

Intergovernmental Oceanographic Commission
Workshop Report No. 110



**IOC-ICSU-CEC Regional Workshop
for Member States of the
Mediterranean - GODAR-IV
(Global Oceanographic Data
Archeology and Rescue Project)**

Foundation for International Studies
University of Malta
Valletta, Malta
25-28 April 1995

UNESCO

TABLE OF CONTENTS

SUMMARY REPORT

	Page
1. OPENING AND WORKSHOP ARRANGEMENTS	1
2. SUMMARY OF SCIENTIFIC PRESENTATIONS	2
3. NATIONAL REPORTS	13
4. WORKSHOP CONCLUSIONS AND RECOMMENDATIONS	40

ANNEXES

- I. WORKSHOP PROGRAMME**
- II. LIST OF PARTICIPANTS**
- III. GODAR PROJECT PROPOSAL**
- IV. MEDALPEX DATA AND POEM DATA MANAGEMENT ARRANGEMENTS**
- V. LIST OF ACRONYMS**

1. OPENING AND WORKSHOP ARRANGEMENTS

The GODAR-IV Regional Workshop for the Mediterranean Sea was opened by the GODAR Project Leader, Director of WDC-A, Oceanography, Dr. S. Levitus, at the University of Malta, Foundation for International Studies, Valletta, 25 April 1995. He welcomed the participants to the Workshop and expressed thanks to the local organizers for the provided facilities and all necessary preparation for the Workshop. Dr. Levitus then focused attention of the participants on the objectives of the GODAR project as presented in Recommendation IODE-XIV.3, adopted by the IOC Assembly at its Seventeenth Session (Annex III) and stressed the importance of applying regional specifics for meeting those objectives in the Mediterranean Sea.

On behalf of the local organizers, Rev. Prof. P. Serracino Inglott, rector of the University of Malta, welcomed the participants and expressed his satisfaction for IOC to hold such an important Workshop for the Mediterranean countries in Malta. With a special reference to the resolution on the 'Protection of the Global Climate for Present and Future Generation of Mankind' put forward by Malta in 1988 at the XXXXIIIrd UN General Assembly, he mentioned that the contribution of Malta towards problems concerning climate change and sea issues is well known on an international level. By way of its geographical position, its past history and political standing, Malta recognizes the key role which it is ready to play in favour of an enhanced co-ordination between Mediterranean countries for a sustainable utilization of the marine resources of this sea. In particular, Malta supports initiatives aimed to reduce the technological disparity among the bordering countries. Prof. Serracino Inglott ended his speech by referring to the local efforts to develop a full national capability in the marine sciences. In particular the Government of Malta has recently approved a Science and Technology Policy document which highlights as a top priority the need to set up a National Marine Sciences Centre in Malta. Arrangements to build such a Centre are already underway.

Dr. I. Oliounine, speaking on behalf of the Executive Secretary IOC, welcomed the participants to the Fourth GODAR Regional Workshop. He emphasized the usefulness of the GODAR project for many scientific and application purposes, and stressed the importance of combining efforts of Member States in the region in view of establishing effective ocean data exchange and management arrangements. Dr. Oliounine then proceeded to discuss the role of Malta in facilitating regional co-operation in marine-related activities and expressed thanks to the local organizers for making this Workshop possible. At the close of his welcoming address, Dr. Oliounine wished the participants every success.

Prof. S. Busuttill, Director General of the Foundation for International Studies of Malta, welcomed the participants to Malta and to his Institute. He noted the very close relationships between Malta and IOC and mentioned the expert meetings organized jointly with IOC on the *Climate Change and Oceans* programme, with particular reference to appropriate protocols of the Climate Convention. He specially pointed out the importance of the International Conference on Oceanography held in Lisbon in November 1994 which brought together many experts from different areas of ocean research and created an important forum for exchanging views and establishing strategy for ocean research, monitoring and exploration. He wished the participants a successful meeting and a pleasant stay in Valletta.

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

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

2. SUMMARY OF SCIENTIFIC PRESENTATIONS

IODE AND GLOBAL OCEANOGRAPHIC DATA ARCHAEOLOGY AND RESCUE PROJECTS S. Levitus, Director, WDC-A, Oceanography, GODAR Project Leader

As of April 1995, approximately 1.2 million temperature profiles and 300,000 salinity profiles have been archived at WDC-A as a result of the GODAR project. A full report describing project results to date is available from the Project Director and will be presented for the consideration of the Fifteenth Session of the IOC Committee on IODE in January 1996.

As part of its commitment to the GODAR project, WDC-A is processing all data gathered within the frame of this project. These data and all oceanographic profile data archived at WDC-A and the U.S. NODC have been made available internationally without restriction on CD-ROMs as well as other media World Ocean Atlas, 1994. In addition to the profile data, objective analyses of these data are available. They include one-degree latitude-longitude mean fields for each of the measured parameters, two derived parameters (apparent oxygen utilization and oxygen saturation) and five-degree square statistics of standard level values.

Table 1

Parameter	Unit	Number of profiles
Temperature	°C	4,553,426
Salinity	p.s.u.	1,254,771
Oxygen	ml/l	367,635
Phosphate	micromolar	184,153
Silicate	micromolar	110,413
Nitrate	micromolar	75,403

The next release of data is expected to occur during 1996. Approximately new 400,000 bathythermograph profiles and 50,000 station data profiles are expected to become available. Table above shows the units and number of profiles for each parameter (Table 1).

IOC PROGRAM ACTIVITIES IN THE MEDITERRANEAN REGION AND REGIONAL OCEAN DATA MANAGEMENT

I. Oliouine, Head, Ocean Services Unit, IOC

The knowledge of the Mediterranean Sea is to a considerable extent governed by its geographical localities as a crossroad to and from Europe, Asia and Africa. It was natural that this region was one of the first to draw attention of a newly established Intergovernmental Oceanographic Commission. One of the first multi-disciplinary scientific programs developed, coordinated and implemented by IOC was the Cooperative Investigations in the Mediterranean Sea (CIM) in the mid 1970s. The objectives, planning and implementation of the programme, were described and results presented by the lecturer.

Other scientific programs in the Mediterranean in the implementation of which IOC was involved, were also presented and analyzed. They included : MEDALPEX (implemented in support of the WMO Alpine Experiment in 1981-1982), POEM (exploration of the Eastern Mediterranean started in 1985 jointly with ICSEM), PRIMO (investigations of the Western Mediterranean, started in 1989). The results of these efforts covered improvement of our knowledge on the dynamical processes in the open sea and coastal areas, evaluation of water masses transfer through straits and at a basin scale, between the coastal zones and open sea during all seasons, description of the distribution patterns of the hydrological, biological, chemical, sedimentological and pollution features.

The scientific experiments gave an opportunity to set a unique dataset which was used for many purposes including modelling. Numerous physical models were constructed suitable for general scientific studies of the Sea and applications.

Special attention was given to the ocean data management issues. Different arrangements for data management used by Member States participating in CIM MEDALPEX, POEM and PRIMO were described and quantitative estimations of datasets given (Annex IV). The publication in 1983 of the Atlas of Oceanographic Data Coverage of the Mediterranean by RNODC-CIM and to the presentation of the MEDALPEX data by RNODC-MEDALPEX (physical, chemical, current data) and PSMSL (sea-level data) on magnetic tapes and in tabulated forms were specially referred to. Concern was expressed that until today about 25 % of all physical, geophysical and chemical ocean data collected during MEDALPEX are still missing. Major parts of POEM and PRIMO data are still out of the WDCs system and are accessible only to the direct participants of the experiments. It was recommended that efforts should be made for making these data widely accessible.

Finally, the IOC contributions to the investigations in the Mediterranean in the fields of ocean-mapping, OSLR, OSNLR and GIPME were presented. The Floating University Project was also given necessary attention.

**MEDATLAS : A MEDITERRANEAN HYDROGRAPHIC ATLAS
FROM A COMPOSITE QUALITY CHECKED DATA SET**
Catherine Maillard, SISMER, Centre IFREMER de Brest, France

Context and objectives

Till only a few years ago a large quantity of oceanographic data was dispersed among numerous marine institutions and laboratories inside and outside the Mediterranean region. No special attention had been given to the protection of these data or to applying standard internationally agreed rules and principles for data archiving. Important sets of XBT data collected by the Navies and fisheries have neither been fully available.

At the same time, during the last years a growing number of users has shown interest in oceanographic data, modern and historical, for: scientific studies of physical processes or climatological changes; modelling; planning new field experiments; industrial purposes; calibrating sensors like multibeam sounders or acoustic tomographers.

The data centres have noticed an increase of requests for data and data products: comprehensive temperature and salinity data sets, data of good quality, gridded statistical values, and data sets easy to handle. To meet these requests it was necessary to make data sets available in a common exchange format, on modern data carriers, and to insure that no anomalies would impede any further use of the data. Digitised atlases fulfil these requirements, but it is necessary to update them regularly.

This is the objective of the MEDATLAS programme, which has been initiated by a consortium of several Mediterranean Data Centres including the Hellenic Data Centre (Greece), the IEO Data Centre (Spain), the SHOM/CMO (French Navy), IFREMER/SISMER (France, co-ordinating centre), the ICES data centre (Denmark, supervisor of the Quality Control procedures). It is funded by the European Union as a MAST supporting initiative for ocean data and information management, and by the national agencies in charge of the data centres. The work programme is implemented in close relationship with the MODB project (also a MAST supporting initiative), and the WDC-A.

Beyond the short term objective of the programme, several long term results are expected : improvement of the data safeguarding, better preparation for sea cruises and numerical experiments, enhanced experience for banking other data types like nutrients, chemicals, time series, floats, strengthening cooperation between Mediterranean data centres and improved collaboration between agencies implementing international projects like GODAR and GOOS (Global Ocean Observing System).

