

Intergovernmental Oceanographic Commission

Workshop Report No. 88

IOC-CEC-ICSU-ICES Regional Workshop for Member States of Eastern and Northern Europe

**(Global Oceanographic Data Archeology and
Rescue [GODAR] Project)**

World Data Centre B, Oceanography
Obninsk, Russian Federation
17-20 May 1993

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1. BACKGROUND AND OBJECTIVES OF GODAR

The Global Ocean Data Archeology and Rescue Project known now as GODAR, was the name given by the IOC Assembly at its Seventeenth Session (Paris, 25 February -11 March 1993) to a new project which has been defined to be launched in the framework of the IOC International Oceanographic Data and Information Exchange (IODE) Programme. In response to the recommendation of IOC-XVII, the Secretary IOC appointed Dr. S. Levitus, Director of WDC-A, Oceanography as the Project Leader.

The GODAR Project Proposal (Annex H) was previously given strong endorsement by the IOC Committee on IODE at its Fourteenth Session (Paris, 1-9 December 1992), following initial preparatory activities as a result of the Workshop held in September 1990 at the US National Oceanographic Data Center (NODC) in Washington DC. After the Workshop, data archeology and rescue activities were begun at the three World Data Centres for Oceanography in Washington (USA), Obninsk (Russian Federation) and Tianjin (China), as well as at the ICES Secretariat in Copenhagen, Denmark and the Japan Oceanographic Data Centre.

An international Workshop on Ocean Climate Data, sponsored by the IOC, CEC, ICES, WMO and ICSU (Greenbelt, Maryland, USA, 18-21 February 1992) noted the progress achieved in data archeology during 1991 by a few Member States and international organizations and recommended expanding this *ad hoc* multi-lateral effort to an international data rescue and recovery project (IOC Workshop Report No. 78, 1992).

The Project which has been under development for over two years is endeavoring to augment the historical oceanographic digital data archives by seeking out and recovering manuscript and ocean data not yet included in the ocean databases accessible to the world research community. The term "*data archeology und rescue*" refers to this two-part process of first identifying and locating data and then performing the steps required to merge them into a digital database.

The above project is ambitious but is essential to closing the gap in the long time-series of ocean observations which is of the utmost importance for climate change studies. Efforts in the context of the preparation for UNCED, including assessments of the state of the environment, the SWCC, the IPCC, and negotiations for the FCCC have shown very clearly the need for long time-series of quality data. Governments and scientists are now recognizing the value and indispensability of historical ocean data for scientific research and to national decision making. Vigorous ocean data archeology efforts will help to significantly enhance the ocean data record from past decades. These efforts will rely on data exchange of the IOC'S IODE and the WDC system.

The GODAR Workshop held in Obninsk, Russian Federation, from 17-20 May 1993, was a result of the IOC Assembly decision to have the first regional workshop for eastern and northern Europe in the Russian Federation, taking into account the availability of the unique datasets in the region, particularly in Russia, Poland and the Ukraine, and the real danger of losing them. This Workshop was seen as the first and most urgent step in the development of GODAR in a wide and global perspective. It is expected that this Workshop will be followed by other similar regional workshops in different parts of the world, facilitating international exchange of data under the IODE umbrella.

The purpose of the Workshop was to make data available to the wide international community in order to build global oceanographic databases for different fields of application, including global change and climate studies, world ocean research and global ocean monitoring, and to help in the capacity building of national, regional and global infrastructures.

The desired outcome was to assess the state of data holdings in the region, to identify common goals and problems with data preservation, and to recommend implementation steps and approaches to solve these problems. The Workshop was also considered as a start for laying the groundwork for a major upgrading of the entire regional ocean data management system, a major step in the development of a region wide ocean data system modernization programme.

The present report contains a summary of the scientific papers and national reports presented at the sessions, as well as recommendations and conclusions formulated by the Workshop. Information provided by national representatives, and those gathered from the report of the IOC-ICSU sponsored mission to Russia in 1992, laid the basis for the List of Main Marine Institutions and Principal Ocean Data Holders in

the region presented in Annex IV. Other annexes contain the Workshop Programme (Annex I) and List of Participants (Annex III).

The opinions expressed in the Workshop Report are those of the participants and do not necessarily coincide with those of the sponsoring organizations.

2. OPENING AND WORKSHOP ARRANGEMENTS

The Workshop was hosted by the World Data Centre B, Oceanography, which operates under the auspices of the Russian Research Institute for Hydrometeorological Information of the Hydrometeorological Committee of Russia. In the absence of Dr. S. Levitus (Project Leader), Dr. Y. Sychev, Head of the NODC of the Russian Federation who has been co-operating with Dr. Levitus for the last two years in data archeology on a multilateral basis, was invited to Chair the Session. Dr. Y. Sychev was assisted each day by a Co-Chairman, who helped the Chairman to implement his duties more effectively, and also served as the Rapporteur of the corresponding sessions. Drs. H. Dooley, M. Jones and Y. Oliouline kindly agreed to provide this assistance.

Mr. P.A. Nikitin, Head of the Department of Marine Operations of the Hydrometeorological Committee of Russia welcomed the participants in a brief opening ceremony. He stressed that as the Workshop was one of the first milestones on the way to meeting GODAR objectives, it would help to synthesize from the disparate views of the participants a prospectus for ocean data rescue in the region. He recalled the efforts of the NODC of the Russian Federation and the WDC-B, Oceanography in the field of data archeology, and considered their contributions to GODAR as very important. He recognized that though the implementation of GODAR in the region should be executed and funded largely by Member States themselves, it would be critical to the success of GODAR to have adequate support from international organizations and developed countries outside the region. Mr. Nikitin wished the participants every success in their endeavors.

Dr. Y. Oliouline on behalf of IOC emphasized the importance of the Workshop and its relevance to the UNCED decisions and related the objectives of the Workshop and to recommendations of the last session of the Committee on IODE. He highlighted the importance of collaboration of international organizations in implementing GODAR and expressed thanks to the commitments and support from five other international organizations which helped IOC and the Russian Federation to organize this Workshop, namely, the Commission of European Communities (CEC), the International Council of Scientific Unions (ICSU), the International Council for the Exploration of the Sea (ICES), the World Meteorological Organization (WMO), and the International Council on Archives (ICA). This participation was an important indicator of the great interest which international organizations have in the GODAR Project.

Over 40 scientists, administrators and data managers joined in the discussions (see List of Participants, Annex III). During the four day of lectures, reports and round table discussions all objectives of the Workshop were achieved.

The Workshop Programme (Annex I) was divided into 3 general parts. The first consisted of lectures presented by representatives of international organizations which were followed by those by selected experts from leading national ocean data centres who spoke on their experience in data archeology, search and rescue. These lectures highlighted ICES, ICSU, IOC, WMO and ICA activities relevant to the topics of the Workshop, quickly helping other participants unfamiliar with the programme to understand the requirements and constraints. The lecturers set the tone for the Workshop.

The Workshop continued with the review of the extent and breadth of regional data holdings. This part included reports in which national representatives refined the picture by giving an overview of national ocean data management infrastructures in operation today, of ocean data holdings and their accessibility, rules under which national data exchange is organized, actions taken by their countries in protecting ocean data from being lost and the problems countries of the region are facing in doing this. These reports helped the Workshop to put the discussion in a broader context and produced valuable descriptions of the main concerns, goals, scope of the effort, responsibilities and responsible organizations, specific steps of implementation and benefits of the GODAR implementation.

The third part consisted of round table discussions on strategies and the technical aspects of implementing GODAR in the region. These discussions focussed on the formulation of recommendations, the implementation plan, criteria for the identification of priorities in rescue operations, education and training. Results of these discussions are presented in chapters 5 and 6 below.

The Workshop formulated and agreed upon the definition of the term “data at risk of being lost” as follows:

- (i) Held on a medium which will degrade physically in the coming years, or
- (ii) Held on electronic medium or in a format which will not be readable in the coming years, or
- (iii) Held by individuals or institutions which will not be able to keep together the data itself and related metadata, or
- (iv) Held on medium which makes public access difficult in spite of its relevance for today’s research on global change.

The Workshop identified the list of criteria which will be useful to guide the Project Leader and his Regional Assistant, Secretary IOC, Member States in establishing priorities in data rescue operations. This list is based on the Recommendations IODE-XIV/3 in accordance with which our primary concern is the acquisition of ocean data for the study of the role of the world ocean as part of the earth’s climate system.

Data may be of the following categories:

- (i) Available only in manuscript form;
- (ii) Available only in analog form;
- (iii) Already digitized but not available to the international scientific community.

Within these constraints further priorities need to be set in order to ensure resources are focused on meeting the needs of the Climate Programme. However, in doing so, we must not forget the fundamental aim of the IODE-System to have all oceanographic data available in the World Data Centres. If priorities have to be set for categories (i) and (ii) consideration should be made of:

(a) Data types

These should include one or more of the following t, s, O₂, nutrients, PH, alkalinity, CO₂, primary production, chlorophyll

If data additional to these, in particular marine meteorological data and secchi disk, etc., are available, then these must be digitized too.

(b) Spatial distribution

The greatest priority should be given to data from the open sea. However, since most Data Centres document data at the cruise level, it is important that all stations in a cruise are digitized together. This means that a high priority is assigned if at least one open sea station is included in a cruise.

An additional level of priority must be accorded to different open sea areas, based on their importance to climate processes and the degree of station coverage in that area. Thus priority should be given to data from the Southern Ocean; Indian Ocean; South Pacific Ocean; Atlantic Ocean.

(c) Length of time-series

All data which satisfy (i) but which do not necessarily satisfy (ii) and have a frequent sampling interval over a period of at least one decade should be given high priority. This includes time-series at fixed coastal stations in inland and coastal seas.

(d) Condition/security of manuscripts

If, during the cataloging process, it is recognized that, for whatever reason, the data are likely to be irrecoverably lost and criteria (a) and (b) or (c) are fulfilled, then the highest priority must be accorded.

For category (iii) data, all data satisfying category (a) - data types, should be transferred to the World Data Centres as soon as possible. If these data are held in a form which cannot be read (e.g., obsolete computer/database) their conversion to a machine readable form should be accorded high priority.

“Other” priority data identified in this category at the Workshop include substantial volumes collected in the Baltic Sea, Black Sea and Sea of Marinara.

Data not being classified as high priority by the above criteria (a) and (b) are not likely to be digitized within the foreseeable future within the framework of the GODAR project. However, the indication of their existence by the GODAR cataloguing/tracking system means that the opportunity should be taken now to ensure these data enter the public domain. Therefore, regional GODAR Workshops should attempt to identify sources and funding/help for such data,

The Workshop strongly endorsed the need to rescue these data which though of marginal value to the GODAR Project may have great value for the work of international organizations concerned with the region. The Workshop considered that other organizations with interests in the above-mentioned geographical areas should be invited to consider ways of helping to rescue these data (e.g., Baltic Sea - ICES, HELCOM, Nordic Council, EC; Black Sea - COMSBLACK UNEP, EC; Sea of Marinara - UNEP, ICSEM, EC).

For the Black Sea Member States together with the ongoing efforts of the COMSBLACK programme monitoring and studying physical, chemical, biological, ecological and pollution processes in the Black Sea, this will be a very valuable step, with high priority towards the establishment of a Black Sea Oceanographic Information Network. The potential to achieve this goal is present within the COMSBLACK programme.

Noting that GODAR is a global, ambitious and complex project in which scientific, economic, political and other issues of national, regional and international scale will be interwoven, the Workshop recommended that a regional assistant(s) to the project leader be nominated, and suggested Dr. Y. Sychev to become the project leader assistant for the eastern European region for the period of two years - 1993-1995. The responsibility of the regional assistant will be to monitor the implementation of agreed-upon activities in the region and inform regularly the Secretary IOC and the project leader on developments.

It was understood that this is a first approach. The criteria included in the list maybe changed from region to region and modified as the project matures.

3. SCIENTIFIC PRESENTATIONS

IOC and its Role in Meeting UNCED Objectives
in the Field of Ocean Data Collection and Management
Dr. Y Oliounine, Head Ocean Services Unit, IOC

The Intergovernmental Oceanographic Commission (IOC) of UNESCO was founded in 1960 with the recognition that the oceans have a great impact on both environmental change and sustainable development.

The IOC is the only intergovernmental mechanism solely charged with dealing with the oceans, coastal areas and the whole marine environment. The IOC is not responsible for the preparation of legal instruments, conventions and guidelines. It is instructed with the provision of the elements necessary for the preparation of such acts, for their implementation as well as other management actions.

Interest in the IOC has grown rapidly - its membership increased from 40 states in 1961 to 120 by 1992,

Over the three decades since its inception, the purpose of the Commission has been to promote marine scientific investigations on the nature and resources of the oceans.

Since 1960, the IOC has promoted a number of important research initiatives aimed at improving the knowledge base of the ocean environments, its state of health and biodiversity and how oceans interact with land and drive global and regional climate. Today through the advent of specialized research and monitoring programmes – such as the Study of Tropical Oceans and Global Atmosphere (TOGA), World Ocean Circulation Experiment (WOCE), Coastal Ocean Advanced Science and Technology Study (COASTS) and Global Sea-Level Observing System (GLOSS) – the IOC promotes, jointly with WMO and ICSU (International Council of Scientific Unions), marine scientific investigations in the fields of ocean dynamics, circulation and climate. Much of the basic scientific development is being carried out through co-operative activities with the Scientific Committee on Oceanic Research (SCOR, member of ICSU).

Other programmed, such as the joint IOC-FAO (Food and Agriculture Organization of the United Nations) programme on Ocean Science in Relation to Living Resources (OSLR), focus on the ocean's living resources, particularly on marine environmental factors having an impact on recruitment and fisheries. The IOC-UNEP (United Nations Environment Programme) IMO-GIPME (International Maritime Organization, (Global Investigation of the Pollution of Marine Environment) concentrates on studies of pollution distribution and impacts, particularly in the coastal zone, as well as inputs of pollutants to coastal zones and open ocean areas.

As the name implies, the programme on Ocean Science in Relation to Non-Living Resources (OSNLR) focuses on the study of processes influencing generation, distribution and availability of non-living marine resources, including coastal erosion. It has links with the Ocean Mapping programme.

The IOC is now embarking on another ambitious project: the creation of the Global Ocean Observing System (GOOS) in co-operation with WMO, UNEP and ICSU. GOOS is a comprehensive system for collecting, analyzing and distributing physical, chemical and biological data from all the world's marine water bodies, with the aim of improving the understanding and prediction of the state of the world ocean's health as well as the role of the ocean in global climate change, and improving predictions of climate. GOOS is a contribution to UNEP'S Global Earth Monitoring System (GEMS) and is a part of the UNS Earthwatch.

Much progress has been made, especially over the past decade, in knowledge of the global climate system. This has been accompanied by better understanding of the impacts of climate variations and potential climate change on economic and social activities and on ecosystems. This progress culminated in 1992 in adoption of the Framework Convention on Climate Change and the atmospheric, oceans and climate sections of Agenda 21 adopted by the Governments of the Earth Summit, UN Conference on Environment and Development in Rio de Janeiro.

The Conference in Chapter 17 "Oceans" of the Agenda 21 stated that: the marine environment - including the oceans and adjacent coastal areas - forms an integrated whole that is an essential component of the global life support system. It should be viewed as a positive asset presenting opportunities for sustainable development.

Within this framework, achievement of the protection and sustainable use of the marine environment requires new approaches to ocean management, at the national, regional and international levels - approaches that are integrated in content and precautionary and anticipatory in ambit. The overall goal is to ensure that the oceans provide environmental and economic benefits for the well-being of present and future generations.

Chapter 17 specifies as one of the overall objectives the promotion of exchange of data and information and co-operation with a view to the development of standard inter-calibrated 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", the IOC has been very active in promoting the international exchange of scientific data and information through the International Oceanographic Data and Information Exchange (IODE) network. World Data Centres Oceanography - in Washington, DC (USA), Obninsk (The Russian Federation), and Tianjin (China) - compile and correlate data from 40 national oceanographic data centres around the world. All the data gathered, amounting to over 2.2 million separate observations made by 960,000 oceanographic stations (each "station" being a separate measurement point), are comparable in format and methodology of collection so that they can be used by anyone in the network.

