digitization ("data rescue") is planned. For example the US NODC has located 150,000 MBT profiles in manuscript form and is contracting to have these data digitized. All the above institutions are already closely cooperating on archaeology and rescue activities to avoid duplication of effort and to maximize their resources.

Purpose

To facilitate the creation of global oceanographic databases for use by the international research community for the study of the role of the world ocean as part of the earth's climate system.

Main Emphasis

Specifically the project will emphasize:

(i) Digitization of data now known to exist only in manuscript and/or analog form. This effort will have highest priority of all activities.

(ii) Ensuring that all oceanographic data available for international exchange is archived at two or more international data centers in digital form.

(iii) Preparing catalogues (inventories) of:

a) Data now available only in manuscript form;
b) Data now available only in analog form;
c) Digital data not presently available to the international scientific community.

(iv) Making all data accessible on various media including CD-ROMs as well as standard magnetic tape.

These efforts represent implicit acknowledgement of the value of the ICSU-IOC International Oceanographic Data and Exchange (IODE) system but also recognize the need to enhance and expand the existing scope and efforts of this system as well as other international exchange mechanisms such as bilateral agreements. In fact this International Data Archaeology and Rescue Programme will build on existing data archaeology programmes at WDC-A, WDC-B, and ICES.

The enhanced databases will be made available as ASCII files on CD-ROM disks as this is the technology that represents the least expensive and most efficient means of distribution of large datasets.

The World Data Center-A for Oceanography (WDC-A) volunteers its services for these activities. WDC-A will work with data centers and research institutions around the world to compile the most complete oceanographic databases possible and will arrange for the production and distribution of the resulting databases on CD-ROMs and magnetic tapes.

Proposed Activities

(i) IOC Secretary in consultation with the Chairman of the Committee on IODE appoint a project leader to direct the project (March 1993) - no funds required.

(ii) A project leader with the assistance, if necessary, of selected experts, will prepare an implementation plan and identify priorities (April 1993) - no funds required.

(iii) Workshop on GODAR will be arranged in Russian for Eastern Europe countries (May-June 1993) -20K from IOC RF and 40K from extra-budgetary sources.

(iv) IOC will mobilize and provide resources to sponsor series of regional and international meetings on the formation of global oceanographic databases for international distribution as part of GODAR (1994-...) - funds from IOC RF and extra-budgetary sources.

(v) IOC provide support via its VCP and by using extra-budgetary sources for the delivery of hardware/software required, and by arranging contracts with the staff of data centres to implement specific projects (1993-...) - funds from extra-budgetary sources.

(vi) IOC request its Member States declassify as much militarily-restricted oceanographic data as possible for international distribution.

Data Types of Interest

(i) Hydrographic casts including all chemical and biological observations;
(ii) Salinity/Conductivity Temperature-Depth casts;
(iii) Expendable Bathythermograph casts;
(iv) Mechanical Bathythermograph casts.

ANNEX III

LIST OF PARTICIPANTS

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ANNEX IV

LIST OF PRINCIPAL DATA HOLDERS IN THE REGION AND TYPES OF ARCHIVED DATA

AUSTRALIA[4]

Table 1. New South Wales

Institution	Contacts	Tel. No.	Address	Data Types Held
Sydney Public Works Dept. Manly Hydraulics Lab.	Mr. M. Kulmar (Waves) Mr. D. Brown (Currents)	(61-2) 948 02 00	Manly Hydraulics Lab. 110B King St. Manly Vale NSW 2093	Waves, Currents
University of NSW (Math. Dept.)	Prof. J. Middleton	(61-2) 697 20 84	Dept. of Maths, UNSW P.O. Box 1 Kensington NSW 2033	Waves, Currents
Water Board	Mr. P. Tate	(61-2) 339 92 79	Water Board, Environmental Management Unit P.O. Box A53 Sydney South, NSW 2000	Waves, currents, temp.
NSW Fisheries	Mr. R. West (Deputy-Director)	(61-2) 527 84 11	NSW Fisheries Research Institute P.O. Box 21 Cronulla, NSW 2230	
NSW Environment Protection Authority (Marine & Estuarine Waters Branch)	Mr. A. Heggie	(61-2) 795 55 32	NSW EPA, Marine & Estuarine Waters Branch P.O. Box 1135 Chatswood 2057	CTD, Currents, Transmissivity, Ammonia, Chlorophyll, oxygen & other water chemistry
Lawson & Treloar Ltd.	Mr. N. Lawson	(61-2) 922 22 88	Lawson & Treloar Ltd. Unit 24, 177-199 Pacific Highway. North Sydney, NSW 2060	Waves, currents, temp, CTD (estuarine)
Defense Science & Technology Organization (DSTO) Maritime Operations Div. Sydney	Mr. L. Hamilton	(61-2) 692 14 75	DSTO Maritime Operations Div, Sydney P.O. Box 44 Pyrmont, NSW 2009	Currents, Waves, Temp, Salinity, Transmissivity, Secchi Disk

[4] Information on progress of completion, incomplete.