Tasks to implement

The programme duration is three years and the final data product must be published in 1997. The following tasks should be implemented by the end of the project :

- to update the archived hydrographic data (depth, temperature and salinity) from all, European and extra-European, sources;
- to quality control the data in the perspective of scientific use, according to the IOC and MAST recommendations and taking advantage of the regional expertise of the Mediterranean data centres;
- to merge the compiled data sets, operate a final control and compute an updated statistical climatology with a resolution adapted to the Mediterranean circulation scales. It is expected to improve the results by processing several large classified data sets which are not directly available to the users. This phase of the project will be implemented in collaboration with the MODB group at the Liège University, who has developed specific variational algorithms for data interpolation;
- to give easy access of the final merged data sets to users; electronic data publishing techniques will be used; a printed user guide and selected number of plates will be prepared for inclusion in the atlas package.

First results of the data compilation

A first effort was made to rescue data collected by national laboratories of the partner countries which carried out field experiments in the Mediterranean region. The dispersed datasets have been identified through cruise reports. Requests focused on hydrographic (CTD, Nansen casts, BT) data have been sent to all chief scientists. When necessary, those requests were supported by visits to the data holders in laboratories. When contacting the data sources with a request to release a copy of their data, it was proposed to safeguard also the associated parameters like nutrients or other chemical data.

Data requests have also been sent to IODE selected national contacts. However very few data was obtained in return for the moment. At this stage of the project, it appears that an extended co-operative effort is necessary to locate data and establish contacts with data holders. It would be very useful if, in the frame of their national missions and the GODAR project, the IODE data centres outside the EU contribute to this archiving effort. In addition, a good knowledge of the regional oceanographic processes occurring in the Mediterranean Sea is necessary to implement a robust quality check in such contrasted regions, with so stratified waters on the vertical, so large differences in water masses from one basin to another and from one season to another.

Up till now, the MEDATLAS and MODB have worked in parallel. In the future, some work needs to be implemented jointly. Relatively little overlapping has been made during the first phase of the projects because the partners in both initiatives were mostly complementary.

THE MEDITERRANEAN OCEANIC DATA BASE (MODB) : A TOOL FOR SCIENTIFIC INVESTIGATIONS IN THE MEDITERRANEAN SEA USING HISTORICAL DATA AND CLIMATOLOGICAL ANALYSES

P. Brasseur, GHER, Université de Liège, Belgium

The climatological picture of the ocean is an important element of oceanographic research, including process studies, diagnostic investigations, modelling work and planning of experiments at sea. The need to improve the existing climatologies available over the Mediterranean Sea (as, for instance, the Mediterranean subset of the Levitus climatological atlas of the World Ocean) was clearly identified within the community of researchers.

The MODB is a supporting initiative that has been implemented within the framework of the MAST programme to update historical data sets and to produce an improved, composite climatology consistent with the regional scales of the Mediterranean basins. The project involves six European laboratories deeply committed to Mediterranean oceanographic research; those institutes have been approached because they hold a substantial amount of hydrological measurements collected in the Mediterranean Sea since the beginning of this century.

The merging of all available hydrographic profiles into a single data set has been undertaken in order to eliminate duplicates of profiles spread between the various centres. The final MODB data set will include over

100000 hydrographic stations originating from the former French BNDO (Brest, France), the WDC-A (Washington, USA), the ENEA (Italy), the OGS (Trieste, Italy), the IRPEM (Ancona, Italy) and the POEM Group.

From the raw data, a seasonal climatology is reconstructed applying a variational analysis method similar to the conventional objective scheme used by most oceanographers. Gridded temperature and salinity fields (at $\frac{1}{4}$ of degree as horizontal resolution) represent the trends of the seasonal variability that affects the water mass properties with a high degree of realism. As an example, the upper layer is subject to a well-defined seasonal signal which is reflected in both temperature and salinity.

Another important objective of MODB is the dissemination of its data products; this goal is achieved using *Internet*, and more specifically the World-Wide-Wed through *Mosaic* or *Netscape* interfaces. The MODB data server is located at the address <http://modb.oce.ulg.ac.be>. An automatic procedure allows the users to submit requests using electronic forms to retrieve the desired data sets.

The scientific benefit from the use of MODB climatologies has been raised in several international research projects. It has been demonstrated that numerical models of the general circulation are greatly ameliorated when MODB data products are exploited as initial and boundary conditions. Studies of the interannual variability of the circulation as a result of external atmospheric forcings were also made possible because of the relevance of the background climatological picture.

In the future, it is expected to extend the MODB methodological framework to the production of a new climatology covering first the Atlantic Ocean, and then the World Ocean at a later stage.

CHANGES IN THE CHARACTERISTICS OF THE MAIN WATER MASSES IN THE SOUTH EASTERN LEVANTINE BASIN

A. Hecht, Israel Oceanographic and Limnological Research Ltd., Haifa, Israel

Temporal changes in the characteristics of the AW (Atlantic Waters) and LIW (Levantine Intermediate Waters) were described. The results stem from the analysis of the Israeli MC (Marine Climate) series of cruises. These were 20 cruises carried out over a period of five years (1979-1984), in the Southeastern Levantine Basin. Each cruise consisted of the same 25 to 30 stations, located (via satellite navigator) at $\frac{1}{2}$ degree intervals.

The results indicated a seasonal trend in the AW, which was poorly defined in the spring but, as the year progressed and as the LSW (Levantine Surface Waters) formed and penetrated downward, became better defined, and occupied a narrower layer whose depth increased. There appeared to be no season related variation in the LIW.

Abrupt, significant, and apparently irreversible changes in the characteristic salinity of the AW and the LIW occurred in the Southeastern Levantine basin during 1982. Thus the AW salinity changed from an average of 38.72 ± 0.05 psu at 45 decibars to an average of 38.87 ± 0.06 psu at 50 decibars; and the LIW salinity changed from an average of 38.95 ± 0.02 psu at 271 decibars to an average of 39.02 ± 0.02 psu at 187 decibars. These changes persisted to the end of the cruise series. Furthermore, although the MC series were discontinued at the end of 1984, later cruises, such as the POEM series, occupied some of the same stations as the MC series (station 10 in particular). Thus we could continue to follow the behavior of the AW and LIW after 1984.

It turned out that the salinity of the AW and the LIW did not revert to their pre-1982 values and there were additional 'jumps'. Thus, on station 10, we seem to observe another jump in March 1989, and still more possible jumps in August 1990 and October 1991. In October 1991 an AW salinity of 39.07 psu was observed, as well as an LIW salinity of 39.32 psu. The accuracy of these values were tested against the salinities measured at 1100 decibars, where according to our measurements, no changes were observed since the beginning of the MC series.

Changes in what appear to be "stable characteristics of water masses" are not restricted to the Levantine Basin. Interannual changes were reported in the Western North Pacific by White and Meyers (1982), and in the North Atlantic by Brewer et al. (1983) as well as by Roemmich and Wunsch (1984). In the Mediterranean Sea, Bethoux (1979) described the factors that could lead from a climatic change to a change in the water

characteristics and flow. Lacombe et al. (1985) in a detailed study of the deep waters of the Western Mediterranean, reported on the sporadic appearance of warmer and more saline bottom waters, distinct from the overlying deep waters. They ascribed the formation of these waters to open-sea deep convection interacting with the other water masses advecting into the region, i.e. Local Intermediate Waters and Levantine Intermediate Waters.

They concluded that the most important cause for the production of the "new" bottom waters should probably be sought in the variation of the surface heat budget. However a "quick look" at the relevant rain statistics along the French coast did not yield any direct support to their assumption. Parilla et al. (1986) also found real interannual changes in the LIW in the Alboran Sea. Charnock (1989) pointed out that the trend described by Lacombe was continuing and that there were indications that the deep waters of the Mediterranean Sea are changing. Charnock also pointed out that changes in the characteristics of the deep water reflect changes in sea-surface energy exchange processes and are linked to changes in weather and climate, possibly not only locally but over the whole Mediterranean Basin. Bethoux et al. (1990) found that in 1988 the deep waters of the Western Mediterranean were significantly warmer and more saline than in 1959. They concluded that this has been a continuous trend during the past three decades and ascribed the effect to greenhouse-induced warming.

Theocharis et al. (1985) reported that, from 1972-1976 to 1980-1982, an unusual and significant decrease in the integrated salinity of the upper 60 m layer occurred in the Saronikos Gulf. Although they observed an increase in precipitations during 1976-1982, they concluded that this was not sufficient to explain the decrease in the salinity and, by a process of elimination, they attribute this change to advection of fresher than usual Black Sea waters into the Aegean Sea. Lascaratos (1989) used the same data as well as additional data from the Evoikos Gulf and, in conjunction with evidence of the sea level changes in the Aegean, reached the conclusion that these were "obviously related to some climatic oscillations in the area".

A thirty-year time series of measurements in the middle of the Adriatic Sea, analyzed by Zore-Armanda et al. (1988), and Zore-Armanda and Gacic (1991) indicates a clear upward trend in salinity during the last 20 years of the series. After failing to find corresponding changes in the local components of the mass balance equation (e.g. precipitation, evaporation or runoff), they concluded that the salinity change is due to the erection of the Aswan High Dam on the Nile and the subsequent reduction in the Nile runoff from about 40 km³ per year to about 4 km³ per year (Gerges, 1976). The erection of the dam was reported to affect the entire circulation of the southeastern Levantine Basin (e.g. Gerges 1976, Sharf El Din 1977). Nof (1979), predicted that the diversion of the Nile can result, ultimately, in increasing the salinity of the waters aggressing from the Gibraltar by .016 psu, therefore one can expect the salinity of the LIW to increase by an even larger amount. Steady state is expected to be achieved within 25 to 50 years (i.e. 1990 to 2015).