The main achievements of IODE during the last few years included:

- (i) Standardization of ocean measurements for international inter-comparability development of internationally agreed formats, rules and procedures for ocean data exchange, observing and data management networks.
- (ii) Through GTSP, assembling the complete, up-to-date global temperature-salinity data set; improving data flow monitoring to capture more data and prevent data loss, quality controlling historical data to the same level as more recent temperature-salinity data and, finally, developing long-term time-series data sets for climate change research.
- (iii) Development of software and installation of a Personal Computer-based system (OCEAN-PC) in the IOC Member States, permitting participants of the IODE system, mostly developing countries, to quality control, store, analyze and exchange national ocean data.
- (iv) Launching GODAR projects to locate and preserve on modern data carriers original records of ocean data, some more than 100 years old.
- (v) Continuous updating of the MEDI Catalogue with references to ocean data sets worldwide; making access to the Catalogue through the electronic mail bulletin board.
- (vi) Preparation, publication and distribution of manuals and guides on internationally agreed procedures for ocean data management.

In the coming years major efforts will be concentrated on developing data management and archival facilities in support of GOOS, on the extension of data services provided by IODE to different user groups, on the need to recover large quantities of oceanographic data from past decades and transfer these data into machine-readable form, on the need to manage classical and new types of marine data, such as chemical and biological, not only to support GOOS from the operational point of view, but also for scientific experiments. It must also be noted that the increasing amount of data, e.g., from satellites will put enormous pressure on the data handling system.

To meet effectively the objectives of UNCED in data and information management, IODE centres in their turn should recognize:

- (i) The importance of identifying and holding all data sets in an accessible and usable form, thus facilitating interdisciplinary access to such data.
- (ii) The creation, collation and maintenance of data sets in an accessible and usable form are both a necessary and expensive exercise. Member States need to plan and provide the relevant financial support to meet their basic infrastructure costs for holding and disseminating data.
- (iii) The importance to support relevant national and international activities involved in meta-data collection, development of standards and quality assurance. This includes criteria and priorities for archiving and preserving of data relevant to ocean research, monitoring and exploitation,

Ocean Data Archaeology Project Receives International Support
Dr. S. Levitus, Director WDC-A, Oceanography, GODAR Project Leader and R. Gelfeld USA NODC

The IOC Assembly at its Seventeenth Session (Paris, February-March 1993) approved an intergovernmental global project, entitled Global Oceanographic Data Archaeology and Rescue (GODAR), and called on the Commission's Member States to provide active support for this effort.

In priority order, the GODAR Project seeks to:

- (i) prepare catalogues of data available only in manuscript or other non-digital form, as well as digital data not currently available at one of the participating ocean data centres in the world;
- (ii) digitize data that now exist only in manuscript or other non-digital form;

- (iii) ensure that all oceanographic data available are archived in digital format two or more data centres;
- (iv) perform quality control on all data, and
- (v) make all data readily accessible for international exchange.

The enhanced historical ocean data archives resulting from this project will, *inter alia* enable improved ocean climatologies to be constructed and will support more complete studies on ocean variability for heat, salt and nutrients. Diagnostic studies of the variability of the world ocean are critical for understanding the role of the latter in the Earth's climate system. In addition, these data will be valuable to numerical modelers for use in preparing fields of initial and boundary conditions.

All important first step in this project is summarizing the data held in the world's oceanographic data archives. This will enable researchers and data managers to see what data are available, locate gaps in data coverage, and identify data they have or know about that are not in the archives. Vigorous ocean data archaeology efforts will help to significantly enhance the ocean data record from the past decades. These efforts will rely on data exchange mechanisms of the IOC'S IODE and the World Data Centre system. As the holder of the world's largest unclassified oceanographic data archives, the USA NODC has assumed a special responsibility for providing the worldwide oceanographic research community with information on its data holdings.

The USA's NODC WDC-A has begun to receive significant new data accessions that enhance the geographic and temporal coverage of the NODC's data holdings. To date, these data submissions – primarily oceanographic stations and bathythermograph temperature profiles — have been received from five countries and from ICES. Because of the substantial processing time required to check these historical data for duplicates and other problems, some of these data have not yet been incorporated into the NODC master archives. All these data, as well as the USA NODC and WDC-A (Oceanography) oceanographic profile data (with scientific quality control flags assigned to each profile), are planned to be available no later than December 1993.

The enhanced oceanographic databases that will result from this project will be made available as ASCII files on CD-ROM. This provides the least expensive and most efficient means of distributing these large data sets. WDC-A, Oceanography, has volunteered its services to co-ordinate this activity. This WDC will work with other ocean data centres and research institutions to compile the most complete oceanographic databases possible and will arrange for the production and distribution of the resulting databases on CD-ROM and magnetic media.

WMO Experience in the Implementation of the Data Rescue Project (DARE)
of the WCDMP 'Lessons and Conclusions'

Dr. G.D. Schietecat, Co-ordinator WMO International Rescue Co-ordination Centre

The climatic and hydrological data archives of many developing countries are threatened by a variety of natural and man-made disasters.

Even in the absence of such events, the hot and humid climates characteristic of many regions of developing countries, combined with the less than ideal conditions under which the documents are stored, insufficient funding, inadequate training and the decreasing number of workers assigned to the maintenance of the data archives, take a steady toll on the physical integrity of the documents.

The increasing interest in global environmental issues such as climate change has given an extra urgency to the need to preserve climate records throughout the world in order to establish an accurate baseline against which to measure changes that might be occurring in the world's climate system.

In 1985, the Executive Council of the World Meteorological Organization (WMO) recognized the importance of rescuing the meteorological data and the extension of the programme to the whole of Africa (WMO Regional Association I) was recommended. The programme was called DARE I, Data Rescue in Region I, and is one of the priorities of the World Climate Data Programme. It started on the 1 January 1989 and is executed by Belgium and sponsored by Belgian Trust Funds. In the other continents similar initiatives will be taken in the near future and other countries have already offered to help with the realization. The

DARE I Project can count on the co-operation of the General Administration for Co-operation and Development (AGCD/ABOS) providing the financial input, the United Nations Development Programme (UNDP) assisting the IDCC in Africa, the United Nations Environmental Programme (UNEP) offering the equipment and the World Meteorological Organization (WMO) for the general organization. All these activities will, however, under the authority of WMO, be co-ordinated by the IRM/KMI (Royal Meteorological Institute of Belgium). To this end an International Data Rescue Co-ordination Centre (IDCC) was established with the following objectives:

- (i) to equip the different African countries participating in the project with a portable microfilmer to microfilm smaller documents and a table microfilmed for bigger documents and books;
- (ii) to install this equipment and to train the national staff for the microfilming of the documents;
- (iii) to arrange the data in chronological order and to complete them with data from other sources in order to get a database on microfiche and an inventory of all data;
- (iv) to provide every country with their data on microfiche together with a microfiche reader/printer to use them;
- (v) to equip the Regional Centres with the necessary instruments and to train the staff;
- (vi) to digitize a sub-set of the data of up to 10 stations per 250,000 km² so that they can be used for computer processing.

The advent of the PC based WMO sponsored CLICOM software package had made it very desirable for countries to switch to a system that is universally used and would greatly facilitate the exchange of climatological data among countries.

At the present time most digitized data users are content with ASCII files. In developing countries with CLICOM installed, a CLICOM compatible format is preferred. After all, a CLICOM compatible format is the most likely to be used in most instances.

In spite of the effort that has been made toward computerizing the climatological and hydrological data archives in the African countries, the greater part of the archives consist of the unpublished original paper documents that come in a large variety of formats. Efforts continue or will begin as soon as possible to rescue from possible destruction the original documents that constitute the bulk of the climatological data archives of the countries of Africa.

Currently, the cheapest and most readily available method for preserving data that have been stored on paper is microfilming. This method allows the storage of the manuscript data using much smaller volumes. Microfilm is a durable medium which can preserve an image of the original manuscript for several generations and can be easily reproduced.

Microfilming has been adopted by the IDCC as the method for the preservation of the information contained in original manuscripts, as it is a relatively inexpensive, durable and easily reproducible medium. The oldest and most fragile documents are given priority for microfilming. Original data are likewise given priority over derived data (such as plotted weather charts).

Before the IDCC undertakes a microfilming data rescue effort for a particular country, it tries to obtain as much information as possible on the contents of the country's archives, including the number and types of stations, their record period and the dimensions of the manuscripts on which the data are recorded. As complete microfilm records are created for each station, the rolls of microfilm are converted to microfiche. This process permits the organization of the records in a logical manner, since a single microfiche can be composed from sections of several microfilm rolls. In addition, microfiche provide a more conveniently accessible storage medium. The working time to convert the microfilm into microfiche depends upon the chronological order of the documents on the microfilm. It is assumed that cutting and microfiching 1.25 microfilms per day is a good average. As 1 microfilm yields some 40 microfiche, one person produces on average 50 microfiche per day. One person can inventory on average 100 microfiche per day. As one microfilm yields some 40 microfiche, this represents 2.5 microfilms. The IDCC maintains the microfiche jacket with the cut microfilms of the climate records, while another microfiche (a diazo copy of the microfiche

jacket) is sent back to the original country. Data rescue should stand for microfilming and digitizing together. A good test for both could be comparing of digitized data from both the original documents and the microfilmed documents. The IDCC attaches extreme importance to the proper training of the local personnel that will be employed in the microfilming project. In many countries of Africa the IDCC has to face the feeling of the countries that they are being *looted* when microfilming their documents. Before microfilming or digitizing is started, good arrangements should be made to overcome misunderstandings.

The experience gained by the IDCC with the countries of Africa has demonstrated the desirability of creating one or more Regional Data Centres for data rescue activities to handle many of the tasks that would otherwise be executed in each country. A Regional Data Centre, for instance, can take care of the microfilm development, convert the films into microfiche, do the inventorying and cataloging of the microfilmed material, perform a careful quality control of the microfilmed data and serve as a clearinghouse for data requests. Each country would only need to get the microfilming equipment and supplies and a microfilm or microfiche reader/printer.

Regional Data Centres for data rescue activities could serve as a possible recipient of funding help from international institutions that would help to keep it going on beyond the DARE I Project now performed by the IDCC.

Will the Data Archeology Story be a Long-term Saga?
Dr. H. Dooley, Oceanography Secretary ICES

The question in this presentation took a cue from the archeological profession itself which generally found that archeological research will never be finished. On this basis, the presentation examined why this data archeology project was necessary at all, and was there anything in current data flows that could convince us now that further data archeological projects would be necessary in the future.

It was noted that there has already been one archeological project in the 1960s, undertaken by the UK NODC with a massive digitization programme which involved most of the data published in the first half of the century. This digitization included also almost all of the data published by ICES for the North Atlantic area.

The presentation concluded that there was nothing in present practices and data flows that would convince us that this present project will be the last, and that Global Datasets will continue to be compiled in this way in the future.

Prospects Opened for GODAR by Archival Survey for Climate History
K. Hall, County Archivist of Essex, International Council on Archives

Because of the uncertainty among meteorological experts as to the consequences of climate change, or whether or not it is changing, it is necessary to make a careful and detailed study of meteorological data from the past, but for most areas of the world meteorological records were only kept from 1850 onwards. To account for normal fluctuations and periodicity in the climate, a considerable longer period needs to be studied. Since 1990, therefore, representatives of the International Council on Archives, the International Council of Scientific Unions, United Nations Educational, Scientific and Cultural Organization and the World Meteorological Organization have run an European pilot project for an Archival Survey for Climate History. It has been the first attempt to use the services and expertise of professional archivists in the realm of sciences.

In the test project archivists in six European archive institutions systematically searched the public and private archives in their care, using standard report forms with the parameters defined by WMO, to identify those documents containing meteorological points and occasional data for the period 1725 to 1775, and serial data for the period 1680 to 1880. The completed forms with sample copies of the original documents were then evaluated by scientists appointed by WMO, UNESCO and ICSU. All the evaluators stressed the value of the project and stated that the value for developing climatic base-line datasets was enormous and that if the methodology were further developed the data retrieved would benefit global change studies and climate reconstruction.

For the next phase, improved report forms have been developed. ICSU World Data Centres and WMO are defining a global grid, a time-frame and various parameters required for a global project. ICA and UNESCO will co-ordinate within various countries through local, regional and national archive institutions the retrieval and digitization of climate data sufficient to significantly enhance the current global record of climate. Initially, efforts will concentrate on parts of Africa, Asia, South and Central America where there are severe gaps in temporal and spatial coverage. Each participating country will receive copies of the global and regional datasets established. WDCS and WMO will incorporate data into existing climate datasets. The inter-disciplinary Project Committee will determine priorities. The Project Document for this Global Survey is now being prepared to act as a basis for targeted funding requests.

There exist in large quantities in the archives especially of maritime and ex-colonial nations data which may be of potential value to GODAR for long time spans and for extensive areas. It would be simple for ICA to devise a limited test project to determine whether sufficient data exists in historical archives to justify GODAR participation in the enhanced Global Archival Survey for Climate History. An early decision about participation is necessary.

MAST Data Policy - Needs and Options

*M. Bohle-Carbonell, Chief Marine Science and Technology Programme
Commission of the European Communities*

The programme 'Marine Science and Technology' (MAST) is one of several specific research programmed of the European Communities. Specific to MAST is its focus on marine research. MAST projects cover a wide range of technological developments and scientific undertakings.

The specific research programmed of the European Communities are designed to achieve the objectives of Community research as they are derived from the Single European Act and the EEC Treaty. In this field the Community's final aim is to strengthen the scientific and technological basis of European industry while promoting the cohesion of the scientific community. The Community research therefore is policy driven and focused on actions within the Community.

In order to contribute to its programme objectives, MAST undertakes some limited actions in the field of "European Ocean Data and Information Management" because:

- (i) Ocean data and information exchange is essential for marine research and its applications but there is a lack of cohesion and consistency in oceanographic data gathering and management of marine data in Europe.
- (ii) Research projects of the European Community have spent and will spend considerable amounts of Community funds for co-ordinated data gathering in the seas surrounding Europe but these data holdings are not as easily available as they could be.
- (iii) The inherent wealth of any data set is not fully exploited if it is analyzed for project needs only and not made available generally.

In order to overcome these obstacles, MAST fosters the co-operation of data centres and research institutions, which are situated in the European Community, by providing specific support to MAST projects in the field of ocean data and information management. It is expected that this approach is the only one raising the performance of data centres and research institutions within the EC Member States up to a level which is appropriate for their activities inside and outside of the European Community.

Experience in Archeological Research and Rescue Operations at the National Centres - Two Years of Co-operation

*S. Levitus, Director WDC-A, Oceanography, GODAR Project Leader
(Lecture was presented on the Speaker's behalf by Y Sychev, Director NODC of the Russian Federation)*

The IOC/IODE/GODAR project had its origin at a meeting held at NODC WDC-A, Washington, DC in September 1990. The meeting was supported by the US Climate and Global Change Programme. Scientists and data managers from several countries and international centres including the former Soviet

Union, Korea, Japan, Chile, Australia, the USA and ICES met informally to discuss the state of historical oceanographic data and in particular to discuss a project that has come to be called "Oceanographic Data Archaeology and Rescue". As a result of this workshop NODC WDC-A received funding to begin an "NODC Oceanographic Data Archaeology and Rescue" (NODAR) project. This project focussed on data from the US as well as other countries. Close working relationships with other data centres (WDC-B, WDC-D, ICES) were developed to avoid duplication of effort and maximize the use of scarce resources. These working relationships included the exchange of data, catalogue information about data holdings, as well as the exchange of scientists and data managers between centres. The emphasis on "rescue" and exchange of data occurring simultaneously was started for two reasons: (i) Some data are at risk of being lost forever if not saved immediately, (ii) to demonstrate to the international research and administrative communities how quickly the project could act to actually make previously unavailable data accessible in digital form to the international scientific community. Table 1 documents how successful this effort has been. Approximately 750,000 oceanographic stations have become available as a result of this project. This includes Mechanical Bathythermograph profiles which will help determine interannual variability of the upper ocean thermal structure. In addition numerous station data casts which include temperature, salinity, and other parameters in some cases, are now available. As part of its commitment to the institutions and countries who have made these data available NODC WDC-A will make all these data plus all the data in the NODC digital profile archives available as ASCII files on CD-ROM as well as magnetic media. In accordance with GODAR and WDC principles the data will be distributed internationally without restriction.

Data distribution plots of observations in the USA NODC's global physical-chemical data files have already been produced and sent to 25 oceanographic centres and collecting institutions around the world. In October 1992, the NODC presented a more comprehensive set of data distribution maps in a publication entitled National Oceanographic Data Centre Inventory of Physical Profiles: Global Distributions by Year for All Countries. This publication shows the geographic and temporal distribution of nearly 3.1 million ocean temperature or temperature-salinity profiles in this NODC's data archives as of June 1992. Copies have been distributed to oceanographic institutions and researchers around the world.