Institution	Contacts	Tel. No.	Address	Data Types Held
University of Sydney Ocean Technology Group	Dr. I. Jones	(61-2) 692 45 86	University of Sydney Ocean Technology Group Sydney, NSW 2006	Synthetic Aperture Radar (SAR) Images, Radar Reflectivity, Acoustic Backscatter, Whitecap Video Film, Stereo Photography of Sea Surface, Air Bubble Photography
University of Sydney Coastal Studies Group	Dr. A. Short	(61-2) 692 36 25	University of Sydney Coastal Studies Group Sydney, NSW 2006	Surf zone currents, tidal currents in estuarine inlets
Australian Nuclear Science & Technology Organization (ANSTO)	Mr. R. Szymczak	(61-2) 717 92 21	ANSTO Private Mail Bag 1 Menai, NSW 2234	trace elements, heavy metals, radio-chemistry, suspended solids in water & sediments
Australian Museum	Dr. H.G. Cogger (Deputy-Director) Dr. P. Bearants (Marine Invertebrates Group)	(61-2) 339 81 11	Australian Museum P.O. Box A285 Sydney, NSW 2000	
Woolongong Woolongong University (Geography Dept.)	Dr. E. Bryant	(61-42) 21 31 72	Woolongong University (Geography Dept.) Locked Bag 8844 South Coast Mail, NSW 2521	
Newcastle Hunter Water Corp.	Mr. R. Andrew	(61-49) 26 73 22	Hunter Water Corp. P.O. Box 5171B Newcastle West, NSW 2302	Currents
Newcastle University (Geography)	Assoc. Prof. H. Bridgeman	(61-49) 21 50 00	University of Newcastle Geography Dept. Newcastle, NSW 2308	
Lismore Southern Cross University (Coastal Resource Management)	Prof. P. Saenger	(61-66) 20 30 00	Southern Cross University Coastal Resource Management P.O. Box 157 Lismore 2480	currents, waves, temp, salinity

Institution	Contacts	Tel. No.	Address	Data Types Held
Canberra (ACT) Australian Defence Force Academy (Geography & Oceanography)	Dr. P. Holloway	(61-6) 268 83 11	Dept. of Geography & Oceanography, Australian Defense Force Academy Campbell, ACT 2600	CTD, currents
Australian Defence Force Academy (Civil Engineering)	Dr. I. Young	(61-6) 268 81 11 (Switch)	Dept. of Civil Engineering, Australian Defence Force Academy Campbell, ACT 2600	
Australian National University (School of Earth Sciences)	Dr. R.W. Griffiths	(61-6) 249 34 12	Australian National University (School of Earth Sciences) G.P.O. Box 4 Canberra City, ACT 2601	

Table 2. Western Australia

Institution	Contacts	Tel. No.	Address	Data Types Held
Perth Murdoch University (Mathematics & Physical Sciences)	Dr. J. Webb	(61-9) 360 60 00	Murdoch University (Math. & Physical Sciences) South St. Murdoch, WA 6150	
Woodside Petroleum Ltd.	Mr. S. Stroud	(61-9) 224 41 11	Woodside Petroleum Ltd. 1, Adelaide Terrace Perth, WA 6000	
University of WA (Botany Dept.)	Dr. D. Walker			
Curtin University (Centre for Marine Science & Technology)	Prof. J. Penrose	(61-9) 351 73 80	Curtin University, Centre for Marine Science & Technology G.P.O. Box U1987 Perth 6001	currents
CSIRO Fisheries & Oceanography, Western Australia	Dr. A. Pearce	(61-9) 246 82 15	CSIRO Fisheries & Oceanography Leach St. Marmion, WA 6020	satellite sea surface temperature, MBT
WA Fisheries (Marine Research Lab.)	Mr. N. Caputti	(61-9) 246 84 44	WA Fisheries, Marine Research Lab. P.O. Box 20 North Beach, WA 6020	Nansen bottles, temperature time-series, secchi disk

Institution	Contacts	Tel. No.	Address	Data Types Held
WA Dept. of Environment Protection	Mr. N. d'Adamo	(61-9) 222 70 42	WA Dept. of Environment Protection 141, St. Georges Terrace Perth, WA 6000	currents, CTD, turbity, secchi disk
University of WA (Centre for Water Research)	Dr. C. Pattiaratchi	(61-9) 380 31 79	University of WA (Centre for Water Research) Nedlands 6009	CTD (high resolution)
WA Dept. of Marine & Harbours	Mr. G. Ryan	(61-9) 335 08 88	WA Dept. of Marine & Harbours 1, Essex St. Freemantle, WA 6160	waves
Steedman Science & Engineering Ltd.	Mr. T. Tate (Manager) Mr. M. Beardsley (Data Librarian)	(61-9) 387 79 55	Steedman Science & Engineering Ltd. 31, Bishop St. Jolimont, WA 6014	currents, waves, CTD, XBT, thermistor chain

Table 3. South Australia

Institution	Contacts	Tel. No.	Address	Data Types Held
Adelaide Flinders University (Flinders Inst. of Atmospheric & Marine Science)	Prof. M. Tomzack	(61-8) 201 22 98	FIAMS G.P.O. Box 2100 Adelaide, SA 5001	
SA Fisheries	Dr. P. Petrusevics	(61-8) 226 06 35	Dept. of Fisheries Research Branch P.O. Box 1625 Adelaide, SA 5001	
SA Dept. of Environment & Planning (Marine Section)	Mr. T. Wynne	(61-8) 207 20 00	SA Dept. of Environment & Planning (Marine Section) G.P.O. Box 667 Adelaide, SA 5001	
Defence Science & Technology Organization, Salisbury (Maritime Operations Div.)	Mr. S. Taylor	(61-8) 259 57 66	Maritime Operations Div. DSTO P.O. Box 1750 Salisbury, SA 5108	
SA Engineering & Water Supply Dept.	Dr. D.A. Steffensen	(61-8) 226 20 00		
University of Adelaide (Geology & Geophysics)	?	(61-8) 303 44 55 (Switch)		