It is difficult to ignore the fact that the changes described above have occurred in 1982 which happened to be the period of the strongest ENSO on record. Later changes in the salinity also coincided with ENSO episodes. The environmental parameters affected by ENSO (e.g.; cloudiness, precipitations, sea surface temperature, winds, etc.) have a direct bearing upon the mass balance and salinity balance equations and therefore on the salinity. Thus one can hardly avoid the speculation that the salinity changes were related to an ENSO episode. So far there appears to be no evidence of any ENSO effects on the waters of the Mediterranean and the evidence at the lecturer's disposal did not enable him to reach such a conclusion. However the recurring "coincidences" are worth investigating.

The lecturer concluded that the salinity changes in the AW and the LIW were not the result of a particular set of circumstances; most probably they were the result of a combination of events. The importance of the LIW to the Mediterranean and the Atlantic circulation makes it worth while to follow and investigate not only the present changes but also to try and establish whether such changes have occurred in the past.

HARMFUL ALGAL BLOOMS IN THE MEDITERRANEAN AND WHAT DATA IS NEEDED TO MAKE THEIR STUDIES MORE EFFECTIVE

M. Estrada, Institut de Ciències del Mar (CSIC), Barcelona, Spain

In temperate seas like the Mediterranean, seasonal phytoplankton blooms occur regularly during the annual cycle. Besides these seasonal blooms, generally dominated by diatoms, high population densities of phytoplankton may accumulate when adequate nutrient supply coincides with high stability of the water column. Extreme cases of these blooms may produce discoloration of the water ("red tides"). Their appearance is related to the persistence of favorable stability conditions during enough time and the existence of mechanisms (for

example, interaction between water circulation patterns and mobility of the organisms) favouring active or passive accumulation of organisms. In some cases, phytoplankton blooms may be harmful for the marine fauna or for human health (either directly or through consumption of contaminated marine products), due to toxic effects or to harmful effects associated to high biomass of non-toxic species. It should be noted that, in some cases, toxic effects can be produced even at low concentration (not reaching bloom proportions) of the causative organism.

Although the Mediterranean is globally an oligotrophic sea, coastal areas such as estuaries, semi-enclosed bays and lagoons may present naturally high productivity. Increased nutrient inputs due to anthropogenic causes may contribute to enhance this productivity and may lead to the appearance of spectacular phytoplankton blooms. On occasions, massive blooms may occur in open nearshore zones, in association with particular hydrographic conditions (e. g. Noctiluca red tides in the Catalan coast).

Toxic episodes recorded in Mediterranean waters include PSP (paralytic shellfish poisoning), DSP (diarrhetic shellfish poisoning) and fish mortalities. The recorded organisms causing PSP are the dinoflagellates Gymnodinium catenatum and species of the genus Alexandrium. DSP is produced basically by several species of Dinophysis. Fish and shellfish mortalities in aquaculture operations have been associated to species of Gyrodinium and Gymnodinium.

High biomass effects include anoxia (mainly due to oxygen consumption by a decaying bloom) and mucilage problems. Particularly extreme cases of mucilage production are the episodes of "mare sporco" in the Adriatic.

The taxonomy of many potentially harmful phytoplankton organisms is problematic; this represents a difficulty in the context of interpretation of both present and historical data. For example, Alexandrium comprises a numerous group of morphospecies, and genetic differences (as measured by molecular biology techniques) and the ability to produce toxins may not be correlated with morphological classifications. A non-toxic species resembling Gymnodinium catenatum may be easily confused with the toxic organism, and it is likely that this confusion has occurred in some data sets. Another problematic question is the classification of Dinophysis species; there are intermediate forms among some of them, and their status as separate species is under discussion.

From the point of view of data archaeology and rescue, it is important to keep in mind that populations of each particular species vary as part of an ecosystem, which includes other species in the community and the physico-chemical environment. Thus, data archiving should not be restricted to the target species, but should include accompanying environmental data. Types of information to be considered include images, video recordings and molecular biology data of relevant species, and traditional knowledge concerning harmful marine events.

In order to foster understanding of the mechanisms of formation and maintenance of harmful blooms, acquisition of data must have started before the event occurs; when harmful effects are apparent it is already too late to measure some of the needed variables. Thus, it is important to establish permanent sampling schemes, at least of some key variables. Phytoplankton samples, which are time-consuming to study, may be stored and examined later if necessary.

Historical phytoplankton data may be important to ascertain transfer (anthropogenic or not) and spreading patterns of harmful species. Many phytoplankton data sets are in extreme danger of being lost; they are often unpublished, in manuscript or table form, and a great deal of their information may be difficult to interpret if the responsible scientist cannot be contacted.

Relevant information needs not to be restricted to the aquatic medium. For example, data on nutrient content in runoff waters or sediment profiles (for example, for examining cyst abundances) may be relevant to interpret long-term trends in harmful events.

At present, there is considerable concern about an apparent worldwide increase of harmful algal effects and the possible association of this increase with climate changes and anthropogenic nutrient enrichment of coastal environments. The number of reported events has increased spectacularly in the last years but it is not known whether this reveals a real underlying trend or is due to increased monitoring efforts and the multiplication of aquaculture operations. Adequate interpretation of historical data and management of present data is very important to ascertain trends in harmful algal bloom occurrence.

CIM : AN ATLAS OF OCEANOGRAPHIC DATA COVERAGE FOR THE MEDITERRANEAN SEA*N. Mikhailov, Russian NODC, RIHMI-WDC, Russia*

The project of "Co-operative Investigation in the Mediterranean (CIM)" was developed by the IOC Member States during the years 1971-1975. In the USSR, the Responsible National Oceanographic Data Centre (CIM RNODC) was established in the frame of the WDC-B. The CIM project initiated the compilation of the Atlas of Oceanographic Data Coverage of the Mediterranean Sea. A substantial amount of information about the history of investigations at sea is included in the Atlas. This information includes :

- description of measured parameters: hydrological, hydro-chemical, biological, geological and geophysical observations from the beginning of the 18th century to the eighties of the present century, including major scientific results of Mediterranean Sea studies for this period;
- monthly maps of oceanographic data distributions with a horizontal resolution of ½ degree at selected depth levels;
- inventory of oceanographic cruises in the Mediterranean for the period 1908-1975;
- bibliography of scientific publications related to the region and above-mentioned period.

Some information about the history of oceanographic studies in the Mediterranean Sea (on the basis of the above-mentioned Atlas) was presented in detail.

Stage 1 : Early oceanographic investigations of the Mediterranean Sea in 18th - 19th centuries

Oceanographic observations were made by different instruments and data analysed by different methods. The first oceanographic expeditions had been fulfilled by France (1725, Gulf of Lions), UK (1841-42, Aegean Sea) and Austria (1866-69, Adriatic Sea). Studies included: a first general description of marine environment, measurements of temperature, salinity and O₂ concentrations of the sea water and the general mapping of the above parameters. Several publications describe the scientific results of this first phase: Aime G. (France, 1845), Arago F. (France, 1838), Forchhammer G. (Austria, 1866) and Natterer K. (1892-1894).

Stage 2 : from the beginning of the 20th century to 1950

Oceanographic observations were based on the application of standard methods and instruments. Data were collected by Denmark ("Thor", 1908-1910, 1921; " Dana", 1928, 1930), Austria, ("Najade", 1911-1914), Italy ("Cyclope", 1911-1914), France ("Pourquoipas", 1923, 1938; "President Theodore Tissier", 1933-1934) and Portugal ("Cinco de Outubro", 1923-1926). Research was dedicated to the determination of hydrological and hydrochemical conditions, the formation and dispersion of the water masses and the characteristics of oxygen distribution. Results of this work can be found in Nielsen J.N. publications: Hydrography of the Mediterranean Sea (1908-1910, 1911).

Stage 3 : from 1950 to 1980

During the post-war period, extensive oceanographic studies were implemented on a wider scale. The International Geophysical Year (1957-1959) gave an opportunity to the Mediterranean countries (mainly France, Italy, Yugoslavia, Spain) to carry out several oceanographic expeditions in Western Basin, Adriatic Sea, Aegean Sea and Gibraltar area. The Atlas contains information about approximately 70 cruises of France, 50 cruises of Italy, 100 cruises of Yugoslavia, 20 cruises of Spain, 20 cruises of USA and 90 cruises of USSR. Major results included: a detailed description of hydrological and hydrochemical conditions; a comprehensive investigation of the vertical structure of the water column, description of water masses and currents, processes of water transport etc.; development of seasonal maps of O₂, pH, nutrients, phosphate and silicate distribution; production of accurate bathymetric charts.

Unfortunately, the Atlas does not include the information about oceanographic expeditions in the Mediterranean Sea for the period from 1980 to the present days, although many oceanographic cruises have been carried out by different countries during this recent period. For example, the former USSR alone organised more than 400 cruises between 1981 and 1990.

USE AND DISSEMINATION OF HISTORICAL DATA IN THE MEDITERRANEAN : A ROLE FOR MALTA

A. Drago, Malta Council for Science and Technology, Malta

The need to develop a network system for the comprehensive and large scale monitoring of the marine environment is certainly a top priority especially for the Mediterranean region where both direct and indirect effects of human activities are known to be increasingly affecting the marine ecosystem and causing imbalances in very delicate natural equilibria.

UNEP has estimated that each year the Mediterranean receives over 500 million tons of sewage with 120,000 tons of mineral oil, 60,000 tons of detergents, 100 tons of mercury, 3,800 tons of lead and 36,000 tons of phosphates as a result of human activity on land. Moreover the Mediterranean is a major oil transportation route and up to one million tons of crude oil is discharged annually from accidental spills, illegal bunkering and tank cleaning practices as well as inadequate harbour facilities.