Changes in international relations have greatly expanded opportunities to build more comprehensive oceanographic databases for the world ocean. The international science community has already exhibited great interest in having access to additional data for studies of the world ocean. Figure 1 which is taken from a paper that has been accepted for publication by the US Academy of Sciences (Levitus *et al.*). It shows why there is such interest in time-series of annual mean temperature at 100 m depth at Ocean Weather Station "C". There is clearly a quasi-decadal scale oscillation as well as a linear decrease in temperature over the approximately 40 year period of observation. This figure was only possible thanks to the merging of data from the former Soviet Union and the USA. It is phenomena such as those documented in Figure 1 that are of great importance to understanding the variability of the ocean whether by natural or anthropogenic causes.

Figure 2 presents an example of a US data archaeology and rescue work. This figure shows the distribution of 2814 MBT profiles observed during 1943 by the US Navy. The digitization of these data was funded by NODAR during the past year. When merged with other data from this year (for example, see Levitus and Gelfeld, 1992) scientists will be able to estimate temperature anomalies for more of the Pacific Ocean during 1943 than previously thought possible. When one considers that the global historical database of temperature data has increased by more than 750,000 profiles in the past year and that the results of the first GODAR workshop have identified on the order of another one million profiles that are in manuscript form than it becomes clear that the international scientific community will have access to a much more complete database than ever thought possible. More comprehensive databases will lead to a better description of variability of the world ocean and we hope for an increased understanding of the role of the world ocean as part of the earth's climate system. Such work is international in nature.

Table 1: Data sets received through NODC Data Archaeology and Rescue project as of July 1993.

Table 1

COUNTRY INST.	DATA TYPE	NO. OF PROFILES	PERIOD OF OBS.	REMARKS	NODC ACC. NO.
Argentina	XBT	376	1987-1990		9300067
Australia, CSIRO	OSD	22,190	1929-1990		9200118
France	MBT	2,791	1964-1972	MBT + Surf.Sal	
ICES	OSD	2,861	1971-1974	CINCECA	9200049
	OSD	432	1948-1990	OWS L	9200049
	OSD	1,171	1983-1990	OWS c	9200049
	OSD	7,989	1948-1988	OWS M	9300024
	OSD	245	1925-1930	ATLANTIC SLOPE	9200049
	OSD	8,850	1970-1992	Denmark	9300015
	OSD	7,311	1938-1988	Iceland	9300015
India, INODC	OSD	650	1976-1988		9300118
Japan, JODC	OSD	254,846	1965-1990	JAPAN FISH. AG.	9200262
	DBT	23,452	1979-1986	JAPAN FISH. AG.	9200262
	MBT	60,764	1965-1985	JAPAN FISH. AG.	9200262
	XBT	1,774	1979-1985	JAPAN FISH. AG.	9200262
	CURM	28,487	1964-1985	JAPAN FISH. AG	9200262
Russia, POI	OSD	5,543	1947-1988	S. China Sea	9200011
	CTD	4,249	1981-1988	S. China Sea	9200011
WDC-B	MBT	233,698	1941-1988		9300131
	OSD	11,560	1969-1991		9300131
South Korea, KODC	OSD	28,193	1961-1992		9200148
U.S., SIO	OSD	162	1972-1973 Southtow, Climax	TASADAY LegsI-IV	9300087
Navy	OSD	634	1961	Surface T and S	
	MBT	254,690	1943-1960	Ships of Opportunity	9200037
	OSD	1,172	1958-1990	Ships of Opportunity	

Figure 1

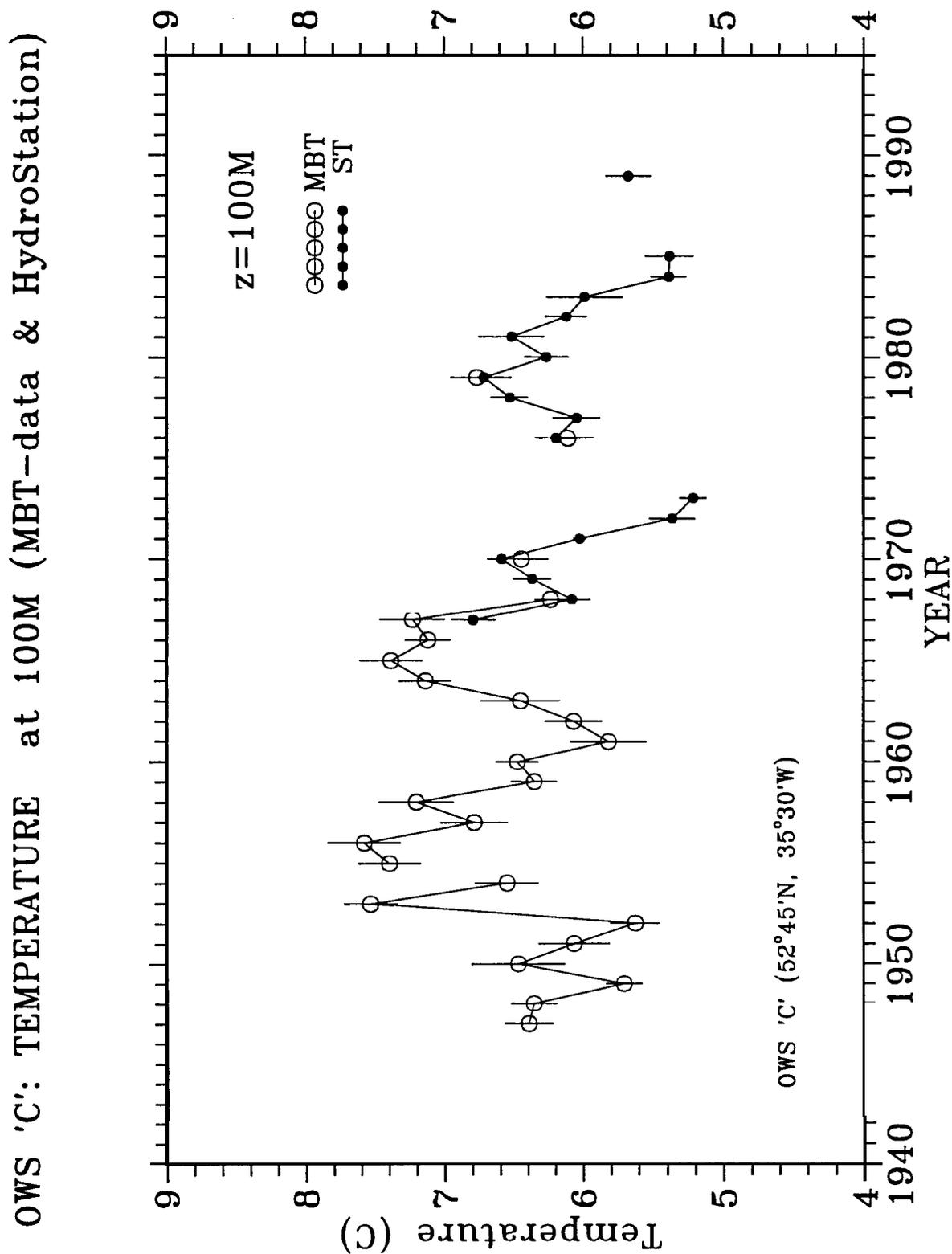
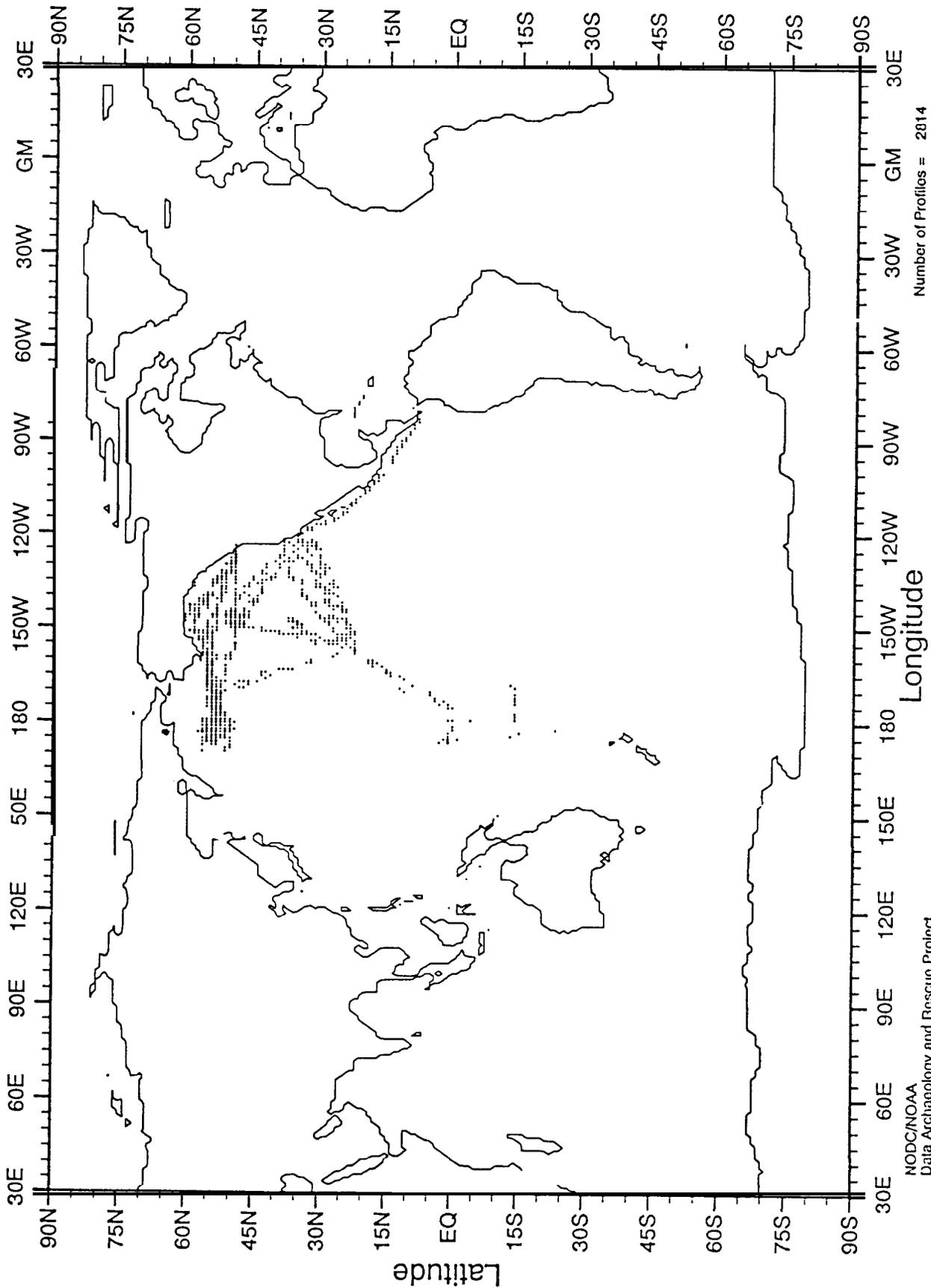


Figure 2

Mechanic 1a Bathymetromographs from Scripps Institute of Oceanography
as of May 1993
This plot for year 1943



Establishing the Uniqueness of Old Data
Dr. H. Dooley, Oceanography Secretary ICES

This presentation described the procedures used at ICES to create definitive profile datasets for each of its member countries. Data sources included the NODC Washington as well as various submissions from member countries and digitization of data by ICES itself during the past 30 years. It was clear that duplication of stations was a major problem in many existing datasets. In many cases, the duplications were rather easy to find and eliminate but in many others, this was not the case. Reasons for duplicates were found to be rather trivial and arose largely from the lack of use of guidelines introduced by the international organizations to prevent such a happening. It was clear that a definitive internationally acceptable country/ship code list was essential and steps are already underway by IODE to ensure this. It was also clear that Quality Control procedures can change many of the important keys used in duplicate checking and efforts must be reinforced to ensure constant station numbering systems. The temptation nowadays is to ignore the use of station numbers, as this is commonly regarded as redundant information.

Data Referral Systems - A Compass in the Sea of Databanks
Dr. Y. Oliouine, Head Ocean Services Unit, IOC

The primary objective of any data management system is to provide a designated user community with the required data. Not all significant public-domain data are in national depositories. The user is often unaware of the range of data available through the data centres and may be unaware even of the centres' existence.

To answer the enquiries about data, to give information on existing marine environmental data collection and their accessibility and availability there is a need for a compass. This compass is a referral service which points users to sources of information.

Referral may be a valid function of the national, regional or global marine data or information centre when an enquiry cannot be answered adequately from local resources. Their expertise is in creating and maintaining up-to-date files and directories of sources. Data archives must include easily accessible information about the data holdings, including quality assessments, supporting auxiliary information, and guidance and aids for locating and obtaining data.

IOC was a pioneer in creating a referral service to meet the needs and demands of the marine community. More than 15 years ago, it was decided to develop the Marine Environmental Data Information Referral System (MEDI). Prior to the development of MEDI, no mechanism existed for tying information together into a global network of marine information sources. In order to ensure compatibility with other international efforts, MEDI has been designed and developed as the sectoral focal point (subsystem) of UNEP/INFOTERRA for marine science.

MEDI has been implemented because of the increasing concern of the international marine science community with problems that transcend the traditional approach of dealing with a single discipline and often a single experiment. Global and regional, single and multi-disciplinary needs have grown exponentially in the past few years, as have the data files in many centres. Studies of the environment effects of man's activities, studies of long-term climate fluctuations, studies related to the use of the ocean as a source of energy and other programmed, all require multi-disciplinary baseline data.

The Marine Environmental Data Information Referral (MEDI) of today is an automated, systematic method for recording and retrieving information about marine environmental data files that exist in international centres and in national centres associated with an international network. MEDI is designed as an internationally accepted means of cataloguing such data as may be required by agencies, scientists and administrators. It makes possible the systematic identification of what data are available world-wide on a specific topic.

MEDI development data centres, international organizations and marine scientific institutions world-wide have provided input concerning the availability, location and characteristics of their marine environmental data. 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 categories of data described include all

aspects of marine science, including marine meteorology, physical and chemical oceanography, marine biology and geology, pollution, etc.

The revised MEDI information contains short plain text entries that can be transferred easily through communication networks, on floppy disks, on magnetic tapes or, on paper. Its main advantage is to make MEDI a simple directory of data sets available from MEDI contributors and searchable by anyone, with any kind of terminal, from any RNODC or oceanographic institution, anywhere in the world, using international electronic mail.

In the middle of the 1980s, IOC made 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.

For those who wish to contribute to the MEDI System, information is submitted on a MEDI Input Registration Form, directly to IOC. MEDI offers services in response to specific questions regarding the availability of data. Most requests coming through MEDI Centres or from international organizations are considered an exchange service and will be dealt with free of charge.

During the coming years before the next meeting of the IOC Committee on IODE in 1996, IOC plans to: provide Member States with a copy of the MEDI diskette; produce a hard copy publication of the MEDI entries. (A parameter/geographic index will be produced and accompany the publication. It is not known if the MEDI entries will be placed in a computer searchable database. The file is already too large to browse comfortably and indexes are needed to find information); produce an in-house log to keep track of MEDI submissions, requests, and any other associated information. (This could be as simple as a log book or as complex as a computer database).

MEDI cannot be effective if all centres holding data do not provide well-documented information about the extent of their holdings and the accessibility of the data. Furthermore, data interchange between agencies will become a major issue as global change programmed require data from ever-wider sources. Users must have an easy method to access an on-line system to search for specific datasets of interest. In addition, a directory with information about data centres must be available. There should be no charge to use the directory, except the telephone or electronic mail cost of connecting.

Where are All the Data? EDMED - A New Approach to Data Directories
M. Jones, Director BODC, UK

Data on the marine environment lie dispersed across Europe in collections maintained by hundreds of different laboratories, university departments, institutes, data centres and private companies. These range from professionally managed holdings and computer databases to *ad hoc* files and collections of hard copy tabulations, analog records, images and samples such as sedimentary cores and biological specimens.

Until recently, very little information had been available at an European level or even on a national basis to identify the various collections of marine data and describe their contents, where and in what form they were held and how they might be accessed. EDMED (European Directory of Marine Environmental Data) was developed to address this problem so as to provide users of marine data with the means of identifying sources of data and to provide essential background information against which appropriate strategies might be developed for managing and exploiting marine data, both on an European scale and a national level.

The British Oceanographic Data Centre (BODC) was contracted by the Marine Science and Technology (MAST) Programme of the Commission of European Communities (CEC) to develop the EDMED system and to design a user-friendly input form for submitting dataset descriptions. Two forms have been produced - one for describing each data holding centre and the other for the individual datasets held. The forms have been deliberately kept simple, requiring information to be submitted in a free text format geared to enabling data holders to describe their datasets in terms that they find to be appropriate and relevant.