Table 4. Victoria

Institution	Contacts	Tel. No	Address	Data Types Held
Melbourne Victorian Institute of Marine Science (VIMS)	Dr. K. Black	(61-3) 651 19 98	VIMS 23, Andrew Place East Melbourne, VIC 3002	currents, waves, temperature, salinity, turbidity, ambient light
Victorian Dept. of Conservation & Environment (Marine Science Labs. Queenscliff)	Mr. R. Winstanley	(61-52) 52 01 11	Victorian Dept. of Conservation & Environment (Marine Science Labs) P.O. Box 114 Queenscliff, VIC 3225	
Victorian Environment Protection Authority (EPA) Water Quality Branch	Ms. J. Kilby	(61-3) 628 59 55	EPA of Victoria Marine Studies Group 27, Francis St. Melbourne, VIC 3000	
Deakin University (Faculty of Aquatic Science)	Assoc. Prof. G. Westcott	(61-55) 63 31 00		
Chisolm Institute of Technology (Water Studies Centre)	?	(61-3) 573 23 26	Chisolm Institute of Technology (Water Studies Centre) 900, Dandenong Rd. Caufiled East, VIC 3000	
Museum of Victoria (Marine Research Group)	Mr. D. Phillips (Director)	(61-3) 694 61 11	Museum of Victoria (Marine Research Group) 328, Swanston St. Melbourne, VIC 3000	
Melbourne University (Engineering)	Dr. R. Hughes	(61-3) 433 62 15		
Monash University (Mechanical Engineering)	Dr. J.B. Hinwood	(61-3) 565 40 00	Monash University (Mechanical Engineering) Wellington Rd. Clayton, VIC 3168	
Consulting Environmental Engineering Ltd.	Mr. T.J. Pollock	(61-3) 429 46 44		
Caldwell Connell Engineers Ltd.	Dr. I.G. Wallis	(61-3) 697 82 68	Caldwell Connell Engineers Ltd. 60, Albert Rd. South Melbourne, VIC 3205	

Institution	Contacts	Tel. No	Address	Data Types Held
Port of Melbourne Authority	Mr. R.B. Thomas	(61-3) 645 25 44		

Table 5. Queensland

Institution	Contacts	Tel. No.	Address	Data Types Held
Brisbane Qld. Dept. of Environment & Heritage (Qld. Govt. Hydraulics Lab)	Mr. D.A. Robinson	(61-7) 227 71 11		Waves?
Qld. Beach Protection Authority	Mr. R.J. Lloyd	(61-7) 227 84 95		
Queensland University of Technology (Civil Engineering)	Mr. T.L. Piggot	(61-7) 223 25 44		Waves
Qld. Dept. of Primary Industries (Fisheries Research Branch)	Dr. B. Pollock (Manager)	(61-7) 239 34 15	Qld. Dept. of Primary Industries Fisheries Div. G.P.O. Box 46 Brisbane, QLD 4001	
Qld. Dept. of Environment & Heritage (Coastal Management Branch)	Mr. E. Kleverlaan	(61-7) 227 84 94	Qld. Dept. of Environment & Heritage (Coastal Management Branch) P.O. Box 155 North Quay, QLD 1002	
Kinhill, Cameron & McNamara Ltd.	Mr. T. Connor	?	Kinhill, Cameron & McNamara Ltd. P.O. Box 1197 Milton, QLD 4067	
University of Queensland (School of Marine Science)	Assoc. Prof. J.G. Greenwood, Director	?	University of Queensland (School of Marine Science) St. Lucia, OLD 4067	
University of Queensland (Civil Engineering)	Dr. M.R. Gourley	(61-7) 365 11 11	University of Queensland (Civil Engineering) St. Lucia, OLD 4067	
Townsville Australian Institute of Marine Science	Dr. D. Burrage	(61-77) 78 92 11	AIMS P.M. Box 3 Townsville, QLD 4180	currents, waves, temperature, salinity, turbidity

Institution	Contacts	Tel. No.	Address	Data Types Held
James Cook University (Physics)	Prof. M. Heron	(61-77) 81 41 11	James Cook University, Physics Dept. Townsville, QLD 4811	
James Cook University (Civil Engineering)	Dr. L. Bode	(61-77) 81 41 11	James Cook University, Civil Engineering Townsville, QLD 4811	
James Cook University (Centre for Remote Sensing)	Dr. J.D. Hopely	(61-77) 81 41 11	James Cook University, Centre for Remote Sensing Townsville, QLD 4811	satellite data
Great Barrier Reef Marine Park Authority (GBRMPA)	Mr. S. Woodley (Director, Research & Monitoring)	(61-77) 81 88 11	GBRMPA P.O. Box 1379 Townsville, QLD 4810	

Table 6. Tasmania

Institution	Contacts	Tel. No.	Address	Data Types Held
Hobart CSIRO Div. of Fisheries	Mr. B. Griffiths	(61-2) 20 79 00	CSIRO Div. of Fisheries G.P.O. Box 1538 Hobart, TAS 7001	
CSIRO Div. of Oceanography	Dr. N. White	(61-2) 32 52 22	CSIRO Div. of Oceanography G.P.O. Box 1538 Hobart, TAS 7001	Currents, waves, CTD, temp, salinity, satellite SST, water chemistry, drifting buoys, underway temp/salinity, seasoar temp/salinity
Australian Antarctic Div.	Mr. K. Kerry		Australian Antarctic Div. Channel Highway Kingston, TAS 7050	
University of Tasmania (Antarctic CRC, Remote Sensing Centre)	Dr. R. Coleman		University of Tasmania (Antarctic Co-operative Research Centre) G.P.O. Box 252C Hobart, TAS 7001	satellite data

Institution	Contacts	Tel. No.	Address	Data Types Held
Dept. of Primary Industries, Tasmanian Fisheries Research lab.	Dr. S. Stanley (Assistant-Director)	(61-2) 27 88 67	Dept. of Primary Industries, Tasmanian Fisheries Research Lab. P.O. Box 192B Hobart, TAS 7001	
Tasmanian Dept. of Environment	Mr. T. Brown	(61-2) 33 80 11		