Only about a third of the demand for fish in the area is supplied directly by the Mediterranean Sea. Mariculture initiatives are thus increasingly exploiting coastal areas in order to at least in part make up for this deficit; this together with over-fishing and the invasion of tropical species of plants and animals are affecting the structure and biodiversity of the Mediterranean food chain.

With the addition of the potential impacts of climate change, the threat leading to extreme deteriorations at a rapid rate is very realistic. According to studies made by the Intergovernmental Panel on Climate Change, the Maghreb region appears to be most vulnerable to climate changes in the Mediterranean; shifts of soil moisture limits in some semi-arid and sub-humid areas could lead to significant reduction of crop potentials with serious implications for regional food suppliers in these less developed countries.

There have been several efforts in the past aimed to tackle these problems of the Mediterranean: these include the UNEP's Mediterranean Pollution and Research Programme (MEDPOL); the POEM and PRIMO projects for physical oceanographic studies in the Eastern and Western Mediterranean; and the EROS-2000 project in the NW Mediterranean, launched to study the inputs, cycling and fate of natural and man-made chemicals from rivers and the atmosphere. These initiatives were however mainly followed by the European coastal states and the concerted action that is effectively required on a regional scale never set off. The EU-funded Mediterranean Targeted Project within the MAST Fourth Framework Programme actually excludes the South Eastern Mediterranean (SEM) countries, and the EU-AVICENNE pilot project has too limited funds for its very diverse component programmes.

This situation has to be improved. It is imperative that a sustainable exploitation strategy be developed without delay at a regional scale for the future management of the basin. It is necessary to prepare a plan which involves both the EU and SEM countries for comprehensive large scale continuous observation of the Mediterranean Sea in order to monitor the measure of stress on this sea, as well as to establishing networks, regional databases and integrated programs. It is necessary without delay to narrow the gap between the more technologically advanced countries and the less developed Mediterranean countries lacking human resources, financial support and infrastructure that are required to keep pace with the Northern EU Member States.

In this respect the recommendations emanated in Sofia-Antipolis, March 1995, during the Conference of the EU and Mediterranean Ministers of Science and Research in favour of a EU-supported Euro-Med Network in marine science and technology between the EU and the SEM countries is a great step towards the achievement of these goals.

The Conference has reiterated the problems outlined above and served to identify the solutions. The conclusions from the Conference focused on the need for the EU to invest in training and infrastructure, targeted to the least developed Mediterranean countries, and to establish a co-ordinating body which ensures that funds are used in equity between countries and according to a holistic plan of action and in conformity to well-defined objectives.

An underlying fundamental component in this plan requests an efficient mechanism exchange for oceanographic data and information and is of course the competence of IODE. More specifically the Mediterranean task of GODAR in this context is considered to be a top priority; the need of combining historical data in a common

database and making it available to the Marine scientists in all the Mediterranean countries is essentially the first step in the above plan. The need for IOC to intervene and participate in the Mediterranean is thus a crucial matter.

By way of its geographical position its past history and the solid political relation with both EU and SEM countries, Malta is obliged to play a significant role in the Mediterranean.

One clear aspiration of Malta is that of using the planned National Marine Sciences Station as an oceanographic data centre for the Central Mediterranean. Arrangements for the building of the Station will be finalized soon; the TCP/IP link between Malta and Europe is only several months away. At the same time there is a need to increase both the effectiveness and the number of oceanographic data centres in the Mediterranean in order to achieve the plans outlined above. Moreover, the National Marine Sciences Station in Malta is expected to start functioning before full completion of its premises and will be prepared to take up, among its first tasks, a concrete task in GODAR such as in the digitization, management and archival of historical data in the Central Mediterranean.

Through an AVICENNE Project entitled Data Processing for a Mediterranean Automated Environmental Monitoring Network (MEDNET), the Malta Council for Science and Technology and the Euro-Med Centre on Insular Coastal Dynamics are also developing together with French (IFREMER, MORS ENVIRONMENT) and Cypriot (Department of Fisheries) partners, the essential components for a network that can serve as a tool for both data and information exchange in the Mediterranean.

MEDNET is an offspring of a mother project in France, called RAVEL, in which a series of monitoring stations will be deployed along the French coastal area with an aim of establishing a network for the measurement and real-time transmission of physico-chemical parameters including temperature, salinity, dissolved oxygen and pH which are measured with currently available sensors. Other parameters indicative of the general water quality, such as turbidity, chlorophyll and pheopigments, ammonia, nitrates, nitrites, phosphates, and even sulphides, which can be toxic for marine life, will be also taken into consideration even though in situ measuring equipment are not all currently available. These parameters will be the subject of special research, such as the miniaturisation of laboratory apparatus, eventually to be integrated into the stations. Continuous measurement of turbidity (by nephelometry) and of chlorophyll (by fluorimetry) is currently possible. Methods for frequent measurement of nitrate balance are also available.

The inclusion of such parameters in the measurement schemes completes and clarifies our understanding of coastal waters. Nutrient salts and, notably, nitrogenous deposits are indispensable to the development of phytoplankton, the first link in the food chain, whose quantity can be evaluated by the measurement of chlorophyll and pheopigments.

A prototype solar-powered buoy has already been constructed and successfully deployed in 1994. The buoy samples water from various selected depths by means of a pumping system and uses state-of-the-art electronic systems and sensors for on-board direct measurement.

The present MEDNET project aims to adapt the MAREL network for the Mediterranean and to develop some of its key components. The planned configuration of the network is expected to make full use of existing structures and mechanism for oceanographic data management and exchange and will support the NODCs of the IODE system.

The setup of the Mediterranean Network avoids the need of a large central processing Centre. Besides the unnecessary huge investment required for such a Centre, the heavy demand for the services which it will have to supply and the eventual extensive use of international telecommunication links which it would require, one must also consider problems related to restrictions on the international distribution of sensitive data and information; constraints may also be imposed by political issues as well as by physical factors such as the different telecommunication services that are available from the Mediterranean countries.

SCIENTIFIC RESULTS MADE POSSIBLE BY GODAR

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

A direct result of the GODAR project has been the creation of datasets that allow the international research community to describe the interannual variability of upper ocean thermal structure. For example, we now have available a 44-year record of upper ocean thermal observations for Ocean Weather Station 'C'. This record indicates that the sub-arctic gyre of the North Atlantic Ocean has experienced a linear cooling trend during the 1966-1990 period. In addition, the record indicates the existence of a quasi-decadal scale oscillation of annual mean temperature with a range exceeding 1.0° Celsius and space scales associated with this oscillation indicate that this feature is highly correlated with an oscillation of the surface pressure field over the North Atlantic known as the East Atlantic oscillation. At 400 m depth there is a linear cooling trend during the 1966-90 period that may be associated with the upper part of the Mediterranean outflow.

In addition to the creation of this (and other) time-series, enough data are now available to begin construction of yearly upper ocean thermal anomaly fields for large parts of the World Ocean for selected time periods. The creation of such fields has occurred, the analysis procedures are being refined. Results indicate that the upper ocean (0-200 m) thermal structure of the subarctic and mid-latitudes of the North Atlantic vary oppositely in phase.

MEDITERRANEAN MARINE INFORMATION NETWORK

C. Galdies and A. Vassallo, Euro-Mediterranean Centre on Insular Coastal Dynamics, Malta

The need for a co-operative network of marine libraries, information and documentation centres in the Mediterranean and Black Sea areas as a mechanism to help in the transfer and exchange of marine environmental information has long been felt by information professionals and information users alike. A co-operative regional network of marine libraries, information and documentation centres should doubtlessly lead to the gradual improvement of services to the marine research community, particularly in the "information-poor" areas.

Following the recommendations and objectives outlined during the *Training Workshop on aspects of Marine Documentation in the Mediterranean* (23 - 26 Nov., 1992, Foundation for International Studies, MALTA), a pilot survey questionnaire was formulated by a group of information experts and sent out to Mediterranean and Black Sea marine libraries and institutions. (*taken from the Directory of Med. Mar. Env. Centres - MAP Technical Report No. 65; UNESCO/UNDP Internet Survey on Existing International and National Information Infrastructures on Marine Pollution in Mediterranean and Black Sea states*).

The objectives of such a network, as arising from this meeting, were the following:

- to collect and make more accessible scientific and technical documents related to marine resources in the region; to support ongoing research through information searching, retrieval services and document supply;
- to record and disseminate information about publications related to this region; particularly reports and "grey" literature;
- to provide mutual support and a forum for marine information staff in the region, encouraging training and sharing of technical expertise.

The main aim of the questionnaire was to obtain a clear picture of the existing marine information facilities in the region, especially with regard to referral services, subject specialities, access to other databases and other services and a total of 383 copies were sent out. Following the response of the pilot survey questionnaire of the regions' sources and resources, a detailed report was compiled by the Centre from which a number of recommendations have been made. These recommendations will be implemented during the course of 1995.

During the course of 1995, the main activity related to this project will involve the establishment of a network of marine information centres where the role of ICOD will be to provide information to regional end-users on the availability of marine-related information sources in the Mediterranean and the Black Sea. The project is envisaged in three phases:

Phase 1. Production of a Network Directory.

Since approximately 15% of the respondents do not have access to any computer facilities, the Centre will publish, as its first priority in the establishment of a network, a hard-copy directory of those institutes willing to participate in the Mediterranean Marine Information Network. Such a directory shall include the following information sorted alphabetically by country :

- Name of contact person and full postal address of the Institute
- Telephone, Telex, Telefax, Cable and E-Mail Addresses
- Working Language/s
- Type of library holdings in the relevant topics
- Subject areas covered by the library
- Services provided by the library
- Library publications.