The EDMED Directory is being produced by BODC as a PC-based system and will be made available on floppy disk, complete with a user-friendly software interface. The software enables the contents of the Directory to be searched and browsed interactively and for information to be extracted out on a selective

basis. Output from the Directory may be easily directed to a word-processor for the production of high quality reports.

Datasets covered by EDMED include physical oceanography, chemical oceanography, biological oceanography, marine meteorology, hydrography, marine ecology, underwater acoustics, marine geology and geophysics and - to a lesser extent - marine pollution datasets. Data collected by satellites are not included as they are cataloged elsewhere.

Datasets are cataloged irrespective of their format (e.g., digital databases or tiles, analog records, paper charts, hard copy tabulations, microfilm, geological and biological samples, etc.) and include data collected from the last century to the present. The primary geographic area of interest is the seas and the oceans adjacent to Europe (e.g., North Atlantic, Mediterranean, Baltic, North Sea, Northern sub-polar and polar seas), although wider ranging data are also included, particularly global datasets. In addition to datasets that are readily available to users, EDMED also includes references to working datasets and datasets of a confidential or restricted availability.

By January 1993, a total of 1,581 datasets descriptions from 367 data holdings had been assembled at BODC, with national contributions as follows:

Country	No. of Datasets	No. of Data Holding Centres
Belgium	89	24
Denmark	92	35
France	79	28
Germany	153	22
Greece	112	50
Ireland	118	56
Italy	133	25
Netherlands	77	18
Spain	296	36
Portugal	170	38
United Kingdom	262	35

It is envisaged that the full implementation will take place in 1993 when descriptions of datasets will be loaded onto a central directory at BODC.

“Modern Formats”

R. Keeley, MEDS, Canada and N. Michailov, Head of Laboratory, NODC, Russian Federation

The Ocean Climate Data Workshop (Greenbelt, Maryland, USA, 18-21 February 1992) noted among other items, problems associated with increasing sizes of data collection, the increasing complexity of data, including data from marine biology and chemistry, the growing importance of metadata, the need for the correlation of datasets across disciplines and the impact of formats on data exchange. The Group of Experts of IODE on TADE decided to study the underlying data structures of ocean data collection in order to meet the concerns expressed by the OCDW. It was decided to examine the major formats used in international data exchange, to decide on how data collections may be represented by data structures and to use the data structures to describe a format for data and information on a variety of exchange media.

A review was made of the structures of a number of data formats used internationally (FGGE-11 and III levels, GF-3, BUFR, JGOFS, WOCE and some others) and of specific formats for data presentations, e.g., TOGA - CD-ROM, ICES, GTSP - MEDS, NODC, USA - CD-ROM, ATLAST, NODC-Japan, etc. It was

noted that the question of media to be used in data exchange could be of a crucial importance because the technical capabilities are changing rapidly and any successful formatting scheme must operate independently of an exchange medium.

A modern format for data exchange must be capable of handling both the standard data currently included in the IODE system but also newer and more diverse data types such as being collected by the JGOFS programme. A format should be flexible and simple and should encourage data exchange and insure greater compatibility of data from diverse programmed. A formatting scheme was demonstrated that was based on the principals and strengths of GF3. So, the format is self describing, but simplified and generalized so that data could be placed on any medium, could be readily moved to commercial software such as spreadsheets or relational database tables, and was capable of representing a wider range of data structures than is GF3.

4. SUMMARY OF NATIONAL REPORTS

Bulgaria

Several organizations and institutes in Bulgaria are involved in the collection and management of marine data. They include institutes of the Academy of Sciences, such as the Institute of Oceanography (this Institute carries out a wide variety of ocean research activities. The observed data are available in different forms [magnetic tapes, disks, registers, etc.]. There is no common database in the Institute and data are archived by individual scientists); the Institute of Geology (this Institute is primarily collecting marine geological and geophysical data. The datasets are available on computer compatible media); the National Institute of Meteorology and Hydrology (NIMH carries out the functions of the National Hydrometeorological Office. A meteorological database (MDB) has been developed. The data are stored on various data carriers. At the same time, the entry of data on computer compatible media is continuing. A new technology for the transfer of data from data sources to the MDB has been used since 1991. The main problem is the shortage of computer facilities); the Laboratory of Marine Ecology (the laboratory collects biological and chemical data from coastal waters. The data are archived in tables and cataloged by individual scientists).

The Hydrographic Service of the Navy (NHS) of the Ministry of Defense is the national agency responsible for research and monitoring of Bulgarian coastal and offshore zones, and for data collection. Collected data are archived basically in the form of catalogues. A part of the archived data is available on computer compatible media. New technology for the transfer of data to computer compatible media is needed, as well as training in the techniques for data quality control.

The Institute of Water Transport of the Ministry of Transport collects oil pollution data. The collected data are archived on magnetic tapes.

There is also a data collection centre at the Ministry of Environment. The data are received from other organizations as well as from the local branches of the Ministry. The Centre has created procedures for data archiving.

The state company *GEOZASHITA* of the Ministry of Territorial Planning collects coastal erosion data. The high quality data are stored mainly in the form of tables and catalogues. There is a strong need to transfer the data to magnetic tape.

Among other institutions in Bulgaria which may have in their possession large volumes of marine data, it is worth mentioning a scientific group at the Sofia University collecting physical and chemical data (the data are archived on magnetic tape and in the form of tables and catalogues) and the Institute of Fish Resources mainly with good collections of marine biological data. These data are available in the form of tables and catalogues. These collections include unique data for the area of the South Ocean from 50° S to 70° S and are at risk of being lost.

A decision to establish an NODC in Bulgaria under the auspices of the Information Services of NIMH was taken in 1985. Unfortunately, due to financial and staff problems, the Centre until today cannot implement effectively accepted functions and responsibilities.

To support ocean data management activities there is a need to employ not less than two specialists. NODC can use the operators of the Information Service of NIMH, however, the lack of funds prevented hiring of knowledgeable and experienced technicians for the office. On the other hand, education in the field of oceanography is far from adequate and there is no special institute in the country where oceanographers can be taught. In light of Resolutions XIV-12 and XVII-20, there is an urgent need in Bulgaria, for well-trained professional oceanographers as well as for data managers.

A computer PC-DX 486 installed at the HDM (about 200 Mb) is sufficient for the purposes of the data archeology project. In the framework of NIMH with the support of WMO, a project was started for the development of a national computerized system for data exchange. Realization of this project will improve communications between NODC, data sources and users. At present, NODC is using the standard software of NIMH, including the Relation Database Management System "*Oracle*". A project on the development of an ocean database is being implemented based on "*Oracle*". The Database is envisaged as an open flexible system which will be linked with various facilities for data processing. A Meteorological Database and a technique for archiving of meteorological data have been created. This technique can be adjusted to archive oceanographic data. The lack of funds does not allow the purchase of new software for processing and for analyses of data. There is also a need for software for ocean data quality control. This will give NODC an opportunity to develop products and result in an increase of data submitted for international exchange. A project targeted to improve ocean data quality can be started, if appropriate funds are available. This project will include data editing, estimation of missing data and detection of trends using robust statistical methods.

NODC took part in discussions of creating new national rules for coastal zone management and in working out a concept of a technical project for the est abolishment of a Monitoring System for the Bulgarian offshore zone. A project for the improvement of data exchange between stationary buoys and a coastal receiving station was facilitated.

A large quantity of marine data is at risk of being lost, mainly because of two reasons:

- (i) a certain amount of data is not available on computer compatible media;
- (ii) very often data are archived by individual scientists.

Roughly 75% -8070 of all data available at Bulgarian institutions exist in forms that cannot be used for computer processing. It should be noted that in accordance with the present national legislation, all data from the Exclusive Economic Zone (EEZ) of Bulgaria are confidential and are not supposed to be internationally exchanged. A certain amount of historical marine data exists in proceedings, annuals and various publications. A study and search should be arranged. Bulgaria sees two ways in arranging the work of rescuing these data:

- (i) to urge the owners of data to rescue the data within their capabilities;
- (ii) to provide NODC with copies of data for processing and archiving.

The second way seems more effective and corresponds to the conception of international data exchange and the development of national data management infrastructure. In order to participate actively in this there is a strong need to make in Bulgaria a careful survey of existing problems at different institutes and to identify the ways to overcome them. Rescue activities will not be possible without this study.

In the framework of the former bilateral agreement on the exchange of data between the NHS and the Main Hydrographic Service (MHS) of the former Soviet Union, a certain amount of data has been exchanged including data for the Bulgarian offshore zone. In cases when NHS was not able to process data, these data have been processed in MHS and are archived there. It would be much appreciated if MHS or NODCS of the Russian Federation and Ukraine transfer copies of these datasets to NODC of Bulgaria. The acquisition of these data is very important for the Bulgarian NODC in order to increase the significance and authority of the centre.

The implementation of national plans of marine data collection and management will not be made until marine-related activities are given a high priority by the Government. It is necessary to make the policy makers realize the strategic value of marine data for sustainable development and for the effective use of natural resources. In this connection, an IOC mission to Bulgaria could be very useful. The efforts and recommendations both of the mission and from the national oceanographic community can help to shift attention of national decision-makers to the need for integrated ocean-related policy and for necessary funding.

Another problem is that many institutes and owners of marine data understand the value of data only in their narrow field of interest. In the present difficult financial situation they try to create their own data management policy to satisfy their own commercial interests. Under these conditions there is no place for the National Ocean Data Centre. Although the majority of lab owners have no capabilities for creating their own databases, they are reluctant to give data to NODC. The solution of this problem is complicated and it will be addressed through adopting appropriate national legislation.

Germany

The National Oceanographic Data Centre of Germany, the “Deutsches Ozeanographisches Datenzentrum” (DOD) operates as a branch of the marine research department of the “Bundesamt für Seeschifffahrt und Hydrographie” (BSH) in Hamburg, the former Deutsches Hydrographisches Institut (DHI). DOD has full access to the CDC mainframes of the computer centre.

In the past two years, DOD’s activity was highly influenced by the German unification. DOD in Hamburg remains the National Oceanographic Data Centre with the responsibility to index and archive all marine data gathered in the former GDR, not only all historic data, but also the data from on-going research and monitoring programmed. Closest connections were developed to the institute for marine research in Restock-Warnemiinde, now the “Institut für Ostseeforschung Warnemiinde” (IOW); the progress made may be judged by the following 3 examples:

- (i) information and communication set-up in the IOW is now running in a CDC-environment, thus enhancing fast data and information exchange by using the same systems as used in Hamburg by BSH/DOD;
- (ii) nearly all CTD and hydro-chemical data sampled by the research vessels ‘*Alexander von Humboldt*’ and ‘*Professor Albrecht Penck*’ for the period 1985-1991 are now archived and available in the DOD database. Part of this dataset was also a major contribution to the Quality Status Report of the North Sea within the North Sea Task Force (NSTF) work. Both ships as well as other “new” research ships are fully integrated in the ROSCOP/Cruise Summary reporting system;
- (iii) within the EDMED project “*Completion of the European Directory on Marine Environment Data for all EC Member States*”, for which DOD forms the national focus in Germany, the IOW in Warnemiinde was the first institute to submit all required information.

However, a vast amount of data has to be worked up, documented and entered into machine readable forms before it can be archived in the DOD database. This is especially true of pollution related data as well as all sediment data.

DOD is in the on-going process of loading all data held in the centre as files into a relational database. Because not only physical oceanographic data, water chemistry data as well as CSR and platform information are loaded but also pollutant data of water, sediment and organisms (inclusion of the last data type is just ahead), this database is called marine-environmental or “Meeresumwelt-Datenbank (MUDAB).

The MUDAB system now in operation within DOD may differ from other NODCS due to its:

- (i) Area Coverage (also data derived from main rivers are archived, both hydrological and chemical as well as loads and riverine input data).
- (ii) Data Type Coverage (also atmospheric input data are stored, both national as well as the whole Convention area of the Oslo and Paris Commissions. Sediment data of the North Sea are stored from the last century onwards. Biological data on primary production, plankton and benthos are archived in a routine way now. Data exports to different formats required by different commissions still has to be enhanced. Biological-effect data as data on fish diseases in connection with contaminants in fish, shellfish and birds are stored as new data types).

- (iii) Inclusion of Different Types of Pollution Data (capability of storing such diverse data types as on oil spillage or the pollution load data for the whole Baltic Sea, including input data from rivers, municipalities and industries, all per individual item or in a summarized figure).

The on-going development of that database as well as project instruments is facing the transition to an open UNIX-system, using INGRES as an RDB. On-line access to the database is already operational now also for other institutes in Germany and will be extended in the near future.

There is a strong desire of the new federal states to focus efforts on the old data. This task is a long-term process. Enormous funds seemed to be necessary but today the national experience shows the need for the following actions:

- (i) The "archeology" should include the preparation of inventories of:

- (a) data only available in manuscript form,
- (b) data only available in analog form, or
- (c) data not presently available due to a classified status.

This development is a pre-requisite of the project success.

- (ii) After completing the task of the inventory development, a ranking of datasets should be undertaken. This should enable the project-management group to draw up a step-wise action plan with definite amount of resources needed;

- (iii) Only then the "rescue" part of the project should start.

DOD submits data on a routine basis to ICES and World Data Centres, as well as to national and international bodies on request. Mostly formats set up by ICES are used, while GF3 is mainly used for CTD data. In 1992, a major data submission was made to ICES and the IODE System.

DOD has the mandate to act as a Special Analysis Centre (SAC) for WOCE data. Within this SAC, the following institutions are closely co-operating

- (i) National Oceanographic Data Centre of Germany, DOD;
- (ii) Institut für Meereskunde (IfM) Hamburg, and
- (iii) Max-Planck-Institut für Meteorologic (MPI) Hamburg.

Thus, DOD is fully engaged in WOCE activities. Also, DOD acts as the national focus for the German contribution to the JGOFS project.

Latvia

Marine data for the Republic of Latvia are available at the Latvian Hydrometeorological Agency (LHMA) and consist of the data collected at marine stations and posts in the coastal zone as well as on board research vessels in the Gulf of Riga and the Baltic and from aircraft. Marine data available at the Agency are presented in a tabular form. In 1993, the recording of current coastal observation data on floppy disk has been started.

The coastal sea monitoring in Latvia started in the second half of the last century. The number of stations and posts in operation varied, due to the destruction of breakwaters, dikes and moorages employed in the observations.

At present, the coastal sea network of LHMA consists of 9 coastal stations and posts, and 2 seasonal posts for ice observations. The stations and posts (Salacgriva, Tuja, Skulte, Daugavrija, Roja, Kolka, Ventpils, Paviļosta, Liepaja, Ovishi, Mikelbaka) provide for:

- (i) sea-level and water temperature measurements, 4 times/day (00, 06,12,18 GMT). At high water levels (above 80 cm) measurements are made every second hour;

- (ii) water salinity and ice condition observations I-time/day
- (ii) wave observations during daylight 1-3 times/day.

The stations and posts with automatic tide gauges make continuous water level measurements. Hourly and extreme values acquired are tabulated.

Simultaneous meteorological observations are made of the following parameters:

- (i) wind
- (ii) air temperature
- (iii) seaward horizontal visibility
- (iv) cloudiness

The summary of available time-series is presented in the table below.