Table 7. Northern Territory

Institution	Contacts	Tel. No.	Address	Data Types Held
Darwin NT Dept. of Primary Industries & Fisheries	Mr. R.J. Slack-Smith (Acting-Director)	(61-89) 89 55 11	NT Dept. of Primary Industries & Fisheries P.O. Box 990 Darwin, NT 8001	
NT University (Faculty of Science)	Dr. D. Parry	(61-89) 46 66 66	NT University (Faculty of Science) P.O. Box 40146 Casuarina, NT 8000	
NT Museum of Arts & Sciences	Dr. A.J. Bruce	(61-89) 82 42 49	NT Museum of Arts & Sciences G.P.O. Box 4646 Darwin, NT 8001	

References

Reef Research Vol. 3, No. 3, September 1993, GBRMPA
Inventory of Global Change in Australia, Researchers and Institutions, Australia Academy of Science, 1993
Status of Marine Science and Technology in Australia, Heads of Commonwealth Marine Agencies, (HOMA), June 1993
AODC's "CONTACTS" database on the HP Vectra PC
Australian Marine Research in Progress, 1988
Scientific and Technical Research Centres in Australia, CSIRO, 1988

CHINA

Institution	Address	Type of Data
National & Marine Data & Information Service	93, Liuwei Rd, Hedong District, Tianjin, 300171 Tel: (86-22) 450 52 13 Fax: (86-22) 430 44 08	Marine Meteorological, Hydrological, Chemical, Biological, Geological & Geophysical Data
Institute of Marine Geology (Ministry of Geology & Mineral Resources)	P.O. Box 18, Qingdao 266071 Tel: (86-532) 51 46 51 Fax: (86-532) 51 53 13	Marine Geological & Geophysical Data
South China Sea Fisheries Institute	231, Xingang Xi Rd, Guangzhou 510300 Tel: (86-20) 445 31 24 Fax: (86-20) 445 14 42	Fishery Data, Marine Hydrological & Biological Data

INDONESIA

Institution	Address	Type of Data
Research & Development Center for Oceanology (RDCO-LIPI)	Jl. Pasir Putih I, Ancol Timur, Jakarta Utara, P.O. Box 4801/JKTF Fax: (62-21) 68 19 48	Physical, Chemical, Marine Pollution, Marine Biology (biodiversity, distribution, etc.), Marine Geology (geomorphology sedimentation)
National Hydrographic Office NAVY (Dishidros TNI-AL)	Jl. Pantai Kuta V/1, Ancol Timur Jakarta 14430 Tel: (62-21) 68 48 10 Fax: (62-21) 68 48 19	Tide
Marine Fisheries Research Institute (BPPL)	Kompleks Perikanan Pelabuhan Samudra Jl. Muara Baru Ujung, Jakarta, Utara	Fisheries, (CPUE, stock assessment) including acoustic data
Meteorological & Geophysical Agency	Jl. Arief Rakhman Hakim No.3 Jakarta 10340	Meteorology
National Co-ordination Agency for Survey & Mapping (BAKOSURTANAL)	Jl. Raya Jakarta Bogor KM 46 Cibinong, Bogor P.O. Box 46/CBI CIBINONG Fax: (62-219) 83067	Tide & remote sensing data
National Institute of Aeronautics & Space (LAPAN)	Jl. Pemuda Persil No.1 Rawamangun, Jakarta	Oceanography (salinity, temperature) using satellites
Research Centre for Marine Geology (PPGL)	Jl. Dr. Junjunan 236, Tromol Pos 215, Bandung 40174 Fax: (62-22) 61 78 87	Marine Geology & Geophysics

FRENCH OCEANOGRAPHIC CENTRES IN THE PACIFIC

Institution	Contacts	Tel. No.	Address	Type of Data
ORSTOM, Oceanographic Div.	Mr. J. Picaut	Tel: (687) 26 10 00 Fax: (687) 26 43 26 Email: J.PICAUT (Omnet)	ORSTOM, Oceanographic Div. B.P. A5 Noumea New Caledonia	
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JAPAN

Institution	Contacts	Tel. No.	Address	Types of Data
Maritime Safety Agency		Tel: (81-3) 3541 3811 Fax: (81-3) 3545 2885	Ocean Surveys Div. Hydrographic Dept. Maritime Safety Agency 3-1, Tsukiji 5-chome, Chuo-ku Tokyo 104 Japan	Physical & Chemical, Oceanography, Marine Geology & Geophysics
Meteorological Agency		Tel: (81-3) 3212 8341 Fax: (81-3) 3211 3047	Oceanographic Div. Marine Dept. Meteorological Agency 1-3-4, Ohte-machi, chiyoda-ku Tokyo 100 Japan	Physical & Chemical Oceanography, Marine Meteorology, Marine Biology
		Tel: (81-3) 3502 8111 Fax: (81-3) 3591 5314	Research Div. Research Dept. 1-2-1, Kasumugaseki, Chiyoda-ku Tokyo 100 Japan	Physical, Marine Biology, Fishery
Japan Marine Science & Technology Centre		Tel: (81-468) 66 38 11 Fax: (81-468) 66 32 02	Marine Research Dept. Japan Marine Science & Technology Centre 2-15, Natsushima-chou, Yokosuka-si Kanagawa 237 Japan	Physical Oceanography
Environment Agency		Tel: (81-3) 3581 3351 Fax: (81-3) 3593 1438	Water Quality Bureau Environment Agency 1-2-2, Kasumigaseki, Chiyoda-ku Tokyo 100 Japan	Marine Pollution, Chemical Oceanography