This directory service will eventually be available as part of the network's marine information database on computer diskettes and disseminated on request.

Phase 2. Publication and dissemination of a newsletter/bulletin.

The publication and regular distribution of a newsletter, containing research news and events on marine-related activities, should serve as an important link between the various co-operating institutes. It will also contain a current awareness bulletin listing regional scientific papers and reports.

Phase 3. Production of a Regional Marine Database.

The next step in the co-ordination of the Mediterranean Marine Information Network would be the production of a computer database formatted using appropriate bibliographic software, and should contain the following topics:

- Directory of participants
- Union list indicating periodical titles and holdings of the co-operating centres
- Records of the region's published marine literature
- Citation index covering regional publications.

This database, to be established in Malta, will be used to provide relevant information to end-users making specific requests.

REFERRAL SYSTEMS - WHAT, WHERE AND HOW ?

I. Oliouline, Head, Ocean Services Unit, IOC

Referral systems are necessary to identify the various collections of marine data and describe their contents, where and in what form they are held and how they may be accessed. Not all significant public domain data are in national depositories. The data lie dispersed in collections maintained by thousands of laboratories, university departments, institutes, government departments, data centers and private companies. The user is often unaware of the range of available data. Referral may become a valid function of the national, regional and global centres when an inquiry cannot be answered adequately from local resources.

Information was given on a few referral systems like MEDI, EDMED, INFOCLIMA, CODATA.

The oldest among them is the Marine Environmental Data Information Referral System (MEDI) which was created about 20 years ago by IOC jointly with UNEP to meet the needs and demands of the marine community. MEDI is a 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. The last issue of the MEDI Catalogue was published by IOC in 1993 and contains almost 250 file descriptions from 24 countries. The categories of data described include all aspects of marine science : marine meteorology, physical and chemical oceanography, marine biology and geology, pollution, etc.

In the mid-1980s, IOC made a survey and published a specialised catalogue of remote-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.

At present, MEDI is not the only referral system which is dealing with information on ocean data files. Descriptions of the European Directory of Marine Environmental Data (EDMED) of the Directory of Data Sources for Sciences and Technology (CODATA) of ICSU and of WMO INFOCLIMA catalogue were given in detail. The strong and weak points of all these systems were demonstrated and procedures for their usage described.

It was shown that a future comprehensive information base should be in a form which is rapidly and easily accessible, updatable and transferable into various kinds of reports to be communicated to a broad range of audiences and user groups world wide. To achieve this goal and make referral systems effective, is possible only if all centres holding data provide electronically or by mail, well-documented information about the extent of their holdings and the accessibility of the data. Data interchange between agencies is becoming a major issue as global change programs require data from ever wider sources. Users must have an easy method to access an on-line system and to search for specific datasets of interest.

3. NATIONAL REPORTS

CROATIA

The Republic of Croatia is essentially a maritime country. In the 11th century Croatia had the biggest vessel fleet in Europe, and the well known trade vessel fleet of the Dubrovnik Republic in 15th century. In 1995, Croatia celebrated the thousandth anniversary of the first written national law on fisheries.

The Republic of Croatia has an area of 56,538 km², its territorial sea water covers 31,900 km² and the Exclusive Economic Zone includes about 52,200 km². The total Croatian coastline including islands is 5,740 km long and represents about 16 % of the Mediterranean coastline. With 7.5 % of its territory environmentally protected, four of seven Croatian National Parks are in the coastal area (Kornati, Mljet, Briuni and River Krka).
Marine Research Infrastructure

Oceanographic investigations in the Adriatic Sea have a century long history. The first expedition was carried out by the vessel NAJADE (1907). In 1994, the Center for Marine Research from Rovinj celebrated 90 years of its activity, and in 1995 the Institute of Oceanography and Fisheries celebrated 65 years of activity.

Today, marine research activities in Croatia are financially supported by the Ministry of Science, Technology and Informatics, and some governmental agencies such as the Agency for Environmental Protection and the Agency for Fisheries and Aquaculture.

Institutes mainly involved in marine research activities are :

- *Institute of Oceanography and Fisheries - Split (IOFS)*

- Departments in Split : marine physics, chemistry, biology, fisheries, aquaculture, ecology
- Departments in Dubrovnik: ecology, aquaculture

- *Institute Rugjer Boskovic` - Zagreb (IRBZ)*

- Center for Marine Research Rovinj (CMRR) : marine physics, chemistry, ecology
- Center for Marine Research Zagreb (CMRZ) : marine physics, chemistry, ecology, aquaculture

- *Hydrographic Institute - Split (DHIS)*

- Bathymetry, cartography, navigation, marine physics

- *Marine Meteorological Center - Split (MMCS)*

- Marine meteorology

- *Center for Sea Protection - Rijeka (CSPR)*

- Marine water quality

The Croatian scientific institutes have 4 research vessels : "A.MOHOROVICIC" (78 m), "BIOS" (28 m), "V.VELEBITA" (27 m) and "HIDRA" (23 m).

Data Management Infrastructure

Most scientific institutes and universities in Croatia are connected to INTERNET through CARNET (Croatian Academic Network). More institutes involved in marine research have a LAN based on DEC computers and TCP/IP protocols.

Universities and scientific institutes in Croatia have librarian information system based on ORACLE RDBMS, developed by the National Library from Zagreb. In addition, CMRZ maintains a database of publications, journals and papers related to Adriatic Sea investigations based on CDS/ISIS.

CMRR has developed a database of classical oceanographic data using DBASE-IV.

Jointly, IOFS and DHIS from Split are developing Oceanographic Information System of the Adriatic Sea (OIS). It is a Geographical Information System (GIS) mainly based on existing computers and CARNET network. As part of OIS, a distributed database is under development, called: Marine Environmental Database of the Adriatic Sea (MEDAS). It is designed as a relational database using ORACLE RDBMS. It consists of one referral database, and thematic databases with basic or aggregated data, which include marine physics (sea currents, waves, sea levels, T-profiles), classical oceanographic parameters (T,S,CTD profiles, O₂, PH), nutrients, heavy metals, pesticides and hydrocarbonates, fecals, and remote sensing data (temperature and chlorophyll). Output data from databases are presented in GIS form using ARC/INFO software tools.

Data and its availability for international exchange

The Croatian marine institutes possess big volumes of data collected from the beginning of this century up to now. Data were collected and exchanged in the framework of international projects such as: International Geophysics Year (IGY), MEDALPEX, POEM, MEDPOL, and through bilateral arrangements with Italian institutions. However, most of available data have been collected in the framework of national scientific projects implemented in the Adriatic Sea, and by commercial projects (mostly in coastal area). IOFS has 9 stations along the section Split-Gargano with seasonal measurements of standard meteorological, classical hydrographic and biological parameters for about fifty years. Big volumes of meteorological and oceanographic data were collected from oil platforms. During the past 15 years, oceanographic data were also collected in coastal areas by the Croatian marine institutes as part of the monitoring of pollutants in sea water. Because of financial shortcomings caused by the war during the last five years, marine institutions lost about 25% of their qualified staff. Despite of difficulties, important laws were adopted and all scientific institutions obtained a governmental status. Last year, a feasibility study was conducted in order to propose the establishment of a National Oceanographic Data Centre.

As there is no yet an NODC in Croatia, there is no nation-wide data archaeology and rescue programme. However in 1994-1995, inventories of available data have been prepared as part of the MEDAS database project. They include information on the volume of existing data based on the type of data and data presentation. Results of this survey are given in Tables 2, 3, 4 and 5 below. This activity helped also to identify what data have been lost during the 1991/1992 war.

Available data is divided into four different groups: time series data (sea currents, sea level, wind and wave, T-profile); classical hydrocast data (meteo and sea property, T, S, O₂, pH, nutrients); pollutant data (organic and inorganic); biological and fisheries data (scientific research data and data statistics).

Though this survey activity has not been completed yet, the conclusion was that there are large volumes of marine data dispersed between different Croatian institutes, and archiving of this data is not arranged in a proper way. More than 85% of these data is archived at DHIS and IOFS in Split, about 40% is in analog or manuscript form and in danger of being lost. About 60% of the data have been digitized and archived on technical carrier (80 column punched card, 1/2" magnetic tapes, cartridges). About 40% of data passed through satisfied quality control. At present it is not possible to extend further efforts on data archeology and rescue, because of financial and staff shortcomings. The efforts would require additional staff, powerful PC computers with CD-ROM readers, and graphic printers which are not available in many institutions.

Table 2 - Classical hydrocasts

Data type	Met&Se a	T, S	O₂, pH	Nutrient s	CTD	MBT
Number of profiles	30300	51900	16300	9350	473	27450
Data since	1909	1909	1965	1968	1975	1954
Data in manuscript	Data logs, reports	Data logs, reports	Data logs, reports	Data logs, reports	-	Data logs
Digitized data since	1909	1909	1965	1968	1975	1954
Number of profiles	25780	47800	14300	8250	473	27450
Existence of additional data	Yes ?	Yes	Yes	Yes	No	Yes ?

Table 3 - Time series data

Data type	Sea level	Sea currents	Wind & wave	T-profile	SST
Number of stations	9 permanent 14 occasionally	324 1833 series	8	11 27 series	26
Data since	1936	1957	1975	1986	1957
Data in analog form	Recording sheet	-	Recording paper in rolls	-	-
Data in manuscript	Annual reports (from 1957)	Data logs, some in reports	Some in reports	-	Reports
Quantity	-	1473 time series	78 time series, 65 cartridges	27 series	-
Existence of additional data	No	Yes	No	Yes ?	Yes ?