Name of Station <i>or</i> Post	Established date	Marine Ohs.	Current	Water Level	Water Temp.	Water Salinity	Ice Conditions	Wave	Status of Station
Ainazhi	1921			sea gauge-based ohs. since 1929 automatic tide gauge-based measuring in 1932-1944	1934-1943 & 1947-1955		1921-1955	1921-1955	closed in 1955
Salacgriva	1928			sea gauge-based ohs, in 1951-1976	1947-1986	1962-1970	1947 to present	1947 to present	in operation
SkuĻte	1936			sea gauge ohs. since 1939 to present, tide-gauge obs. since 1950 to present	1941-1943& 1947-1962		1921 to present	1936 to present	in operation
Daugavgrīve	1871			sea gauges. since 1871 to present, from 1879-1917,1929-1944& from 1948 onwards tide gauge ohs.	1957-1985		1921 to present	since 1921	in operation
Mersrags	1923			sea gauges. in 1928-1989	1945-1961		1923-1989	1923-1989	closed in 1989
Roja	1932			scagaugcobs.since 1932 to present	1945 to present			since 1932 to present	in operation
Kolka	1884			1925-1944& 1946-1948 sea gauge ohs; 1959-1969 tide gauge ohs.	1898-1915& 1938-1943				closed in 1970
Cape Kollm	1884			1884 to present	1947 to present	1959 to present	1945 to present	1947 to present	in operation
Floating Light Kolka	1859		1859 & 1866-1875						closed in 1875
Mīlebaka	1921						1921 to present		in operation
Ovishi	1921	1921 to present							in operation

Name of Station or Post	Established date	Marine Ohs.	Current	Water Level	Water Temp.	Water Salinity	Ice Conditions	Wave	status of Station
Ventopile	1873			sea gauge ohs. since 1873 to present; tide gauge obs. since 1954 to present	since 1945		since 1921	since 1921	in operation
Pavilosta	1929			sea gauge ohs. since 1929 to present	1945 to present		1948 to present	since 1929	in operation
Liepaja	1865			sea gauge ohs. since 1865 to present; tide gauge ohs. 1927-1944& since 1952 to present	since 1949	1959 to present	1900-1913, 1921-1942 & 1949 onwards	since 1949	in operation
Pape	1926			1929-1959 sea gauge ohs.	1947-1960		1926-1964	1926-1964	closed in 1964

Episodic observations were made until 1949 in the Gulf of Riga and the Baltic. In 1949 a regular station network was established for continuous observations. In 1952, the observations were stopped and resumed in 1957. Since then the observations were made regularly. The programme of observations covered the parameters as follows:

Hydrological	Hydrochemical:	Pollutants:	Hydrobiological:
water temperature	oxygen	heavy metals	phytoplankton
water salinity	pH	petroleum products	zooplankton
transparency	alkalinity	phenols	benthos
Colour	mineral phosphorus		
	silicon		
	nitrite nitrogen		
	ammonia nitrogen		
	total phosphorus		
	total nitrogen		

The station network in the Gulf of Riga consisted of hydrological, hydrochemical and hydrobiological stations.

Seasonal observations in the Gulf of Riga were made at 44 hydrological stations: in May (spring), August (summer), October-November (autumn). As a rule, winter observations were not made because of heavy ice in the Gulf, which hindered the work of the LHMA's exploratory vessel. The observations were made at standard levels of 0, 5, 10, 15, 20, 30, 40, 50 and 60 meters. The lowest level was at a depth of 1-2 m above the bottom. When the halocline was recorded, observations were also made above and below the halocline.

Automatic buoy stations (ABS) were installed in different parts of the Gulf of Riga at each of the 44 hydrological stations. Until 1985, hourly current direction and speed observations were taken during navigation periods with a duration of 1 to 6 months. Since 1986, simultaneous automatic measurements were made of the current, water temperature and salinity and the hydrostatic pressure. Recordings were made at 4 levels: 4, 10 m, 20 and 1-2 m above the bottom. Since 1964, there were 15 stations involved in the automatic current measurements.

In the Gulf of Riga, hydrochemical observations were made at 36 stations. They coincided with those of the hydrological stations. Observations were made 1 time/season in May (spring), August (summer) and in October-November (autumn). The lengths of the hydrochemical data series are different. The larger ones are available for oxygen (since 1959), hydrogen index (since 1958) and for alkalinity (since 1958).

The observations of nutrient started in 1976 at levels: 0, 10, 20 m, and 1-2 m above the bottom.

Regular hydrobiological observations in the Gulf of Riga started in 1968. The hydrobiological stations network covered the southern part of the Gulf of Riga. A total of 11 biological stations were located at sections off the estuaries of the rivers of Lielupe, Daugava and Gauja. Monthly observations were carried out during the navigation period.

In the ex-USSR, the Baltic Sea was traditionally monitored by Lithuanian colleagues. Until 1991, only St. 45B established in 1964 was served by LHMA in the open Baltic. At this station, hydrological observations were made 1 time/5 days, and hydrochemical 1 time/season. The observation programmes were analogous to those for the Gulf of Riga. Meteorological observations on board research vessels were made simultaneously with hydrological, hydrochemical and hydrobiological ones. The programme of meteorological observations included air temperature, wind, cloudiness and horizontal visibility measurement.

The tabulated observation data from the Gulf of Riga and the Baltic are available at LHMA.

In 1991, a National Marine Monitoring Programme was formulated by LHMA, in which new marine boundaries in the Gulf and the Sea were taken into account. The station network in the Gulf of Riga has been changed, and the network of hydrological stations in the Latvian economic zone in the Baltic has been taken over from the Lithuanian colleagues.

Currently, 34 hydrological and hydrochemical and 32 hydrobiological stations are scattered throughout the Gulf of Riga. The co-ordinates of the hydrobiological and hydrochemical stations coincide with those of the hydrological ones.

Within the Latvian economic zone in the Baltic Sea, there are 14 hydrological, 14 hydrochemical and 14 hydrobiological stations in operation at the same locations. Observations are being made 4 times/year: in May (spring), August (summer), October-November (autumn) and in February (winter). The stations 101A and 119 provide observations 1 time/10 days; the observations made at St. 45b are performed 1 time/5 days.

The programmed of hydrological and hydrobiological observations remained unchanged from those before 1991; measurements of phenols are excluded from the programme of hydrochemical observations.

In 1957, air-based observations have been carried out in the Gulf of Riga and the adjacent area of the Baltic. The programme of observations covered measurements of the ice cover and surface water temperature. The observations were made 1 time/10 days, and charts produced are available at LHMA.

Lithuania

The Lithuanian Laboratory of Marine Research was founded in June 1992 to carry out among other things hydrometeorological, hydrochemical and hydrobiological research of the Baltic Sea, its gulfs and the Skagerrak Strait. This includes:

- (i) Standard observations and environmental control in the Baltic Sea proper;
- (ii) Works for the Baltic monitoring programme (HELCOM);
- (iii) The Lithuanian coastal monitoring programme;
- (iv) The investigations in the Kurschiu Gulf and the mouth of the river Nemunas;
- (v) Extra observations in extreme situations.

The laboratory also takes part in different international programmed and projects as PEX, SKAGEX and the Gulf of the Riga project.

Standard observations include Meteorology (temperature and humidity, atmospheric pressure, direction and speed of the wind, weather visibility, cloudiness, atmospheric phenomena); Physical Oceanography (temperature, salinity and density of water, ice measurements, roughness of the sea, colour of sea water and transparency); Hydrochemical (Oxygen, hydrogen sulphide, pH, phosphate, total phosphorous, ammonia, nitrate, nitrite, total nitrogen, silicate, mercury, petroleum hydrocarbons, chlorinated hydrocarbons, phenol, detergent); Determinants in sediments (petroleum hydrocarbons, phenol, chlorinated hydrocarbons); Biological analyses (micro-organisms, phytoplankton, chlorophyll, primary production, macro-zoobenthos, meso-zooplankton).

The laboratory has in its possession 4 research vessels:

Name	Characteristics	Area of Research	No. of Crew/Scientists
Gintaras	45 tons, 10 knots, 1 lab.	Kurschiu Gulf	2/3
Vejelis	88 tons, 12 knots	Klaipeda Strait Coastal Sea Zone	5/3
Vejas	1,124 tons, 9 knots, 7 labs.	Baltic & North Sea	17/18
Vetra	1,124 tons, 9 knots, 7 labs.	Baltic & North Sea	11/18

They have equipment to measure the following parameters:

Water temperature and salinity (CTD); Sea currents (automatic current meters); Hydrochemical and sea pollution (ionometer pH-673, pH meter EV-74, foto-electro-colorometer KFK-2, spectrophotometer SF-16, gas chromatography "Cvet-106, mercury analyzer MAS-50, spectrophotometer "Bechman"); Hydrobiological

(microscopes, zooplankton net WP-2, sediment sampler Van-Vin, spectrophotometer "*Specol*", incubator expose sampler for primary production).

The laboratory has the following staff structure: Administration -7 persons; Oceanological Dept -10 persons; Hydrochemical Dept - 11 persons; Hydrobiological Dept - 10 persons; Research group of the Kurschiu Gulf -2,5 staff units; Group for data management -3,5 staff units.

From the International Geophysical Year in 1957-1958, scientific research ships of the Riga and Kaliningrad branches of the former All-Union Scientific Research Institutes of Fishery and Oceanography (VNIRO) made systematic seasonal observations in the Baltic Sea at 30-50 oceanographic stations: approximately from 10-20 February, 10-20 May, 1-10 August and from 25 October to 5 November. Usually the main hydrochemical and hydrometeorological characteristics were measured simultaneously from aboard two ships. This work was carried out until 1970.

The scientific research ships of Lithuania, Latvia, Estonia, North West Hydrometeorological Service and the Leningrad Department of the Moscow State Oceanographic Institute made similar observations in the Gulfs of Finland, Riga, Kurschiu and Vistula. However, the work was only done episodically in the Baltic Sea.

In 1959, R/V JURATE belonging to the Lithuanian Hydrometeorological Service began systematic investigations of the southeastern part of the Baltic Sea. The measurements were made at 18 oceanographic stations. In addition to routine seasonal investigations, a number of special measurements to study the circulation of water masses in this region were made. The volume of investigations increased in 1962 with the establishment of the sea research unit in the Klaipeda Hydrometeorological Observatory.

Investigations of the inflow into the Kurschiu Gulf from the discharge area of the river Nemunas began in 1811. The first systematic seasonal observations of the Kurschiu Gulf were started in 1954 and systematic hydrochemical control of water has been carried out since 1957. The posts have been installed in the central part of the Kurschiu Gulf in the Summers of 1959-1961.

New hydrometeorological, hydrochemical and surface radiation investigations are made now, as well as studies of the pollution processes in the mouth of the river Nemunas and inflow of the salty water into the Gulf through the Klaipeda Strait.

In 1972, after a scientific research vessel OCEANOGRAPHY was donated to the Klaipeda Hydrometeorological Observatory (HMO) by the State Committee for Hydrometeorology of the former Soviet Union systematic hydrometeorological investigations of the Baltic proper began in Lithuania. Since 1976, (with some changes in 1987) hydrological investigations are being made 6 times a year along longitudinal and transverse sections across the Baltic Sea from Ventpils. This constitutes a part of a wide range of observations made in the framework of the "Baltic" Programme.

Since 1981, seasonal investigations of the Baltic Sea have been carried out systematically without gaps by OCEANOGRAPHY and VEJAS (former 'Lev Titov'). In 1989, OCEANOGRAPHY was substituted by a new R/V RUDOLF SAMOILOVICH (the new name 'Vetra'), the vessel of the same type as VEJAS. From 1989, VEJAS has made hydrochemical and hydrobiological studies and VETRA oceanographic ones. In 1983, an expedition vessel VILNELE of the tonnage 88 tons and in 1991, VEJELIS of the same tonnage were received for the investigation of the Klaipeda Strait and the Southeastern coastal part of the Baltic Sea.

Since 1980, in the framework of the Baltic Monitoring Programme hydrometeorological, hydrochemical and a number of hydrobiological observations have been carried out at 7 oceanographic stations typical for the Baltic Sea: BY-2 (80), BY-5 (62), BCS-III.10 (49a), BY-38 (69), BY-31 (71), BY-28 (27), BY-15 (37). Since 1985 when Lithuania became involved in the implementation of the HELCOM Programme additional observations have been made on 20-30 June, 10-20 September. In 1990, when the third stage of the HELCOM Programme began the number of stations was enlarged to include stations BY-1 (1), P 1 (55), J 2 (65) as well.

Since 1978, seasonal observations have been carried out on the water quality of the Baltic Sea in the framework of the All-union (USSR) Programme which included a wide range of complex hydrometeorological, hydrochemical and hydrobiological investigations at 37 deep stations.

Unfortunately, not all data archived in Lithuania meet present quality control requirements. This is why the observational data only for some selected periods are considered to be reliable: pH and oxygen data from 1961, phosphate, silicate, nitrite from 1967, nitrate and ammonia from 1977 and total phosphorous and total nitrogen only from 1970. There are still some problems concerning the observations of the total nitrogen and partly of some other ingredients.

During the last 10 years hydrochemical and hydrobiological investigations of the dump site near Klaipėda, Pionerskij (Neukuhren), Baltijsk (Pillau) have been made. Klaipėda HMO makes special environmental investigations in the area of petroleum oil wells near Nida and Baltijsk.

In addition to the observations made in the Baltic Sea and adjacent gulfs, every summer between 1973-1976, hydrochemical and hydrometeorological investigations were carried out by Klaipėda HMO in the North Sea. In 1977-1986 these investigations were made once or twice a year, usually at 25 oceanographic stations. In the same time frame, investigations have been carried out in the Skagerrak Strait, where measurements were made once a year at 9-11 oceanographic stations in the 1970s and seasonally in 1981-1989.

Poland

The Oceanographic Database has been organized in the Maritime Branch of the Institute of Meteorology and Water Management (IMWM) in Gdynia.

During the first phase of its creation it was decided to use a domestic computer, ODRA 1305, using punch cards and the operating system GEORGE3.

Almost all IMWM data from the Baltic Sea area, which were available in manuscript form, were then digitized and stored on magnetic tapes. Such a system allowed for serial access only. Data were stored in four different archives in accordance with the time of their collection and of their type, i.e.,

- (i) meteorology and hydrology (data since 1957);
- (ii) marine physics and chemistry (data since 1979);
- (iii) coastal hydrology (data since 1950);
- (iv) most recent archive for atmospheric pollution (since 1988).

During the next phase, the base was further developed with the use of IBM PC compatible computers linked to ODRA 1305. Such an arrangement gave an opportunity to establish an operational database on the PCs. Furthermore, it has become possible to transfer all archives onto a PC hard disk. This work started in 1992 and is continuing. Finally, two databases were obtained and linked together: an old one at ODRA 1305 and a new one with a free access to PCs. The second database permits to make input of any old data as well as data from on-going projects and monitoring programmed.

There is no information of the volume of data from other than the Baltic Sea geographical area which exists in manuscript form at the Institute (IMVM). There is also no information on the quantity and quality of data in other institutes in Poland available on different data carriers (paper, disks, punched cards, etc.). There is a need to develop an inventory of existing oceanographic data before the implementation of the GODAR project is started in the country.

Russia

A data archeology project has been implemented in Russia since 1991 within the framework of IODE/IGOSS project GTSP as a part of Historical Data sub-project. American and Russian data managers and scientists have recognized the importance of including "new" data which are still in manuscript form. An additional reason was that the data in manuscript form can be easily lost. It was agreed to start a pilot project on data archeology on a bilateral basis within the Joint Russian-American agreement on Environment. This project was led by NODCS.

In Russia, the project has started with the identification of all the data stored in all NODC's archives in manuscript form. All the "archeological" data was divided into two groups: foreign data obtained by the WDCS system and national (USSR) data in the NODC possession.

At present, WDC-B has data from almost 3,000 cruises of 54 foreign countries containing about 192,000 hydrological stations. Only 13 countries have shares exceeding 1% of the whole data amount. Their total share is about 85%. More than 60% of data have been obtained from 4 countries: Japan - 27%, USA - 17.5%, Canada - 9.3%, Germany - 8.7%. When moving from the present time to the beginning of the century, the data amount decreases however importance of data remains significant due to the historical nature. Eighty-four cruises were conducted during the first half of the century.

As was expected, the observations were mostly made in the North Atlantic (30%) and the North Pacific (39.6%). The South Atlantic and South Pacific account for 5.1% and 7.3% respectively, the Indian Ocean - about 4% and the Arctic Ocean and adjacent seas - about 2.5% of the 'observations made.

Six months retrieval made it possible for NODC to obtain and catalogue the data held in manuscripts from nearly 1,000 cruises (about 70,000 hydrological stations) of Soviet research vessels. Over 60% of data were obtained from cruises of the 1985-1990 period. 35.5% of the cruises were conducted in the seas adjacent to the CIS (Commonwealth of Independent States). Cruises in high seas have primarily been carried out in the Northern Hemisphere. An estimate shows that the further retrieval of national data similar to the one made will make it possible to give access to more than 500-800 additional cruises performed by marine institutions of the former USSR.

The digitization project itself was started in the middle of 1992 by two main national oceanographic data centres - NODC of Russia (RODC) in Obninsk and Ocean Data Centre of the Navy in St. Petersburg. During the first year of digitization RODC has converted into a digital form data from 40,000 oceanographic stations. Naval ODC - 50,000 MBT profiles and 12,000 station data. All MBT data were transferred into the WDCS system.

At the same time, RODC began to collect information on other "archeological" data holders in the Russian Federation. These efforts allowed the creation of a general picture reflecting the present situation:

The RODC database can be estimated to hold about 1,840,000 oceanographic stations including about 100,000 stations still stored in manuscript form. This total amount can be split in the following way foreign data - about 700,000 stations (70,000 in manuscript form); national (USSR) data - 1,200,000 (30,000 in manuscript form).