Institution	Contacts	Tel. No.	Address	Types of Data
University of Tokyo		Tel: (81-3) 5351 6418 Fax: (81-3) 5351 6418	Oceanographic Research Institute University of Tokyo 1-15-1, Minamidai, Nakano-ku Tokyo 164 Japan	Physical & Chemical Oceanography, Marine Biology, Marine Geology & Geophysics

PHILIPPINES

Institution	Address	Type of Data
Bureau of Fisheries & Aquatic Resources	860 Arcadia Bldg., Quezon Av, Quezon City	Biology, Fisheries & Chemical Oceanography
National Mapping & Resource Information Authority	421 Barraca St, San Nicolas, 1010 Manila	Physical Oceanography, Geology, Geophysics, Satellite Data, Meteorology
College of Fisheries, University of the Philippines Visayas,	Miag-ao 5203, Iloilo	Fisheries, Physical Oceanography
National Research Council of the Philippines, University of the Philippines	Dilliman, Quezon City	
Philippines Atmospheric, Geophysical & Astronomical Services Administration	Asiatrust Bldg., 1424 Quezon Av, Quezon City	Meteorology, Geology, Geophysics, Physical Oceanography, Satellite Data
Marine Science Institute University of the Philippines	Dilliman, Quezon City	Biology, Fisheries, Chemical & Physical Oceanography
Philippines National Museum	Executive House, P. Burgos St, Manila	Marine Archaeological Properties/Resources
Mines & Geosciences Bureau	North Av, Dilliman, Quezon City	Marine Geology & Geophysics
Philippine Council for Aquatic & Marine Research & Development	Los Banos, Laguna	Biology, Fisheries & Chemical Oceanography
Philippine Coast Guard	CG-O Port Area, Manila	Contamination
Mindanao State University	Marawo City	Biology & Fisheries

THAILAND

Institution	Address	Type of Data
Dept. of Marine Science, Chulalongkorn University	Phya Thai Rd, Bangkok 10330 Tel: (66-2) 251 69 68 Fax: (66-2) 251 19 51	S,T,D current, DO, pH nutrients, heavy metals, petroleum hydrocarbons, plankton, benthos mangroves, coral reefs, seagrass beds
Sichang Marine Science Research Station, Aquatic Resources Research Institute, Chulalongkorn University	Phya Thai Rd, Bangkok 10330 Tel: (66-3) 821 61 98 Fax: (66-3) 821 61 98	S,T,D current, DO, pH, nutrients, plankton, benthos, fish larvae
Director, Hydrographic Division, Hydrographic Dept., Royal Thai Navy	Arun Amarin Rd, Bangkok 10600 Tel: (66-2) 465 23 28 Fax: (66-2) 472 12 86	S,T,D XBT currents, waves, tides density, sound velocity, Do, pH, nutrients
Director, Eastern Marine Fisheries Development Center, Dept. of Fisheries	Ban Phe, Muang District Rayong 21160 Tel: (66-3) 865 17 09 Fax: (66-3) 865 17 62	Fisheries data, plankton, benthos, S,T,D, currents, DO, pH, nutrients, heavy metals, petroleum
Director, Phuket Marine Biological Center, Dept. of Fisheries	P.O. Box 60, Phuket 83000 Tel: (66-7) 639 11 28 Fax: (66-7) 639 11 27	S,T,D, currents, DO pH, nutrients, plankton, benthos, mangroves, coral reefs, seagrass beds
Director, Oceanic Fisheries Division, Dept. of Fisheries	Parknam, Samutprakarn 10270 Fax: (66-2) 387 09 65	XBT, CTD, currents, DO, pH, nutrients, fisheries data, plankton, benthos, marine meteorological data (1953-1994)
Director, Upper Gulf Marine Fisheries Development Center Dept. of Fisheries	Soi Sapanpla, Yannawa Bangkok 10120 Tel: (66-1) 211 49 81/2 Fax: (66-2) 211 04 61	Fisheries data, S,T,D,DO,pH, nutrients, plankton, benthos, primary production since 1952
Director, Water Quality Management Division, Pollution Control Dept.	Gypsum Metropolitan Tower, Sri-Ayudhaya Rd, Bangkok 10400 Tel: (66-2) 642 50 21/4 Fax: (66-2) 642 50 26	Sea water quality data (chemical & physical) since 1986

VIETNAM

Institution	Address	Type of Data
Vietnamese Oceanographic Data Center	Trung Tam Tu Lieu Bien, Vien Khoa Hoc Viet Nam Nghia Do, Tu Liem, Hanoi Tel: (84-43) 58333 Fax: (84-43) 52483	**International files**: oceanographic data from international programmes e.g., CSK, KER, IGOSS, TOGA, also JODC & NODC (USA). From 1840 **National files**: oceanographic data obtained by NOPs, co-operative marine investigation, mainly with Russia & P.R. of China. From 1960
Institute of Oceanology	1, Cau Da, Nha Trang Khanh Hoa Tel: (84-58) 22106 Tlx: 581522 PBTX NT VT	**Oceanography**: oceanographic data obtained by NOPs, co-operative marine investigation, mainly with Russia, USA & P.R. of China. From 1924 **Marine Biology**: data on marine biology obtained by NOPs & co-operative marine investigation, mainly with Russia, France, USA & P.R. of China. Since 1924 **Marine Geology**: data obtained by NOPs & co-operative marine investigation, mainly with Russia, France & P.R. of China. Since 1924
Marine Hydro-Meteorological Centre	Trung Tam Khi Tuong Thuy Van Lang, Dong Da, Hanoi Tel: (84-43) 43794 Fax: (84-42) 60779	**Oceanography**: oceanographic data obtained by NOPs, & co-operative marine investigation, mainly with Russia & P.R. of China. From 1960 **Coastal & Islands Stations:** Data obtained by routine standard observation from Hydro-Meteorological Services of SRV. From 1957
Institute of Marine Production	Vien Nghien Cuu Hai San, 170 Le Lai, Hai Phong Tel: (84-31) 46663 Fax: (84-31) 45153	**Oceanography**: oceanographic data obtained by NOPs, co-operative marine investigation, mainly with Russia, P.R. of China & Sweden. From 1960 **Marine Biology**: data on marine geology obtained by NOPs, co-operative marine investigation, mainly with Russia, P.R. of China, & Sweden. From 1960