Table 4 - Biology and Fisheries

Data type	Zoo&Phyto Plankton	Zoo&Phyto Benthos	Chlorophyll	IchtyoPlankton	Fisheries
Number of profiles	1240	895	3460	885	2450
Data since	1957	1957	1957	1957	1957
Data in manuscript	Data logs	Data logs	Data logs	Data logs	Data logs
Digitized data	All	All	2520	All	All
Existence of additional data	Yes	Yes	Yes	Yes	Yes

Table 5 - Pollution data

Data type	Heavy metals (in W, O, S)	Pesticides and PET hydro carbonats	Coliforms
Number of profiles/stations	1820	927	2345
Data since	1979	1981	1974
Data in manuscript	Data logs, reports	Data logs, reports	Data logs, reports
Digitized data since	-	1981	-
Profiles		927	
Data in database	1979	1987	1974
since (profiles)	1820	356	2345
Existence of additional data	Yes	Yes	Yes

Today, oceanographic data from Croatia may be internationally exchanged under the conditions that the data have already been published by national institutions. No restriction is applied to data collected in the framework of co-operative projects. In all other cases it is necessary to get a special permission from the Ministry of Science, Technology and Informatics.

CYPRUS

The Oceanography-Hydrography section of the Fisheries Department in Cyprus has been active in data collection as early as almost its foundation around 1964.

The first cruises, in 1966, covered the northern part of Cyprus, the Kyrenia area, then the Morphoy Bay on the northwestern part of Cyprus and Famagusta bay to the east. At the beginning, the work was carried out on board hired vessels. As from 1972, the Department owns a steel trawler-research vessel, (16 m o.a.l.) equipped with oceanographic winch, radar, echosounders, Nav-sat, and G.P.S.

Investigations in these areas unfortunately had to be abandoned in 1974. The Research vessel of the Department including its full equipment was left behind in the Kyrenia Harbour, which is located in the Northern part of Cyprus.

After 1974, the Department started purchasing new equipment for oceanographic research mainly focused on the southern coast, in the Limassol-Vassilico area and in the Larnaca area. Mention should be made that in 1986 a 11.5 m multipurpose boat was made available by FAO, which is equipped with an oceanographic winch, radar, echo-sounder, G.P.S. and V.H.F.

Sampling stations taken in the past, cover a distance of approximately 5-6 km offshore. Cross sections of up to 100 fathoms depth were conducted with stations at 5, 10, 20, 30, 50, 75 and 100 fathoms depth. The parameters measured at standard depths were temperature, salinity and dissolved oxygen. Nansen bottles with reversing thermometers were used for temperature measurements and water sampling. Temperature records were also obtained using bathythermographs for several cruises. Transparency measurements were taken using a secchi-disc. In addition, simple meteorological observations were made, like measurements of wind speed and direction, cloud cover, wind waves and swell observations.

The results of oceanographic observations, measurements and samples, were recorded on log sheets, similar to those used by the US Navy Hydrographic Office. Observed values for sea water temperature, salinity, dissolved oxygen and density as well as other determined values were plotted against depth.

The area of Morphou Bay was extensively studied before 1974 in order to assess the extent of pollution caused by the copper mines exploitation in the area. Apart from the standard oceanographic work, sediment samples were taken along eleven cross sections in the Morphoy Bay and analysis for copper, iron, zinc, lead and sulphur

were carried out. The results showed their concentration in the sediment and the effects of the dispersion induced by marine currents.

During the first phase of the MEDPOL project, the Department contributed to five of them, one of which was the IOC/UNEP pilot project on "Problems of Coastal Transport of Pollutants" (MED-VI). The work covered the sectors of Limassol and Episkopi Bay. Part of the work was also undertaken for MEDPOL, phase II. The Department participated also in the Physical Oceanography of the Eastern Mediterranean project (POEM), taking part in three cruises in November 1985, March 1986 and September 1987. For this purpose, the Department purchased a CTD. Ten stations to the south and the west of Cyprus up to 60 miles offshore were conducted with the help of CTD down to 1500 m depth.

Since 1979, nine self recording current meters (Aanderaa) were purchased or donated to the Department, and are being used for continuous measurements. Current meters are moored in areas of specific interest, such as proposed outfalls, electric power stations and in selected regions where continuous records of current are needed. At the mooring places, temperature is measured continuously, in addition to the speed and direction of currents. Conductivity sensors are also installed with some of the current meters, providing continuous salinity measurements. The data are decoded from magnetic tapes and are transferred to diskettes. The current and temperature data are presented in the form of time series of :

- current speed and direction (longshore and offshore components), and temperature;
- current vector scatter plots;
- current progressive vector diagrams;
- current speed cumulative frequency plots;
- current rose plots.

Current meter data exist mainly for the areas from Limassol to Vassilico and in the East for the Larnaca area.

In 1993, the Department purchased underwater temperature recorders. The available software makes it possible to analyse data and to have graphic presentations showing maximum and minimum temperatures for every day and month together with the time of occurrence. The data are transferred and stored on diskettes. The Fisheries Department is the only department that undertakes oceanographic studies and maintains oceanographic data. Apart the data from the POEM cruises, the data on temperature, salinity and dissolved oxygen are not available in a digitized form. These measurements are made by Nansen reversing water bottles, and are entered manually on log-sheets. Data from recording current meters are processed and kept in digitized form on diskettes.

EGYPT

The Egyptian National Oceanographic Data Center (ENODC) is a special unit of the National Institute of Oceanography and Fisheries (NIOF). It was established in 1972 for storing and processing a variety of oceanographic data for different purposes. The principal mission of the ENODC is to help researchers of the NIOF to process their data according to their needs.

In 1978, the centre was equipped with a computer of PDP-11 type. In 1988, an IBM-PS/2 computer was added. Finally, in 1992, a new machine of the type IBM PS/2 Ultimedia-57 SLC with Audia-Visual connection completed the computing equipment of the centre.

Connections between the Sun workstation and the PC's were established. Recording media used in the centre include diskettes 3.5", 5.25", CD ROM, 0.5" tapes, 0.25" cartridge. Accessories like tape readers and printers are also available.

In the ENODC, national data are archived and made available to researchers in different oceanographic branches according to the data management policy set by the centre. These data are mainly hydrographic and chemical parameters collected in the Mediterranean and Red Seas and in Egyptian Lakes. Hydrographic data for the Mediterranean and Red Seas were exchanged with World Data Center-A, Oceanography, in Washington D.C.

There is a periodical series of publications produced by the ENODC. Until now, this series contains 6 publications listed below :

- Check list of Egyptian Mediterranean Fishes. Publication n° 1, 1992
- Polychaetes. Publication n° 2, 1992
- Tides at Alexandria, Egypt for the period 1993-2000. Publication n° 3, 1993
- Tides at Port-Saïd, Egypt for the period 1993-2000. Publication n° 4, 1993
- M₂-tides in the Mediterranean. Publication n° 5, 1993
- Check list of Egyptian Mediterranean Red Sea Fishes. Publication n° 6, 1994

NIOF compiled a climatological data set based on :

- the US NODC data file up to 1988 (position, temperature, salinity and time)
- the ENODC data files for the South Levantine Basin

Based on this data set, annual and seasonal analyses of the climatology were prepared and used in Princeton and Alexandria in conjunction with the development of the POM (Princeton Ocean Model). One objective of this model is to provide estimates of heat storage in the Eastern Mediterranean. Recently the ENODC started working on new projects which include:

- calculation of waves from synoptic charts for estimating the amount of sediment transport along the Nile Delta Coast;
- study of the circulation along isopycnal surfaces representing the intermediate and deep waters;
- identification of SSTA (Sea Surface Temperature Anomaly) in the Eastern Mediterranean.

FRANCE

History and missions of the French NODC (SISMER)

SISMER (Systèmes d'Informations Scientifiques pour la Mer) is a service of IFREMER, the French National Agency for Ocean research, for the national community. It was created in 1990 and is located in Nantes and Brest, the main research centres of IFREMER. Nantes was the previous headquarters of the Fisheries Institute and has kept a major interest in living resources and environment studies. Brest is the main centre for deep sea research. Its missions include:

- to design and operate scientific information systems and databases in the marine domain
- to set the standards of quality to be followed for data banking
- to maintain an inventory of existing marine data sets in France
- to represent IFREMER in the field of scientific data management
- to provide training in its fields of competence.

In the frame of its missions, SISMER assists the French scientific teams in data management. A large part of its activity is devoted to software engineering for data bases which are not operated by SISMER but by these scientific teams. Both Nantes and Brest groups have software engineering teams.

The SISMER *Interface Scientifique* team in Brest operates the national oceanographic data and information archiving system. This team participates also to international programmes and is the contact point for international oceanographic data exchange (IODE programme).

Database Development

During the last years, the following databases have been created or upgraded :

- Coastal environment and national monitoring network
- Sea products manufacturing
- Fisheries resources
- TOGA/WOCE database
- SISMER information server

The later database has been realised in Brest, to insure the safeguarding of the national oceanographic archives and to facilitate the data management of :

- Heterogeneous data types : underway records, vertical profiles
- Various disciplines : fisheries, biology, geophysics, marine physics, chemistry
- Various media : computer disks, books, videos, etc.

It also helps executing control of the data quality and organizing easy (but controlled) access to data files.

This is an integrated archiving system focused on the sea cruise information and catalogues (meta-data). It can be accessed on line through the SAFRAN user interface. Information and data requests forms are also available on WWW/INTERNET.

Data Banking Activity (Interface Scientifique team in Brest)

SISMER insures the safeguarding of the French oceanographic data belonging to the following basis data types: sea cruise information, Nansen casts, CTD, BT, underway multibeam bathymetry , gravity and magnetics. Part of the environmental network databases is also managed by the team.