The naval ocean data centre possesses about 1,460,000 oceanographic stations and only 880,000 stations have been digitized. This centre has also about 580,000 MBT profiles, out of which 232,000 profiles have been digitized.

The Arctic and Antarctic Research Institute (AARI) possesses data for the region of Arctic seas - up to 30,000 oceanographic stations (10,000 in digital form); Arctic Ocean data - 5,000 stations (4,000 in digital form); Southern Ocean - 37,000 stations (all in digital form).

The State Oceanographic Institute (SOI) started the project of the digitization of the Caspian sea data. About 6,000 hydrological stations have been cataloged. During 1992, half of them were digitized.

The Far-East Research Institute for Hydrometeorology estimates its database as 200,000 oceanographic stations (75,000 in digital form).

The Polar Fishery Institute has now about 20,500 stations data (8,000 in digital form).

The Pacific Fishery Institute has about 84,000 stations data (35,000 in digital form) and 100,000 MBT profiles - all in manuscript form.

The total amount of Russian data in manuscript form can be estimated in the following way

- (i) Oceanographic stations - total amount 820,000 stations (NAVY - 580,000 stations, Hydrometeorological services - 180,000 stations, Fishery - 60,000 stations)

(ii) MBT profiles - total 450,000 profiles (NAVY -350,000 profiles, Fishery -100,000 profiles).

No information is included in this picture about the ocean data bases available at the research institutes of the Russian Academy of Sciences.

Sweden

The Designated National Agency (DNA) of Sweden, which is the Oceanographic Laboratory of the Swedish Meteorological and Hydrological Institute, has been involved for a number of years in the implementation of activities similar to GODAR. A systematic practice of scanning libraries was arranged for searching publications containing marine data. DNA works jointly with other marine institutions of the country to safeguard data that are only in manuscript form. The main thrust was on transferring Nansen-cast data to digital form. After the Swedish lightship data are digitized (in the framework of a current joint project with ICES and WDC-A) there will be an almost complete set of Swedish water-bottle data available (including nutrients) in the marine database of the DNA.

The Swedish Navy has digitized a few thousands of MBT-profiles. Efforts are underway to get the Navy to declassify these data, taking into consideration as examples the decision of the American and Russian Navies to make their historical MBT-profiles freely accessible. At DNA all available MBT-profiles have been photographed as there was an opinion that it is not worth digitizing them due to the low accuracy of observations.

The Swedish DNA has not, so far, made any attempt to digitize historical marine biological data. Some data have been digitized by individual scientists for specific projects.

Experts from the SMHI head office are digitizing Swedish historical sea-level data.

Turkey

The first Turkish document concerning the seas dates back to the early 16th century. The most remarkable of them is the famous map of Peri Reis encompassing the Atlantic shoreline of Central America with great accuracy and detail. This map which is dated as early as 1512 coincides almost with modern satellite images. Peri Reis also produced numerous maps of the Mediterranean and Aegean Seas. Another Turkish admiral, Seyid Ali Reis, produced maps of the Red Sea, the Persian Gulf and the Indian Ocean in 1520-1566. Although the rescue of these maps probably does not fit into the framework of the GODAR endeavors, it should nevertheless be conducted as part of a human cultural heritage conservation programme.

Cartography in the modern sense had started during the Ottoman Empire in the 19th century. In close co-operation with Russian cartographers, maps of the Turkish Black Sea coastline and the Bosphorous were produced. These maps which had been prepared mainly for navigational purposes contained accurate bathymetric information.

In the beginning of the 20th Century, oceanography of Turkish straits, especially the two layer flows in the Bosphorous and Dardanelles had been studied in close co-operation with German oceanographers. These studies, the results of which exist in manuscript form, date back to 1909. The archives of the Ottoman Maritime Ministry contained a wealth of marine information which however suffered from the political turbulence of the beginning of the 20th Century and the period during and after the first World War.

Sea-level measurements started at 4 reference stations in the Black Sea, Bosphorous (Marinara), Aegean and Mediterranean Seas in 1908. These measurements had been made daily by the mapping department of the military services. The records exist in manuscript form.

In the early 1930s, the Turkish Republic established a "*Navigational and Hydrographic Service*". Besides its main duty to produce maps for the Navy, this department started to collect basic oceanographic and marine meteorological data for merchant ships. These data are stored in manuscript form and printed as synoptic information.

During the period of 1950-1975, the Navigational and Hydrographic Service produced a large number of mainly MBT and partially XBT profiles. These profiles are stored in manuscript form. The Service was

provided with modern equipment in 1970 and started scientific monitoring of the seas around Turkey. In accordance with the new duties, the name of the service was changed in 1973 to the "Maritime Hydrography and Oceanography Department of the Navy" (MHOD-SHOD). In 1993, the Department was declared as NODC for Turkey.

The first university department which started to work in the field of marine sciences in Turkey was the Institute of Hydro-biology of the Istanbul University, established in 1936. In 1975, the Institute of Marine Sciences and Technology was established in Izmir. In the same year, a marine sciences department was inaugurated at the Middle East Technical University in Ankara which in 1978 converted into the Institute of Marine Sciences in Erdemli.

This scientific infrastructure has increased significantly the capabilities of monitoring both the coastal waters and seas around Turkey. Hand in hand with this development, both the amount and quality of data collected in Turkish seas were increased. The research ship K.PIRI REIS of the Institute of Marine Sciences and Technology in Izmir built in 1978. The R/V BILIM of the Institute of Marine Sciences in Erdemli followed in 1983. The research vessels are involved in national and international research programmed, monitoring and project oriented measurements and studies. Within the framework of the MED-POL programme, R/V K.PIRI REM was involved in systematic monitoring of the quality of the Aegean Sea beginning in 1983. The data are delivered to the Ministry of Environment in Ankara. These data, after final declassification, will be delivered to MED-UNIT in Athens.

Since 1986, the Turkish Scientific and Technical Research Council (TUBITAK) has provided funding for continuous monitoring and research of the Black Sea, the Marınara, the Aegean and the Mediterranean Seas. Three university institutes are involved in this programme:

- (i) The Institute of Marine Sciences and Technology in Izmir (IMST - Izmir);
- (ii) The Institute of Marine Sciences in Erdemli (IMS - Erdemli);
- (iii) The Institute of Marine Sciences and Geography in Istanbul (IMSG - Istanbul).

The first two institute with their research vessels K.PIRI REIS and BILIM are the main contributors to this programme.

The programme involves the continuous collection of physical, chemical and biological data at 201 permanent stations with fixed co-ordinates on seasonal basis. The data collected are submitted to TUBITAK in the form of research and monitoring reports. Partially these data are also transferred onto floppy disks (FD) and given to TUBITAK to be stored in the Workstation in Ankara. Plus to standard physical parameters obtained by CTD casts, these datasets include such parameters as CO₂, o-PO₄, total-P, NO₃, NO₂-N, NH₄-N, PAH, trace elements, turbidity, H₂S, Chl-2, etc. An internal format is used for the processing of these data. The data collected within the framework of TUBITAK programme are not open for wide national or international exchange yet, because the institutions involved are given the scientific priority to process these data first. Thus, these data are not delivered to NODC (MHOD in Istanbul).

Within the POEM co-ordinated experiments, IMS-Erdemli exchanges data with Israeli, Italian and Greek institutions. Within the newly established CoMSBlack (Co-operative Marine Science Programme for the Black Sea) data collected by Turkish (IMST-Izmir and IMS-Erdemli), Ukrainian (MHI-Sevastopol and IBSS-Sevastopol), Bulgarian (Institute of Oceanology-Varna), Roumanian and Russian institutes are being intercalibrated, quality controlled and exchanged among the institutes involved. These data are not open to international exchange for a period of two years after collection.

Parallel to these scientific programmed, the Maritime Hydrography and Oceanography Department of the Navy (MHOD) continues to collect oceanographic data on a routine basis. These data are stored by MHOD in manuscript form.

Thirty coastal meteorological stations are operating along the Turkish coastlines. These data constitute time-series of 60 years and are all stored in digital form at the General Directorate of Meteorology in Ankara. These data have already been quality controlled and are open to international exchange. An internal format is used for storage.

Procedures for national exchange of data and delivery to NODC are as yet unsolved in Turkey. Negotiations between institutes and state agencies are underway. It is expected that the rules of national

exchange will be established during 1993. After this declassification of a great percentage of data will be achieved. It is expected that the data from various institutions will be collected at NODC within the 1993-1994 period. Once the data are declassified and delivered to the NODC, it will also be available for international exchange.

Physical, chemical and biological ocean data in Turkey are stored in various formats mainly at universities, marine scientific institutions, and MHOD. The amount of data totals about 300,000 stations and is mostly in manuscript form. Only data (some 20%) from the last decade have been digitized.

Ukraine

Today there are 5 major institutions in the Ukraine that have 55 research vessels and large archives of oceanographic data:

- (i) Marine Hydrophysical Institute (MHI), Academy of Sciences of the Ukraine (Sevastopol) with its Experimental Branch in Katsiveli, Crimea;
- (ii) Southern Scientific Research Institute of Fisheries and Oceanography, State Committee for Fishery (Kertch);
- (iii) Institute of Biology of Southern Seas (IBSS), Academy of Sciences of the Ukraine (Sevastopol) with its Odessa Branch;
- (iv) Marine Branch of the Ukrainian Research Institute of Hydrometeorology (former Sevastopol Branch of the State Oceanographic Institute), State Committee for Hydrometeorology (Sevastopol);
- (v) Ukrainian Scientific Centre of Sea Ecology (UkrSCES, former Odessa Branch of the State Oceanographic Institute), Ministry for the Environmental Protection of Ukraine (Odessa).

Regretfully, none of these institutions has a full catalogue of its archives now. Therefore, there is only approximate information about the collected data. The work on the generation of a catalogue has been planned in the Ukraine for this year in the framework of the project and aimed at establishing the National Oceanographic Data Centre. If implemented, the more precise and full information will be available by the end of 1993. Data sets of some institutions have partly been copied to the former Soviet NODC in Obninsk. There is a need to compare carefully catalogues of Ukrainian data holdings with the NODC of the Russian Federation.

The following data are being stored in the archives of the above-mentioned Ukrainian institutions:

Marine Hydrophysical Institute

Time interval: From 1956 through 1993.

Geographical areas: Black Sea, Mediterranean Sea, Atlantic Ocean, Indian Ocean, Pacific Ocean and Southern Ocean; Lake Baikal (only optical data).

Type of data: temperature and salinity (Nansen bottles, bathythermographs, CTD); currents (surface, moorings, drifters); chemical parameters (dissolved oxygen, hydrogen sulphide, pH, alkalinity, phosphate, nitrate, nitrite, ammonium, silicate); hydro-optical parameters (Secchi disk and Forel-Ule colour scale, vertical profiles of transparency, colour index scattering functions, radiance index spectra); radioactivity (Sr-90, Cs-134, Cs-137); meteorological data, actinometric data.

Volume of existing data holdings: approximately 28,000 oceanographic stations, 5,000 hydro-optical stations (10,000 color index measurements, 1,000 scattering functions, 1,500 radiance index spectra); meteorological measurements - 98 cruises, actinometric measurements - 70 cruises; 8,000 current data series.

Volume of data transferred to modern computer media: approximately 5% for 1956-1983, 40% for 1984-1989, and 95% for 1990-1992.

Experimental Branch

Time interval: From 1931 through 1993.

Geographical areas: Black Sea, near shore hydrometeorological stations, the oceanographic platform off the Crimea coast, Lake Baikal (only wave data).

Type of data: temperature and salinity (Nansen bottles); near shore measurements (wind, water and air temperature, humidity, clouds, pressure, sea-level, waves, salinity); actinometric data.

Volume of existing data holdings: near shore hydrometeorological data from 1931; data from the oceanographic platform since 1983; 1,500 oceanographic stations.

Volume of data transferred to modern computer media approximately 3%

Southern Scientific Research Institute of Fisheries and Oceanography

Time interval: From 1951 through 1993.

Geographical areas: Indian Ocean, Southern Ocean, Black and Azov Seas.

Type of data temperature and salinity (Nansen bottles, CTD); chemical parameters (dissolved oxygen, pH, alkalinity, phosphate, nitrate, nitrite, ammonium, silicate); phyto-, zoo- and ichthyoplankton; fish by species, shrimps and mussels.

Volume of existing data holdings: approximately 20,000 oceanographic stations in open oceans and 15,000 stations in the Black-Azov Sea 1,800 plankton stations and large volume of data on fish, shrimps and mussels.

Volume of data transferred to modern computer media: approximately 90% of oceanographic data and 3% of biological data.

Institute of Biology of Southern Seas

Time interval: From 1951 through 1993.

Geographical areas: Black Sea, Mediterranean Sea, Atlantic Ocean, Indian Ocean, Pacific Ocean and Southern Ocean.

Type of data: temperature and salinity (Nansen bottles, bathythermographs, CTD); meteorological data; chemical parameters (dissolved oxygen, hydrogen sulphide, pH, alkalinity, phosphate, nitrate, nitrite, silicate); particulate and dissolved organic matter, primary production, phytoplankton pigments, phyto-, zoo- and ichthyoplankton; fishes by species, squids and mussels; hydro-acoustical data.

Volume of existing data holdings: more than 115 scientific cruises, approximately 14,000 oceanographic stations; 6,000 plankton stations; 1,300 towing 10,000 hours of visual nekton counting.

Volume of data transferred to modern computer media: approximately 15% of oceanographic stations, 50% of hydro-acoustic data, and 5% of biological data.

Odessa Branch

Time interval: From 1961 through 1993.

Geographical areas: Black Sea (north-western part), Mediterranean Sea.

Type of data: temperature and salinity (Nansen bottles); currents; waves; Secchi disk and Forel-Ule colour scale; chemical parameters (dissolved oxygen, hydrogen sulphide, pH, eH, alkalinity, phosphate, nitrate, nitrite, organic nitrogen, ammonium, silicate, organic carbon); pollutants in particulate and dissolved forms; primary production, phytoplankton pigments, benthic organisms, phyto-, zoo- and ichthyoplankton; microbiological and biochemical parameters.

Volume of existing data holdings: approximately 30,000 oceanographic stations including 200 stations in the littoral areas of the Black Sea and 200 stations in the Danube mouth.

Volume of data transferred to modern computer media: approximately 5% (mainly for the last few years) KKFZO for the Odessa bay.

Marine Branch of the Ukrainian Research Institute of Hydrometeorology

Time interval: From 1878 through 1993.

Geographical areas: Black sea, Azov sea, near shore hydrometeorological stations.

Type of data temperature and salinity (Nansen bottles); near shore measurements (wind, water and air temperature, humidity, clouds, pressure, sea-level, waves, salinity); currents; chemical parameters (dissolved oxygen, hydrogen sulphide, pH, alkalinity, phosphate, nitrate, nitrite, silicate); pollutants; phytoplankton, phytoplankton pigments, zoobenthic organisms; meteorological data.

Volume of existing data holdings: data from 70 near shore hydrometeorological stations; more than 10,000 oceanographic stations.

Volume of data transferred to modern computer media approximately 3%

Ukrainian Scientific Centre of Sea Ecology

Time interval: From 1968 through 1993.

Geographical areas: Black Sea, Mediterranean Sea, Atlantic Ocean, Indian Ocean and Pacific Ocean.

Type of data temperature and salinity (Nansen bottles); chemical parameters (dissolved oxygen, pH, alkalinity, phosphate, nitrate, nitrite); pollutants; meteorological data, actinometric data, serological data.

Volume of existing data holdings: approximately 50,000 oceanographic stations including a complete Soviet data set for Weather Station "C"; 330,000 meteorological measurements; 350,000 actinometric measurements; 54,000 serological measurements.

Volume of data transferred to modern computer media approximately 20%

It should be noted that work involving transfer of archived data to modern storage computer media, which is analogous to the one proposed by the GODAR project, is being performed in all Ukrainian marine institutions at different scales. MHI has started this work in 1990 using hydrological, chemical and optical data for the Black Sea and current data for the Atlantic. However, the lack of funding hampers implementation of the work at a good pace. The second problem is the shortage of modern computer hardware, primarily storage devices and media (hard disks, streamers, cartridges, etc.). The need for funds is again at the core of the problem.

5. WORKSHOP CONCLUSIONS AND RECOMMENDATIONS

Though some of the recommendations and conclusions mentioned below are not directly related to the objectives of the GODAR Workshop, it was felt that there is a need to formulate some general decisions in support of the IODE system, without which the implementation of GODAR in the region will not have full success.