ANNEX V

TAXEX - TAXONOMIC EXPERT SYSTEM FOR BIOLOGICAL OBJECTS IDENTIFICATION

There are a lot of special spheres of knowledge, having their own doctrine, manuals and yawning gaps, enough entangled, giving abundant material to specify knowledge. One can imagine a start of an industrial branch with industrial enterprise of a completely new type - plant for knowledge specification, which will uptake knowledge as it is, remove its defects, collect it together, fill in blank spaces and put out checked and guaranteed exact knowledge.

D. Michie

The TAXEX system was developed as an alternative to classical determination plates.

TAXEX consists of empty expert system and knowledge base. The empty expert system includes: subsystem of logical deduction, subsystem of dialogue maintenance, subsystem of training, subsystem of explanations. The shell functioning does not depend on subject sphere.

System specialization is given by information included into knowledge base. The information is obtained by thorough treatment and structuring of knowledge on subject sphere, stated in traditional determinative plates, monographs, and also knowledge of experts.

TAXEX functional principle is the following: the system puts questions to the user concerning the meaning of one or another character of the examined object. The user answers these questions. The order of questions is not fixed and is determined by his replies (including "*I don't know*" replies). An advantage of the system lies in the fact that almost all questions are expressed in a graphic form and the texts for them have subsidiary character which permits a considerable increase in dialogue efficiency. To provide input the user may utilize the keyboard or the mouse.

The user can at any moment:

(i) utilize a reference book fitted inside the system and obtain information on any object (for example, for biological ones: information on systematics, morphology, biogeography, ecology, list of literature, etc.);

(ii) obtain information on system current view on an object;

(iii) look through the previous replies and if necessary, come back/return to the original place in the text;

(iv) ask for help.

The dialogue is finished when the system has a version on taxonomic place and identification of the examined object. In case of the user's doubt concerning the correctness of the identification, he can continue the process.

TAXEX can be used in any sphere, where there is a visual identification of objects, classified earlier, for example: biology, agriculture and forestry (determination of diseases from agricultural vermin), medicine, mineralogy, etc.

TAXEX's important merit is availability of training mode. The teacher (expert, user) can indicate an object, and then all the users can answer the system's questions which can be controlled to check correspondence to the given object. In case of an erroneous answer the system gives a warning signal as well as a correct answer which should be repeated.

The following facilities should be available to implement TAXEX: PC/AT-286, 140Kb RAM, EGA/VGA.

At present determinative plates of the Black Sea crustaceans (ISOPODA and TANAIDACEA orders, expert Dr. E.B. Makkaveeva) and of the Black Sea fish (experts Dr. E.M. Kalinina, Dr. L.P. Salehova) have been worked out.

Determinative plates of the Black Sea fish eggs and larvae (Dr. A.D. Gordina, Dr. L.P. Salehova), as well as of the World Ocean euphausides (Dr. V.V. Melnikov), and of Black Sea molluscs (Dr. V.D. Chuhchin), are being prepared.

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All the persons concerned are invited to collaborate.

The Catalogue of Biological Knowledge being Subject to Rescue in the Institute of Biology of the Southern Seas

Group	Taxons	Region
1. Benthos	**Protozoans** Infusoria	Sea of Azov, Black Sea, White Sea
	Vermes Turbellaria Nematoda	Black Sea Black Sea Black Sea, Mediterranean Sea
	Polychaeta	Black Sea, Sea of Azov
	Sipunculida Briapulida Echiurida	
	Crustaceans Tanaidacea Isopoda Decapoda Amphipoda Cumacea Mysidae Harpacticoida	World Ocean Black Sea Sea of Azov
	Molluscs Gastropoda Lamellibranchia	Black Sea Black Sea, Sea of Azov
	Sponges Porifera	
	Bryozoa	Black Sea Black Sea
2. Parasites	Parasites of molluscs, fish, birds, invertebrate, helminths of fish	World Ocean

Group	Taxons	Region
3. Pelagium	**Protozoans**	Black Sea White sea Mediterranean Sea Atlantic Ocean Indian Ocean
	Crustaceans	
	Copepoda Cladocera	Atlantic Ocean Indian Ocean Pacific Ocean Black Sea Mediterranean Sea
	Ostracoda	Atlantic Ocean
	Euphausiacea	World Ocean
	Pelagic Decapoda Planktonic Amphipoda	Pacific Ocean Atlantic Ocean Antarctic Ocean Black Sea Mediterranean Sea Indian Ocean Arabian Ocean
	Tunicata **Sagitta**	Mediterranean Sea Atlantic Ocean Indian Ocean Tropic Pacific Guinean Bay
	Molluscs	Atlantic Ocean
	Cephalopoda	Indian Ocean Mediterranean Sea
4. Fishes	**Pisces**	Atlantic Ocean Indian Ocean Guinean Bay Black Sea Mediterranean Sea Amazon
5. **Ichtyo-plankton**		Black Sea Mediterranean Sea Atlantic Ocean Indian Ocean Pacific Ocean Aegean Sea