General Data Holdings

- French Sea Cruises Inventory : 3600 cruise reports
- European EDMED Inventory of marine data sets for France (about 200 laboratories)
- National Monitoring Network for sea water quality database (RNO) : 30 000 coastal profiles
- National Geophysical Data Bank : data collected underway : 216 cruises
- National Physical and Chemical Data Bank : 32466 Nansen casts, 9404 CTD profiles, 1694 time series
- International TOGA/WOCE Centre of subsurface temperature data : 277000 upper temperature profiles
- European MEDATLAS Hydrological Data Bank Programme (*in preparation*).

In 1994, 101 data requests have been answered : 38 % for geophysical data, 37 % for physical and chemical oceanography, 11 % for sea cruise information and 14 % for general information on oceanographic data. The users belong to :

- IFREMER (25 %)
- French public research out of IFREMER (38 %)
- foreign public research organisations (10 %)
- French private firms (17 %)
- foreign private firms (4 %).

French Data Set in the Mediterranean Sea

617 sea cruises have been reported from 1906. Data sets are not necessarily archived for each of them : fisheries and biological data have no archiving policy, geological data and samples from cores are archived at the BRGM (French Geological Survey Data Centre in Brest). The presently available data set for physical and chemical parameters is :

- 929 CTD profiles (Fig. 1)
- 6018 Nansen Casts (Fig. 2)
- 543 current meter and temperature time series (Fig. 3)

In addition, geophysical data collected on board the JEAN CHARCOT and ATALANTE RV (Fig. 4) are composed of:

- 32 multibeam bathymetry cruises;
- 17 gravity cruises;
- 27 magnetism cruises.