IODE General

- (i) The implementation of GODAR in the region cannot be successful if the following steps are not taken urgently by Member States and international organizations:
 - (a) National Co-ordinators for IODE should be nominated by Member States concerned;
 - (b) DNAs or NODCS should be established;
 - (c) Creation of national oceanographic data banks should be started;
 - (d) National rules and procedures for national and international data exchange between individual scientists, institutions and NODCS should be established, taking into account procedures which already exist in IODE;
 - (e) Training should be arranged for data management experts to get them acquainted with the methodology of GODAR-oriented data management.
- (ii) Noting that new independent states have appeared in eastern Europe, it was recommended that feasibility missions should be arranged to these states to help them build national infrastructure for data management and to recommend effective ways to participate in international data exchange. Member States concerned should approach the Secretary IOC through their respective National Commissions for UNESCO with a request to arrange these missions without delay. New independent states should be encouraged to start or continue international data exchange through the WDC and IODE systems.
- (iii) In order to encourage the support of various laboratories in the activities of the national oceanographic data centres, the IODE National Co-ordinators should establish contact points for data exchange in each laboratory and should take positive steps to advertise IODE and GODAR objectives and to inform groups collecting data of the services available to them through participation in IODE and GODAR.

- (iv) It was recommended that National Co-ordinators publicize the need for submission of CSR to institutions involved in oceanographic data collection. The IOC was requested to provide the necessary number of CSR forms. Member States of the region should ensure that the properly filled-in forms be submitted to WDC-B or ICES for all cruises.
- (v) Though there is a general tendency for improved co-operation between the countries of the Black Sea and the Baltic Sea regions, the importance of regional co-operation was emphasized in the field of oceanographic data exchange and collection in recognition of the impact that regional co-operation in this field may have on social and economic development.

GODAR Project

- (i) The Workshop recommended that the Secretary IOC inform all IOC Member States through an IOC Circular Letter about the decision of the IOC Assembly to launch the GODAR project since 1993, about its objectives and benefits which the participation in GODAR can give to Member States. In return, Member States will inform their relevant oceanographic institutions of the GODAR Project and as to any rules governing international data exchange. The Secretary IOC and Member States should emphasize that one of the commitments of GODAR is the unrestricted international distribution of all data gathered as a result of the project.
- (ii) The volume of marine environmental and geophysical data available at different scientific institutions and governmental agencies of eastern Europe which have never been included in international exchange is enormous. The need for this data among different user groups around the world is high. To make this data accessible to the world community, there is an urgent need to provide assistance now. Assistance should not be considered as something purely philanthropic. The retrieval and rescue of data will be beneficial for all parties. The objectives of this co-operation will be to make data much easier to access and use by national and international user communities.
- (iii) The Workshop agreed that the principles of IOC and ICSU on the free-of-charge availability for international exchange of the datasets rescued under GODAR should be fully preserved. If they do not exist, national policies should be developed to ensure full and open access to data without conditions. In this regard the decision of IOC-XVII on Data Management Policy for Global Ocean Programmed was specifically mentioned. In accordance with this *“full and open sharing of a wide spectrum of global international datasets for all ocean programmed is a fundamental objective”* and that *“international data archives must include easily-accessible information about data holdings, including quality assessments, supporting auxiliary information and guidance and aids for locating and obtaining the data.”*
- (iv) It was recommended that the project leader, his regional assistant and international organizations involved in the implementation of GODAR should investigate a mechanism for protection of data from commercial usage.
- (v) The Workshop agreed that the implementation of GODAR will not be successful if necessary attention is not given to the need to organize activities in the following way
 - (a) Data holders which provide data for GODAR will receive in a timely fashion products based on their data (such as quality controlled data, their digitized forms, etc.) from the GODAR project. The organizers of the GODAR Project should clearly define the nature and content of the products that will be generated and make provisions to ensure that the product(s) will be made freely available to the participating institutions and data centres;
 - (b) Funding agencies and participants in GODAR will be informed regularly on steps and actions which have been taken for the accomplishment of GODAR objectives;
 - (c) Priorities of the project and particular interests of various participants will be met, as far as possible.
- (vi) It was recommended as a matter of urgency that institutions in Member States should be encouraged to prepare catalogues of their data holdings according to the specifications of the EDMED entry forms. Catalogues should include all types of marine data (meteorological, physical, chemical and biological oceanography, geology and geophysics) and cover not only digital databases but also analog records,

manuscripts, samples, photographs, etc. Co-ordination of the compilation of the forms should be organized at a national level and existing NODC/DNAs in the countries should play the role of focal points. The development of such catalogues/inventories will help to make it easier to identify what help might be required, what priorities should be given in rescue operations to ensure that assistance in rescue will be properly focussed and have specific targets. Taking into account the experience of BODC in the development of this type of inventory for Member States of the European Community, this Centre was invited to assist eastern European countries in the implementation of the project by providing advice and guidance.

- (vii) After inventories are compiled they should be sent to WDCs, Oceanography to determine as to whether these data exist in digital form before any priorities for digitization are given. The experience of IOC in the development of the MEDI Catalogue should not be overlooked and this should be widely used. IOC was requested to provide Member States with the necessary numbers of MEDI Catalogues and MEDI Input Registration forms.
- (viii) It was recommended that not only assessment of available data but also the assessment of existing data management infrastructures should be made on a national basis before the priorities for data rescue and financial support are identified. The assessment of technical facilities should be carried out separately from the assessment of ocean data holdings.
- (ix) The Workshop requested that WDCS, Oceanography prepare the following information about their digital data holdings for each country participating in GODAR:
 - a) yearly (or seasonal if desired) data distribution plots for each major data type including hydrographic profiles, CTD profiles, MBT profiles, XBT profiles and SBT profiles;
 - b) Tables showing the number of profiles in digital form for each year for each data type.

Such maps and tables” have proved to be invaluable to existing data archeology and rescue efforts at WDC-A and WDC-B.

- (x) Taking into account the Report of the Director IDCC, the Workshop recommended that the inventories should include information on available marine meteorology data which can be used to meet objectives of the WCRP and WCDMP. Copies of inventories containing this information should be sent by IOC to IDCC. The Director IDCC was requested to investigate WMO’S interest in providing financial support for preparation of inventories and rescuing these data and inform the Project Leader and his Regional Assistant of the response.
- (xi) The experience of IDCC in receiving meteorological data was noted with interest and appreciation. The need to give priority to microfilm and microfiche of this data in the IDCC activities was well accepted. However, it was noted that in the case of GODAR the main accent is not made on rescuing data in order to archive it. On the contrary, data are being rescued in order to use them for modelling and digital analysis. That is why the main activity under GODAR will be the digitization of historical data. Rescue of data through digitization should start whenever necessary from the oldest datasets available.
- (xii) The Workshop expressed thanks to the Director IDCC for his readiness to loan “*supplementary*” equipment for microfilming, e.g., microfilm tables, portable microfilmers, so that if desired, the microfilming could be started immediately. The Workshop also recommended that participating Member States contact IDCC, if the need for microfiche/microfilming arises.
- (xiii) Recognizing the existence of digitized CSR information, it was recommended that WDC-B, Oceanography digitize all CSR forms held by them, provided additional financial support is available, with the interest of using them as a tracking system for “*recent*” data - in support of GODAR.
- (xiv) The Workshop recognized the potential value of co-operation between GODAR and the Archival Survey for Climate History, and that data relevant to the needs of GODAR are likely to be retrievable by the Archival Survey. Therefore, because of the near-completion of the survey project document, GODAR should, as a matter of priority, specify the historical data in detail that it would wish to receive from an enlarged Archival Survey and enter into discussions with ICA, ICSU, WMO and UNESCO to

survey should be undertaken by ICA to test the availability of relevant data in historical archives.

- (xv) Taking into account the experience of the First GODAR Workshop, it was recommended that the preparation of future workshops should include the following actions:
- a) Lists of data holders and an overview of ocean data holdings be prepared before the Workshop and distributed in advance;
 - b) Communication links with GODAR partners outside the region be established for the duration of the Workshop.
- (xvi) Noting the problems in the national and regional communication systems, it was recommended that steps should be taken to improve links between national data management facilities and regional or global data management centres. Member States concerned, international organizations and funding agencies should consider ways of co-operation, support and assistance for the modernization of communication systems. The participants of the Workshop conveyed the urgency of the development of electronic information links within GODAR for both pragmatic and legislated reasons.
- (xvii) It was agreed that four types of assistance in the implementation of GODAR should be considered:
- a) Technical support by providing different types of equipment to make the operation of data retrieval easier - CD-ROM readers, PCs, consumables, etc. (required by all Member States of eastern Europe);
 - b) Direct financial support by providing funds to hire experienced staff to prepare datasets for international exchange, to convert old analog and tabular data to modern digital forms (required by all Member States of eastern Europe);
 - c) Support in training (required by all Member States except Russia. Russia can provide training to the countries of the region);
 - d) Support in arranging missions to provide advice and guidance in the establishment of national data and information management systems for collection, exchange, processing and analyzing ocean data. Development of optimal systems for collection, control, processing and archiving of ocean information at national and regional levels (required by the former Soviet Union Republics and by Member States with under-developed data management infrastructures - Bulgaria, Poland).
- (xviii) The Workshop noted that there may be a danger that funds and technical assistance coming from abroad targeted for search and rescue operations may be diverted to some other purposes. To control the process of spending funds, there may be a need for a special controlling mechanism which may be established in the framework of the GODAR Project under the responsibility of the project leader. The IOC Trust Fund approach will be welcomed.
- (xix) The Workshop recalled Recommendation IODE-XIV.8 on Programmed and Budget which was later adopted by the Seventeenth Session of the IOC Assembly in March 1993, particularly extra-budgetary funds estimated for the need of GODAR implementation in 1993-1995, and called upon the Secretary to investigate the readiness of Member States to contribute funds earmarked to support GODAR. The Secretary IOC was invited to contact the USA, UK the Scandinavian countries, France and Germany in order to determine their interest to support GODAR projects in funds and in kind. The international organizations such as ICSU, ICES, WMO, CEC and funding agencies were invited to reinforce their support for GODAR. Their participation in the project should be clearly stated.

(xx) The Workshop noted that resources needed for GODAR cannot be provided by interested partners or by IOC alone. Sharing of resources¹ is necessary. Sharing will require that:

- a) Data holders, NODCS and WDCS identify resources which will be allocated to relevant GODAR activities;
- b) Interested IOC Member States identify funds which they will provide to IOC for funding main GODAR activities;
- c) IOC and other international organizations, in consultation with the Project Leader and WDCS involved, identify those GODAR activities, which will be supported through international funding;
- d) GODAR participants interested in rescuing a particular dataset shall identify those supplementary resources which they will allocate for this activity
- e) The Project Leader, with the support of regional assistants, identify those GODAR activities which will need corresponding funds, not yet available. They shall identify, in consultation with the Secretary IOC, the extent to which these corresponding funds are necessary. IOC and interested parties are asked to identify mechanisms by which the funds might be raised.

6. REGIONAL IMPLEMENTATION PLAN

The Workshop discussed and agreed upon the list of activities necessary to be fulfilled to meet the GODAR objectives. These activities have been tabled *vis à vis* requirements for hardware, software and resources needed. The results of relevant deliberations are presented in Table 1 below.

TABLE 1

Activity	Hardware	Software	Methodology	Resources
Building inventories	IBM-PC paper	ICES-soft WDC-B soft	EDMED, CSR d-Base, MEDI	NODC:(own) inst .:(own) extrabudgetary
Relevance (priorities)			Common criteria	IOC, (other organizations) external funding
Digitizing	IBM-PC 386 + consumables (limited pool of hardware users)	OCEAN-PC 1. QC-individ. institut. 2. QC-NODC	GTSP Common standards by NODCS	man power hardware software
Processing	CD-ROM reader			
Exchanging	diskettes	NODC format Compression techniques	data tracking communication duplicate- checking (from centres and back)	consumables communication costs - sharing on case to case bases

¹ (Funding, manpower, equipment, consumables, etc.)

Taking Table 1 into account the GODAR implementation plan for Eastern Europe was formulated as presented in Table 2.

TABLE 2

Action Item	Responsible person/Organization	Deadline
Publication of Workshop Report	IOC	Aug/Sept. '93
Development of inventories/ directories of national data holdings:	IOC and BODC	Jul/Aug. '93
- to send copies of MEDI/EDMED entry forms to Member States which have in their possession ocean data and data centres/data holders;	Member States	mid-W93(*)
- To develop inventories/directories of their data holdings on diskettes;	Project Leader, assisted by regional assistant and national GODAR contact points in consultation with Secretary IOC.	end 1994
- To identify priorities based on list of criteria established by Workshop and inform Member States of region and international organizations involved on decision;		
- To identify sources of funding to support digitization.	Project Leader with assistance of Secretary IOC	end 1994
Digitization of historical data, in danger to being lost.		early 1995
Provision of equipment and software for implementation of project (building inventories, processing, digitization) in region based on agreed-upon priorities:		immediate
- To inform ICES and WDCS, Oceanography on their datasets which have not been included in ICES and WDCS catalogues;	Principal data holders involved in preparation of inventories.	early 1994
- To provide summaries of digital data on cruise level.	ICES and WDCS, Oceanography	end 1993

(*) From the experience gained in the preparation of EDMED, the implementation of this activity takes not less than one year. Member States should need to start implementation now.



ANNEX I

WORKSHOP PROGRAMME

17 May

09:00-10:00 Registration

1000-1030 Official Opening

11:00-1230 Lecture 1

Subject

IOC and it's Role in Meeting UNCED Objectives in the Field of Ocean Data Collection and Management

Speaker

Y. Oliouline, Head, Ocean Services Unit of IOC

Lecture 2

Subject

Ocean Data Archeology Project Receives International Support

Speaker

S. Levitus, Director, WDC-A, Oceanography GODAR Project leader and R. Gelfeld, USA NODC (Lecture was presented on the Speaker's behalf by H. Dooley, Oceanography Secretary ICES)

1230-14:00 Lunch

1400-1730 Lecture 3

Subject

WMO Experience in the Implementation of the Data Rescue Project (DARE) of the WCDMP - Lessons and Conclusions

Speaker

G.D. Shietecat, Co-ordinator, WMO International Rescue Co-ordination Centre

Lecture 4

Subject

Will the Data Archeology Story be a Long-term Saga?

Speaker

H. Dooley, Oceanography Secretary ICES

Lecture 5

Subject

Prospects Opened for GODAR by Archival Survey for Climate History

Speaker

K. Hall, County Archivist of Essex, International Council on Archives

Lecture 6

Subject

MAST Data Policy - Needs and Options

Speaker

M. Bohle-Carbonell, Chief, Marine Science and Technology Programme, Commission of the European Communities

18 May

09:00-1230 National Reports

1230-1400 Lunch

14:00-1730 Lecture 7

Subject

Experience in Archeological Research and Rescue Operations at the National Centres - Two Years of Co-operation

Speaker

S. Levitus, Director, WDC-A, Oceanography GODAR Project Leader (Lecture was presented on the Speaker's behalf by Y. Sychev, Director NODC of the Russian Federation)

Lecture 8

Subject

Establishing the Uniqueness of Old Data

Speaker

H. Dooley, Oceanography Secretary ICES

Round Table Discussions on

Techniques for Data Exchange and Archiving

19 May

09:00 -1230 Lecture 9

Subject

Data Referral Systems - A Compass in the Sea of Databanks

Speaker

Y. Oliouline, Head, Ocean Services Unit, IOC

Lecture 10

Subject

Where are all the Data? EDMED - A New Approach to Data Directories

Speaker

M. Jones, Director, BODC, UK

Lecture 11

Subject

"Modem Formats"

Speaker

R. Keeley, MEDS, Canada, Chairman of the GE of IODE (Lecture was presented by N. Michailov, Head of Laboratory, NODC, Russian Federation)

12:30-14:00 Lunch

1400-17:30 National Reports (cont.)

20 May

09:00-1230 Round Table Discussions
Identification of Priorities, Formulation of Recommendations, Drafting of the Implementation Plan

1230-14:00 Lunch

14:00-18:00 Adoption of Recommendations, Implementation Plan and Summary Report of the Workshop

18:30 Official Closure of the Workshop

ANNEX H

GODAR PROJECT PROPOSAL

Recommendation IODE-XIV3

DATA ARCHAEOLOGY AND RESCUE PROJECT

The IOC Committee on International Oceanographic & 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-XIV3

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 data bases 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 data bases 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-ROM's 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 programmed at WDC-A, WDC-B, and ICES.