Group	Taxons	Region
6. Phyto-benthos	**Diatomea**	Black Sea Mediterranean Sea Far Eastern Seas
	Marine Plants (zostera)	Black Sea
	Laurencia	Black Sea
7. Phyto-plankton	**Daitomea**	Black Sea Mediterranean Sea Atlantic Ocean Indian Ocean Baltic Sea Bering Sea
	Golden weeds, green weeds, Blue-green weeds	fresh waters of rivers, lakes, salt lakes
	Micro weeds Chlorella	

ANNEX VI

PROPOSED LIST OF DATA AND METADATA TO BE EXCHANGED UNDER THE GODAR PROJECT TO STUDY THE ROLE OF THE WORLD OCEAN AS PART OF THE EARTH'S CLIMATE SYSTEM

The following list is an attempt to document which data and metadata can and should be exchanged to study the role of the world ocean as part of the earth's climate system. This list may become part of the Global Oceanographic Data Archeology and Rescue (GODAR) Project Plan, as well as other programmes.

This list has already benefitted from the suggestions of a number of scientists and data managers. Please make suggestions and comments.

Data should be written in ASCII files and readable in FORTRAN **without illegal character errors occurring**. A computer programme to read each file of data profiles from a particular cruise would be very valuable as well as a description of methods (code tables for methods). In addition, checking for physically impossible data values of location values is very important. Checking the average speed of the ship between adjacent stations is a valuable check. We will need to work out many of these matters. All data we receive as part of the GODAR project will be made available to the international scientific community without restriction.

The profiles from each cruise should be in a file that is separate from any other cruises. This makes quality control processing easier.

Each profile should contain **all parameters** measured in that profile, including but not limited to:

Physical Parameters

1. temperature
2. salinity

Dissolved Gases

3. oxygen
4. hydrogen sulphide
5. dissolved carbon dioxide
6. partial pressure of carbon dioxide

Nutrients

7. phosphate
8. nitrate
9. nitrite
10. silicate
11. ammonia

Chemical Parameters

12. PH
13. total alkalinity

Radioactive Species

14. tritium
15. carbon 14
16. CFC 11
17. CFC 12
18. CFC 13
19. strontium 90
20. cesium 134
21. cesium 137
22. CE 144
23. radon 222

Biological parameters: use US NODC Taxonomic Code (available on CD-ROM)

24. phaeopigments
25. pigments, particularly chlorophyll-a (pore size, filter type, specific absorption co-efficient, F calculation, fluorescence or absorption)
26. dissolved organic carbon (filter type and pore size)
27. particulate organic carbon (filter type and pore size, acidified or not)
28. particulate nitrogen (filter type and pore size, acidified or not)
29. primary productivity (phyto-plankton) (for both ^{14}C and O_2 techniques individual values (m^{-3}) and dark bottle values are requested
30. phyto-plankton counts (taxon, method)
31. zooplankton counts (taxon, method of collection and count)
32. zooplankton biomass (method, value per water volume, gear type)
33. zooplankton production (method, value per water volume, gear type)
34. bacterial counts (method, microscope, filter type)

35. bacterial production (method, microscope, filter type)

Optical Parameters

36. water colour (Forel-Ule scale)
37. water transparency
39. secchi disk depth
40. mechanical bathy-thermography temperature profiles
41. expendable bathy-thermography temperature profiles

Each profile should also include the following information:

year
month
day
time (Greenwich meridian): hour, minute
latitude
longitude
originator's cruise name and number
originator's profile number or station number
ships code or name

Meteorological data at a time of profile (information on which code tables are used is required, for example, WMO code table 0885 for wave direction or WMO code table 1555 for wave height).

(a) weather
(b) visibility
(c) barometric pressure
(d) wet bulb temperature
(e) dry bulb temperature
(f) wind speed
(g) wind direction
(h) wind force
(i) cloud type
(j) could amount
(k) sea state
(l) wave period
(m) wave direction
(n) wave height

The major point is that we strongly believe that all data measurements from each profile should be kept together along with good documentation.

The international scientific community is particularly interested in oceanographic chemical/biological data to support studies of the earth's carbon cycle and satellite instruments that are attempting to estimate chlorophyll. Primary interest is now in the Indian Ocean, particularly the Arabian Sea and the North Atlantic.

WMO and US NODC code tables can be made available on diskette.

The US NODC User's Guide can be made available if desired.

ANNEX VII

LIST OF ACRONYMS

ADCP	Acoustic Doppler Current Profiler
ADESS	Automated Data Editing & Switching System
ANSTO	Australian Nuclear Science & Technology Organization
AODC	Australian Oceanographic Data Centre
ADCP	Acoustic Doppler Current Profiler
ASEAN	Association of South East Asian Nations
ASFA	Aquatic Sciences & Fisheries Abstracts
ASFIS	Aquatic Sciences & Fisheries Information System
BFAR	Bureau of Fisheries & Aquatic Resources (Philippines)
BMG	Meteorological & Geophysical Agency (Indonesia)
BODC	British Oceanographic Data Centre (UK)
BPPT	Assessment & Application for Technology (Indonesia)
BT	BathyThermograph
CEC	Commission of European Communities
CGSD	Coast & Geodetic Survey Department (Philippines)
CLR	Coastal Living Resources
CNODC	China National Oceanographic Data Centre
COARE	Coupled Ocean-Atmosphere Response Experiment
CODATA	Committee on Data for Science & Technology
CPMS	Co-operative Programmes on Marine Sciences (Thailand)
CRS	Coastal Radio Station
CSIRO	Commonwealth Scientific & Industrial Research Organization (Australia)
CSK	Co-operative Study of the Kuroshio
CTD	Current, Temperature, Depth
CURM	Current Meter
DBT	Digital BathyThermograph
DSTO	Defense Science & Technology Organization (Australia)
EDMED	European Directory of Marine Environmental Data
EEZ	Exclusive Economic Zone
ENSO	El Niño & the Southern Oscillation
EPA	Environment Protection Authority (Australia)
ETI	Expert Centre on Taxonomic Identifications (Netherlands)
FAO	Food & Agriculture Organization of the United Nations
FIAMS	Flinders Institute of Atmospheric & Marine Science (Australia)
GBRMPA	Great Barrier Reef Marine Park Authority (Australia)
GCOS	Global Climate Observing System
GEBCO	General Bathymetric Chart of the Oceans