The enhanced data bases 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 data bases possible and will arrange for the production and distribution of the resulting databases on CD-ROM's 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 111

LIST OF PARTICIPANTS

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Fax (7) (095) 1245996

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Institute for Lake Research
P.P. Shirshov Institute of Oceanology, RAN
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Tel: (7) (812) 2948020
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TURKEY

Prof. E. Izdar
Institute of Marine Science and Technology
Dokuz Eyhd University
P.O. Box 49
5211 Izmir
Teh (90) (51) 631659
Fax (90) (51) 636368
Tbz 953431 TR

Prof. O. Uslu
Institute of Marine Science and Technology
SSK Tesisler, Blok D, Kat 2
P.O. Box 4935211
35260 Konak - Izmir
Tel: (90) (51) 254338
Fax (90) (51) 834849
The 52407 DBTE TR

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Sverdlov Str. 2
Kerch 334500, Crimea
Tel: (7) (6561) 21065/29234
Fax (7) (6561) 21572

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Biology of South Seas Institute
Sevastopol
Tel:(7) (690) 591978
Tbc 187124 IBSS SU
Email: IBSS.SEVASTOPOL (Omnet)

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Marine Hydrophysical Institute (MHI)
Sevastopol
Tek (7) (692) 525276
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Fax: (7) (482) 637200

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BELGIUM
Tel: (32) (2) 2958111
Fax (32) (2) 2963024
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Fw (44) (51) 6523950
Tlx 628591 OCEANB G
E-mail: BODC.UK (Omnet)

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(45) (33) 157092
Fax: (45) (33) 934215
The 22498 ICES DK
E-mail: ICES.DK (Omnet)

ANNEX IV

LIST OF MAIN MARINE INSTITUTIONS AND TYPES OF ARCHIVED DATA

BULGARIA

Name and Address of Institute	Types of Archived Data
Institute of Oceanography (Bulgarian Academy of Sciences) P.B. 152 9000 Varna Tel: (35-952) 772038 Fax (35-952) 774256	Physical and Chemical Oceanography Marine Geology and Geophysics
Experimental Base of the Institute of Oceanography, Shkorpilortzi	Physical and Chemical Oceanography Dynamics, Marine Meteorology
National Institute of Meteorology and Hydrology National Oceanographic Data Centre 66, Tsarigradsco shaussee 1184 Sofia Tek (3592) 7222 71/359 Fax (3592) 880380	Marine Meteorology, Physical and Chemical Ocean Data
Laboratory of Marine Ecology (Bulgarian Academy of Sciences) Kyril and Methody str. 74 Sozopol	Chemical Oceanography Marine Biology and Ecology
Aquiculture Base of the Institute of Fish Industry Sozopol	Marine Biology, Ichthyology
Geological Institute of the Bulgarian Academy of Sciences Acad. G. Boucher str., Block 24 1113- Sofia	Marine Geology and Geophysics
Dept. of Meteorology and Geophysics University of Sofia LA. Ivanov Blvd. Sofia -26	Physical Oceanography, Geophysics
Nautical and Hydrographic Office of the Navy	Hydrography, Cartography, Physical Oceanography, Marine Meteorology

LATVIA

Biological Institute of the Academy of Sciences, Riga	Physical and Chemical Oceanography Marine Biology and Ecology
Fisheries Institute, Marine Ministry Riga	Marine Biology, Fishery

Name and Address of Institute

Types of Archived Data

Hydrometeorological Agency
Latvian Council of Ministries
K. Valdemara 19
Riga LV 1010
Tel: (7) 132332129
Fax (7) 132286783

Physical and Chemical Oceanography,
Meteorological Data

LITHUANIA

Marine Research Laboratory
Taikos A. 265802 Kleipedia
Tel: (7) 370) 6152248
Fax (7) 370) 6156930

Physical and Chemical Data
Sea Ice, Biological Pollution Data

Hydrometeorological Service of Lithuania
Vilnius

Meteorological Data
Sea Level Data, Wave Data

Environmental Protection Dept. of the
Lithuanian Republic, Vilnius

Pollution, Coastal Geology Ecology

POLAND

Institute of Meteorology and Water Management
Maritime Branch
Waszyngtovia 42
81-342 Gdynia
Tel (48) (58) 205221
Fax (48) (58) 201641

Physical and Chemical Oceanography
Marine Meteorology, Coastal
Meteorology, River Water Quality

Institute of Oceanology
Poliish Academy of Sciences,
ul. Powstancow Warszawy 55
81-712 Sopot
Tel (48) (2) 512130
Fax (48) (2) 512130
Tbc 0512\$45 PL

Physical and Chemical Oceanography
Biology

Sea Fisheries Institute
Kottgteja, Gdynia

Marine Biology, Ichthyology, Fishery

Maritime Museum
Gdansk

State Geological Institute
Maritime Branch, Polna, Sopot

Marine Geology

Institute of Hydro-Engineering
Polish Academy of *Sciences*
Gdansk

Hydro-Engineering
Numerical Modelling

Institute of Oceanography
ul. Polanski 63 H.A.
80-306 Gdansk
Tel: (48) (2) 217832

Physical, Chemical, Oceanography
Marine Biology

Institute of Environmental Protection
Gdansk

Marine Pollution, Marine Biology

RUSSIA

Name and Address of Institute

Types of Archived Data

All-Russia Scientific Research
Institute for Hydrometeorological
Information - WDC-B, Oceanography
6, Koroleva Str., 249020 Obninsk
Kaluga Region
Tel: (095) 2552194
Fax: (095) 2552225
Tim: WDCB1.USSR (Omnet)
wdcblm@sovamsu. sovusa.com (Internet)

All Types of Marine Data
Meteorological Data

Centre of Marine Geological Data
38, Krasnogvardeiskaya Str.
353470 Gelendjik
Tel: (095) 24582
Tbc 279124 GEO SU
Fax (095) 9252896 (G21)/861 4124606

Marine 'Geology and Geophysics

Centre for Geo-bio Information (IGBP oriented)
3, Molodeznaya
117296 MOSCOW GSP-1
Tel: (095) 9300506
Fax (095) 9305509
Tbc 411478 SGC SU
Tim: sgc@adonis.ias.msk su

Arctic and Antarctic Scientific Research
Institute (AANII)
38, Bering Str.
199226, St. Petersburg
Tel: (812) 3520096
Fax (812) 3522688
Tlx 121423 NILAS SU
Tim: aaricoop@sovamsu. sovusa.com

Physical, Chemical Data, Sea Ice,
Meteorological Data

Acoustic Institute of Russian
Academy of Sciences
4, Schvernik Str.
197036 Moscow

Physical Data, Marine Geophysical Data

Institute of Oceanology of
Russian Academy of Sciences
23, Krasikov Str.
117218 MOSCOW

All Types of Marine Data, Satellite Data

Scientific Research Oceanographic Centre
2, Krasnogo Electrica Str.
193167, St. Petersburg
Tel: (812) 27746 38/21735 18

Physical Data, Chemical Data

All-Russia Scientific Research
Institute for Fishery and Oceanography
17/1, Verchne-Krasnoselskaya
Str. 107140 Moscow
Tel: (095) 2649387

Fishery, Biological, Chemical Data,
Physical Data

Name and Address of Institute	Types of Archived Data
Pacific Scientific Research Institute for Fishery and Oceanography 4, Tupik Schevchenko 690600 Vladivostok	Fkbery, Biological, Physical and Chemical Data
Polar Scientific Research Institute for Fishery and Oceanography 6, Knipovitch Str. 183763 Murmausk	Fishery, Biological, Physical and Chemical Data
Atlantic Scientific Research Institute for Fishery and Oceanography 5, Douskoi Str. 236000 Kalinigrad	Fishery, Biological, Physical and Chemical Data
Far-East Scientific Research Hydrometeorological Institute 24, Dzerzinskaya Str. 690600 Vladivostok	All Types of Marine Data Meteorological Data
Scientific-industrial Society "Planeta" 7, Bolshevitskaya Str. 123242 MOSCOW Tel: (095) 2523717	Satellite Data
Institute for Lakes' Research Research of Russian Academy of Sciences 9, Sevastianova Str. 196199 St. Petersburg Tel: (812) 2940260 Fax (812) 2987327	All Types of Data for Ladoga Lake and other Lakes of former Soviet Union
St. Petersburg Branch of State Institute of Oceanography 2a, 23 Linia Vasilievskii est. 199026 St. Petersburg Tel: (812) 2188123 Fax (812) 2184556	All Types of Data for Baltic Sea, Wave Data, Satellite and other types of Remote-sensed Data
TURKEY	
Istanbul Technical University I.T.U. Ayazaga Istanbul Tel: (90) (1) 1763721	Fluid Dynamics, Pollution Pollution Data Process
Institute of Marine Sciences and Technology Dokuz Eylul University P.O. Box 49 5211 Izmir Tel: (90) (51) 631659 Fax (90) (51) 636368 Tkc 953431 TR	Physical and Chemical Oceanography Marine Geology and Geophysics Marine Pollution, Ecology and Aquiculture

Name and Address of Institute	Types of Archived Data
Mineral Research and Exploration General Directorate Ministry of Energy and Natural Resources M.T.A. Genel, Mudurlugu Ankara Tel: (41) 234 255/160-162 Tlx: 42040 MTAD TR	Marine Geology and Geophysics
Institute of Marine Sciences Middle East Technical University P.K. 28 33731 Erdemli Işel Tel: (90) (75) 862159 Fax (90) (75) 862327 Tbc 67796 DMS TR Email: U. UNLUATA (Omnet)	Physical and Chemical Oceanography Marine Biology and Pollution
Institute of Marine Sciences and Geography University of Istanbul Muskule Sok.Vefa, Istanbul Tel: (1) 5282539	Physical and Chemical Oceanography Marine Meteorology, Marine Geology Biology and Pollution
Centre of Hydrobiology and Water Products Research and Application Aegean University, Urla Iskelesi Izmir Tel: (51) 162163	Fishery Marine Biology, Ecology and Pollution, Chemical Oceanography
Dept. of Navigation, Hydrography and Oceanography of the Navy Cubuklu 81647 Istanbul Tel: (90) (1) 3310525 Fax: (90) (1) 3310525	Hydrography, Cartography, Physical and Chemical Oceanography, Pollution
Marine Meteorological Service of the State Meteorological Directorate Devlet Meteoroloji, Isleri Genel Mudurlugu Incirli, Ankara	Marine Meteorology
Marmara Scientific and Industrial Research Institute Turkish Scientific and Technical Research Council P.K. 21, Gebze - Kocaeli Tel: 19912300 Tlx 34123 MAE TR	Marine Pollution, Calibration (planned)
Cekmece Nuclear Research and Training Centre P.K. 55 Sefakoy Istanbul Tel: (41) 5790734 Tlx 28790 MOTA TR	Calibration, Instrument Development

UKRAINE

Name and Address of Institute

Types of Archived Data

Marine Hydrophysical Institute of
Academy of Sciences of Ukraine (MHI)
2, Kapitanskaya Str.
335000 Sevastopol
Tel: 525276
Tlx 187115 SWSWO SU
Tim: MHLSEVASTOPOL

Physical and Chemical Data,
Geophysical Data, Satellite Data

Ukrainian Scientific Centre of
the Ecology of the Sea (UkrSCES)
89, French Boulevard
270009 Odessa
Tel: 636741
Tlx 232226 ODESSA OKEAN

Physical and Chemical Data,
Pollution Data, Biological Data

Institute of Biology of Southern Seas
2, Nachimov Av.
335000 Sevastopol
The 187124 IBSS SU
Tim: IBSS.SEVASTAPOL (Omnet)

Biological Data, Physical & Chemical Data

Southern Scientific Research
Institute for Fishery and Oceanography
2, Sverdlova Str.
334500 Kerch, Crimea
Tel: (06561) 21065
Fax (06561) 21572
Tim: jug!niro@mastak. msk.su

Fishery, Biology, Physical and
Chemical Data, Pollution Data

Odessa Branch of the IBSS
37, Pushkinskaja Str.
270011 Odessa

Biological Data, Physical and
Chemical Data

Experimental Branch of the MHI
Katsively, Yalta, Crimea
Tel: 771330

Physical and Chemical Data

Hydro-acoustical Branch of the MHI
Odessa

Acoustical Data

Institute of Geology of the
Academy of Sciences of the Ukraine
Kiev

Geological Data

Marine Geological Branch of the Natural
Museum of the Academy of Sciences of the Ukraine
Kiev

Marine Branch of the Research
Hydrometeorological Institute
Sevastapol

Meteorological, Physical,
Chemical Data

Scientific and Technical Centre of the
Resources of the Shelf Academy of
Sciences of the Ukraine
Sevastopol

Chemical and Biological Data

ANNEX V

LIST OF ACRONYMS

AANn	Arctic and Antarctic Scientific Research Institute
AARI	Arctic and Antarctic Research Institute
AGCD	Administration General for Co-operation and Development
ABS	Automatic Buoy Stations
BODC	British Oceanographic Data Centre (UK)
BSH	Bundesamt für Seeschifffahrt und Hydrographie (Germany)
CEC	Commission of European Communities
CILSS	Comité Inter états pour la Lutte contre la Sécheresse au Sahel
CLICOM	Climate Computing Project (WMO)
COMSBLACK	Co-operative Marine Science Programme for the Black Sea
CTD	Conductivity, Temperature, Depth (instrument)
DARE	Data and Rescue Project (WMO)
DHI	Deutsches Hydrographisches Institut (Germany)
DOD	Deutsches Ozeanographisches Datenzentrum (Germany)
EC	European Community
EDMED	European Directory of Marine Environmental Data
EEC	European Economic Commission
FAO	Food and Agriculture Organization of the United Nations
FCCC	Framework Convention on Climate Change
GCOS	Global Climate Observing System
GDR	German Democratic Republic
GF3	General Format No. 3
GIPME	Global Investigation of the Pollution of Marine Environment
GMT	Greenwich Mean Time
GODAR	Global Oceanographic Data Archeology and Rescue
GOOS	Global Ocean Observing System
GTSPP	Global Temperature Salinity Pilot Project
GUNIO	Directorate of Navigation and Oceanography (Russia)
HELCOM	Helsinki Commission
HMO	Klaipeda Hydrometeorological Observatory (Russia)
IBSS	Institute of Biology of Southern Seas
ICA	International Council on Archives
ICSU	International Council of Scientific Unions
IDCC	International Data Rescue Co-ordination Centre
IFM	Institut für Meereskunde (Germany)

IGBP	Centre for Geo-Bio Information (Russia)
IMS	Institute of Marine Sciences (Turkey)
IMSG	Institute of Marine Sciences and Geography (Turkey)
IMST	Institute of Marine Sciences and Technology (Turkey)
IMWM	Institute of Meteorology and Water Management (Poland)
INFOTERRA	International Environmental Information Exchange Network (UNEP)
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IOW	Institut für Ostseeforschung Warnemünde (Germany)
IPCC	Intergovernmental Panel on Climate Change
IRM	Royal Meteorological Institute (Belgium)
JGOFS	Joint Global Ocean Fluxes Studies
KMI	Kenyan Marine Institute
LHMA	Latvian Hydro-Meteorological Agency
MBT	Mechanical Bathy-Thermograph
MEDI	Marine Environmental Data Information Referral System
MEDPOL	Mediterranean Pollution
MHI	Marine Hydrophysical Institute
MHOD	Maritime Hydrography and Oceanography Department (Turkey)
MPI	Max-Planck-Institut für Meteorologie (German)
MUDAB	Meeresumwelt-Datenbank (Germany)
NODC	National Oceanographic Data Centre
NSTF	North Sea Task Force
OSLNR	Ocean Science in Relation to Non-Living Resources
OSLR	Ocean Science in Relation to Living Resources
PEX	Polar Experiment
RCS	Reference Climatological Station
RDB	Research Data Base
RIHMI	Russian Institute of Hydrometeorological Information
RNODC	Responsible National Oceanographic Data centre
RODC	Russian Oceanographic Data Centre
SCOR	Scientific Committee on Oceanic Research
SKAGEX	Skagerakk Experiment
SMHI	Meteorological and Hydrological Institute of Sweden
SWCC	Second World Climate Conference
TUBITAK	Turkish Scientific and Technical Research Council
UKRSCES	Ukrainian Scientific Centre of the Ecology of Sea
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme

UNEP	United Nations Environment Programme
UNIX	Computer Operating System
VNIRO	Scientific Research Institutes of Fishery and Oceanography (Russia)
WCDMP	World Climate Data and Monitoring Programme
WDC	World Data Centre
WMC	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
XBT	Expendable Bathythermograph
YUGNIRO	Institute of Fishery and Oceanography of the Southern Seas (Ukraine)