GIPME	Global Investigation of Pollution in the Marine Environment
GIS	Geographical Information System
GLOSS	Global Sea-Level Observing System
GODAR	Global Oceanographic Data Archeology & Rescue Project
GOOS	Global Ocean Observing System
GTS	Global Telecommunication System
ICES	International Council for the Exploration of the Sea
ICSU	International Council of Scientific Unions
IGBP	International Geosphere-Biosphere Programme
IGOSS	Integrated Global Ocean Services System
IMO	International Maritime Organization
INFOCLIMA	World Climate Data Information Referral Service
INFOTERRA	International Environmental Information System
INODC	Indian National Oceanographic Data Centre
IO	Institute of Oceanography (Vietnam)
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data & Information Exchange
IOS	IGOSS Observing System
ISLPP	IGOSS Sea-Level Project in the Pacific
JAFIC	Japan Fishery Information Centre
JGOFS	Joint Global Ocean Flux Studies
JODC	Japan Oceanographic Data Centre
JPL	Jet Propulsion Laboratory (USA)
KODC	Korea Oceanographic Data Centre
LAPAN	National Institute of Aeronautics & Space (Indonesia)
LCR	Living Coastal Resources (Thailand)
LIPI	Indonesian Institute of Sciences
LTM	Laboratory of Tropical Meteorology (Vietnam)
MAJDF	Malaysia/Australian Joint Defence Programme
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978
MARPOLMON	Marine Pollution Monitoring
MBT	Mechanical BathyThermograph
MEDI	Marine Environmental Data Information Referral System
MEDS	Marine Environmental Data Service (Canada)
MGB	Mines & Geo-Sciences Bureau
MHC	Marine Hydrometeorological Centre (Vietnam)
MPI	Marine Production Institute (Vietnam)
MRI	Marine Research Institute (Vietnam)
MSI	Marine Science Institute (Philippines)
NAMRIA	National Mapping & Resource Information Authority (Philippines)

NCDC	National Climatic Data Center (USA)
NCMS	National Committee on Marine Sciences (Philippines)
NCSR	National Centre for Scientific Research (Vietnam)
NGDC	National Geophysical Data Center (USA)
NIO	National Institute of Oceanography (India)
NMDIS	National Marine Data & Information Service (China)
NOAA	National Oceanic & Atmospheric Administration (USA)
NODC	National Oceanographic Data Centre
NOP	National Oceanographic Programme
NRCT	National Research Council of Thailand
NZOI	New Zealand Oceanographic Institute
OB	Operational Branches (Vietnam)
OCR	Oceanographic Cruise Report
ORSTOM	Office de la Recherche Scientifique et Technique Outre Mer (France)
OSD	Ocean Station Data
OSLR	Ocean Science in Relation to Living Resources
OWS	Ocean Weather Station
PAGASA	Philippine Atmospheric, Geophysical & Astronomical Services Administration
PCAMRD	Philippine Council for Aquatic & Marine Research & Development
PCG	Philippine Coast Guard
PICES	North Pacific Marine Science Organization
PRIFO	Pacific Research Institute for Fishery & Oceanology (Russian Federation)
PTWS	Pacific Tsunami Warning System
RDCO	Research & Development Centre for Oceanology (Indonesia)
RIHMI	Federal Service of Russia for Hydrometeorology & Monitoring of the Environment
RMN	Royal Malaysian Navy
RMNODC	Royal Malaysian Navy Oceanographic Data Centre
RNODC	Responsible National Oceanographic Data Centre
ROD	Regional Ocean Dynamics
ROSCOP	Report of Observations/Samples Collected by Oceanographic Programmes
ROSTSEA	Regional Office of Science & Technology for South East Asia
RTN	Royal Thai Navy
SAR	Synthetic Aperture Radar
SBT	Selected Level Bathythermograph
SIIS	Station Inventory Information System
SIO	Scripps Institute of Oceanography (USA)
SOA	State Oceanic Administration (China)
SST	Sea Surface Temperature
STD	Salinity, Temperature, Depth
SWCC	Second World Climate Conference
TCTO	Tawi-Tawi College of Technology & Oceanography (Philippines)

TOGA	Tropical Ocean & Global Atmosphere
TTP	Tides & Tidal Phenomena
UKMO	United Kingdom Meteorological Office
UNESCO	United Nations Educational, Scientific & Cultural Organization
UNCED	United Nations Conference on Environment & Development
UNEP	United Nations Environment Programme
UPV-CF	University of the Philippines in the Visayas, College of Fisheries
VCP	Voluntary Co-operation Programme
VIMS	Victorian Institute of Marine Science (Australia)
VNODC	Vietnam National Oceanographic Data Centre
VOS	Voluntary Observing Ship
WDC	World Data Centre
WESTPAC	IOC Sub-Commission for the Western Pacific Region
WHOI	Woods Hole Oceanographic Institution
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
WWW	World Weather Watch
XBT	Expendable Bathythermograph

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