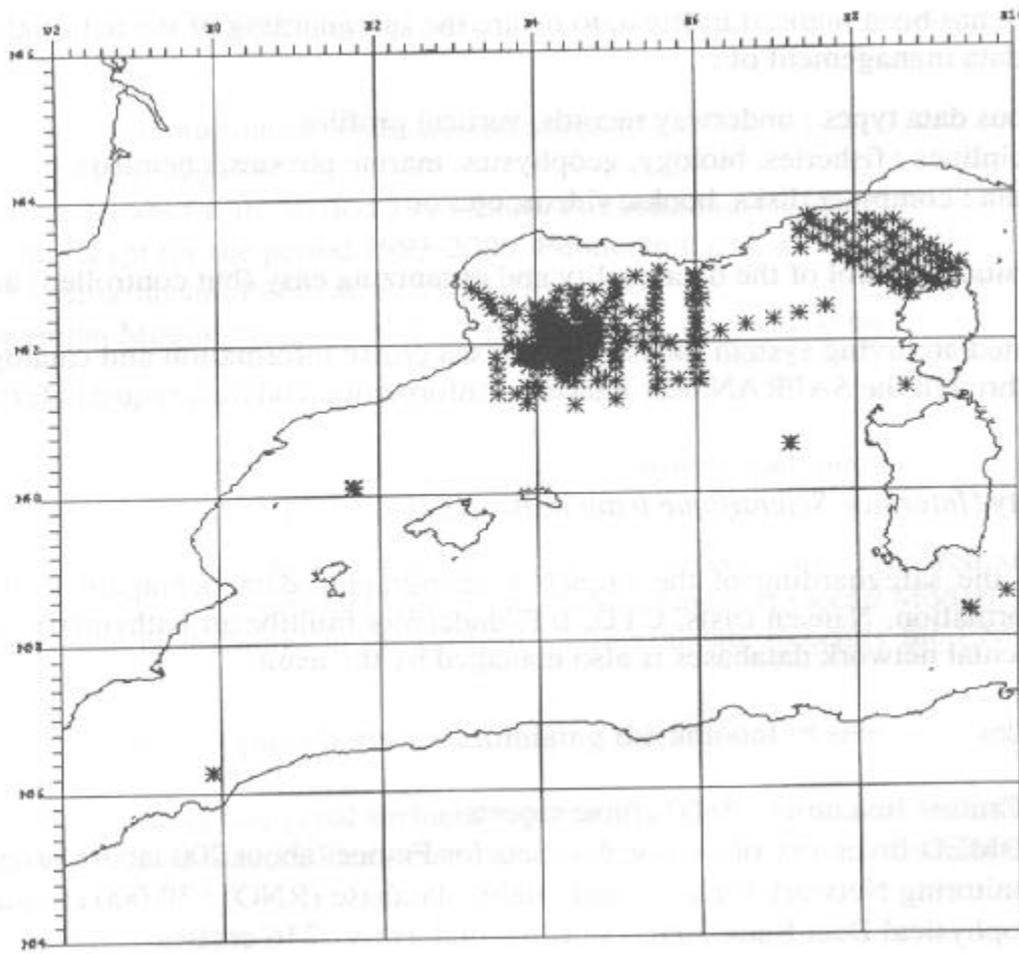


Fig. 1 - French CTD profiles in the Mediterranean Sea

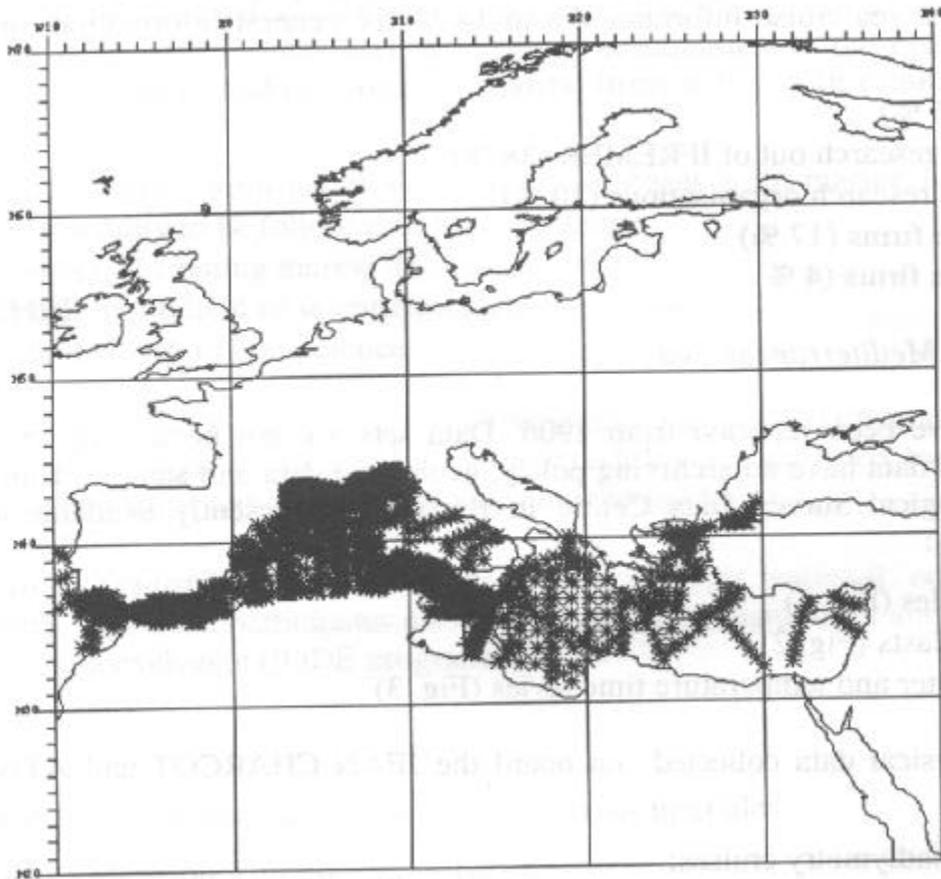


Fig. 2 - French Nansen casts in the Mediterranean

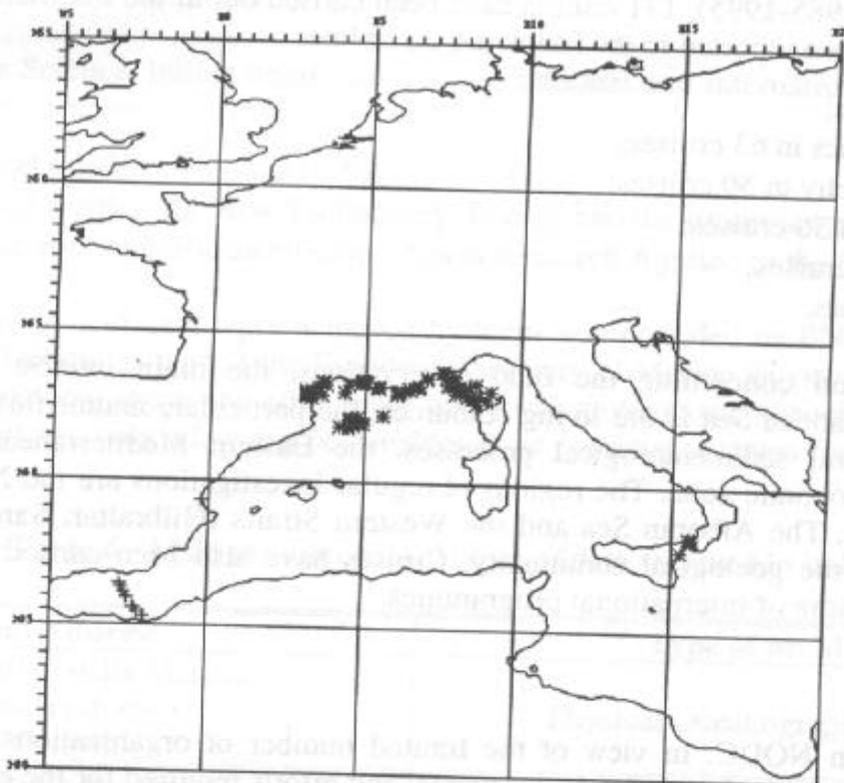


Fig. 3 - French time series in the Mediterranean Sea

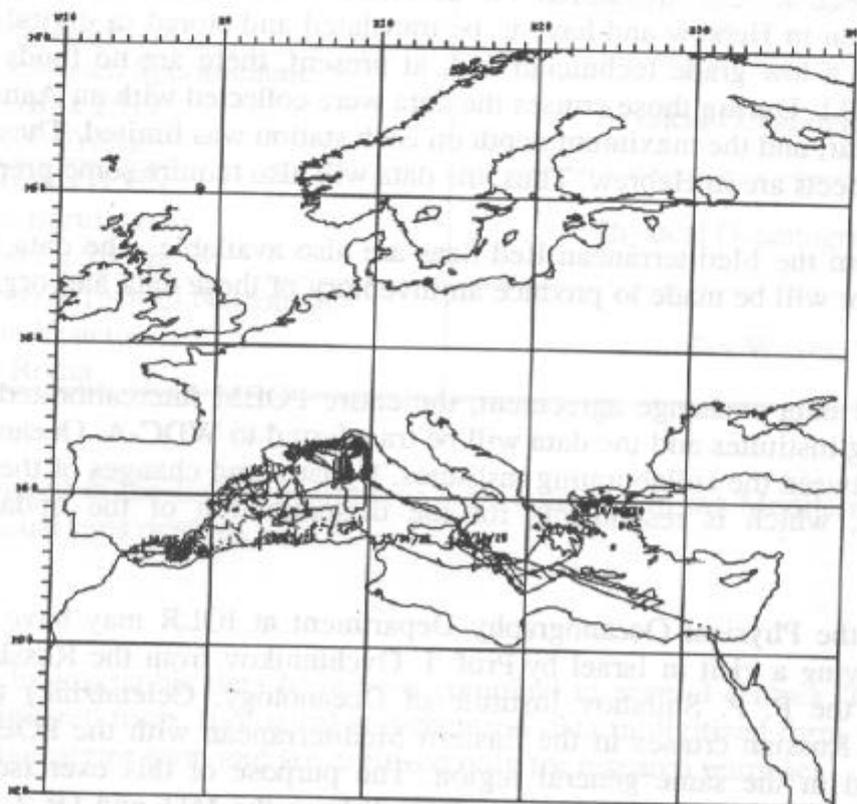


Fig. 4 - Underway geophysical data in the Mediterranean Sea

Recent French oceanographic cruises in the Mediterranean Sea

During the last decade (1985-1995), 171 cruises have been carried out in the Mediterranean Sea. Among these cruises, observations have been reported in the following disciplines :

- biology in 94 cruises;
- geology or geophysics in 63 cruises;
- physical oceanography in 50 cruises;
- fisheries research in 36 cruises;
- environment in 20 cruises;
- chemistry in 7 cruises.

As a general conclusion concerning the field observations, the main interest of the French scientific community in the Mediterranean Sea is the living resources, the particulate matter fluxes, the winter deep water convection, the tectonic and sedimentological processes, the Eastern Mediterranean Ridge and the bottom mapping of the national economic zone. The regions of regular investigations are the North-Western basin (Gulf of Lyon and Ligurian Sea), The Alboran Sea and the Western Straits (Gibraltar, Sardinia and Sicilian Straits) and the Eastern basin for the geological community. Cruises have also been carried out occasionally in other regions, primarily in the frame of international programmes.

ISRAEL

Israel does not have an NODC. In view of the limited number of organizations collecting data at sea, at present, there is no good reason to invest funds, resources, and efforts required for the establishment of an NODC. Israel encourages its marine scientists to maintain their own accessible databases and transfer the information to the WDC-A, Oceanography, at the earliest possible time.

Regarding the physical oceanographic data, the MC cruises are available for dissemination. These are some 700 stations from a series of 20 cruises (MC11 to MC30), carried out in the South Eastern Levantine basin, at intervals of three to four months, on a fixed grid of stations. The data were acquired with a Neil Brown CTD and was calibrated against temperature, pressure and salinity collected by a rosette sampler on each station. The raw data were averaged at 1 decibar and are stored on diskettes. However, the station sheets, which include meteorological data are written in Hebrew and have to be translated and stored in digital form. This will require some three months work for a low grade technician and, at present, there are no funds for it. There are seven cruises that preceded the MC11. During those cruises the data were collected with an Aanderaa current meter, the station pattern was less regular, and the maximum depth on each station was limited. These data are also available on diskettes but the station sheets are in Hebrew. Thus, the data will also require some preparation before delivery.

Some additional data from the Mediterranean Red Seas are also available. The data have been controlled by various scientists. An attempt will be made to produce an inventory of these data and organize the delivery to the GODAR project.

According to the POEM data exchange agreement, the entire POEM intercalibrated data set is available to everyone in the participating institutes and the data will be transferred to WDC-A, Oceanography, five years after the data were exchanged between the collaborating institutes. Updates and changes of the data sets are sent to the Harvard Modelling Center, which is responsible for the dissemination of the updates to the participating institutions.

One of the projects of the Physical Oceanography Department at IOLR may have a direct bearing on the mission of GODAR. Following a visit in Israel by Prof. I. Ovchinnikov from the Russian Academy of Sciences (The Southern Branch of the P. P. Shirshov Institute of Oceanology, Gelendzhik) there was an agreement achieved in comparing six Russian cruises in the Eastern Mediterranean with the POEM cruises carried out at roughly the same time and in the same general region. The purpose of this exercise is to create a common enhanced and intercalibrated data set. Prof. Malanotte Rizzoli from the MIT and Dr. I. Gertman from the IOLR are also participating in the project. The project is expected to last for 3 to 5 years and is supported by the Ministry of Energy and Infrastructure of Israel.

ITALY

Introduction

In the field of Marine Science, Italian organizations with national and international responsibilities belong to one of the three following agencies :

- the Italian National Research Council (CNR)
- the Italian National Agency for New Technology, Energy and the Environment (ENEA)
- the Italian Institute for Scientific and Technological Research Applied to the Sea (CRAM).

A list of main institutions and data types achieved by them was provided by ENEA and OGS ('Osservatorio Geofisico Sperimentale', Trieste) as part of the European Directory of Marine Environmental Data (EDMED). In addition to these organizations, there are other state and local government agencies and academic institutes, however among those agencies, only a few can be considered as potential partners for data archeology and rescue projects (Table 6).

Table 6 - Main institutions and types of data archived in Italy

Name and Address	Type of archived data
Istituto Idrografico della Marina P.so dell'Osservatorio 1 16100 Genova	Physical Oceanography, Cartography
Istituto Superiore di Sanità V.le R. Margherita Roma	Bathing Waters
Istituto Centrale Ricerca Scientifica e Tecnologica Applicata al Mare Via L. Respighi 5 Roma	Fisheries, Biology
Marine Environment Research Centre P.O. Box 316 19100 La Spezia	Physical Oceanography, Cartography
Osservatorio Geofisico Sperimentale P.O. Box 2011 34100 Trieste	Physical Oceanography, Geophysics
SACLANTCEN V.le S. Bartolomeo 19100 La Spezia	Physical Oceanography, Geophysics
Dipartimento Servizi Tecnici Nazionale Via Veneto Roma	Sea Waves, Sea Level

Most of the data archived in the Italian institutions were collected in the Mediterranean Sea in the framework of national and international programmes.

Historical data

Historical records of hydrographic data have been compiled in several centres. The measurements last from 1908 to day and are in digitized form. Biological and chemical data in digitized form were gathered only recently. Old data are mainly in manuscript form and are digitized only for research purposes.

Figures 5 and 6 illustrate the time distribution of hydrological stations available from the ENEA-CRAM historical database.

Data management

Since there is not a central organization in charge of archiving historical data, different data holders have different data management policies. ENEA acquires physical, biological and chemical data for the entire Mediterranean. A backup copy of the original data is done in order to safeguard them properly. The data are controlled, validated and permanently archived.

Data distribution policy

Generally, data are available free of charge for users on a mutual data exchange basis or in the framework of cooperative programmes. ENEA develops data products such as inventories, statistics and atlases.

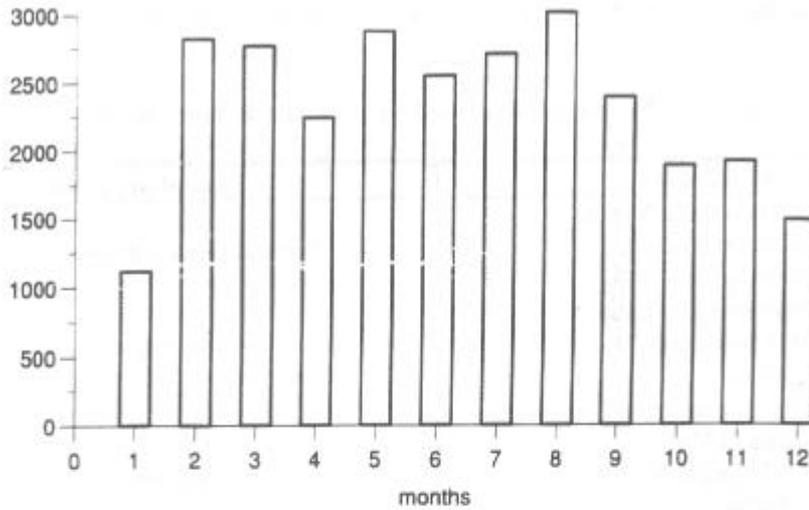
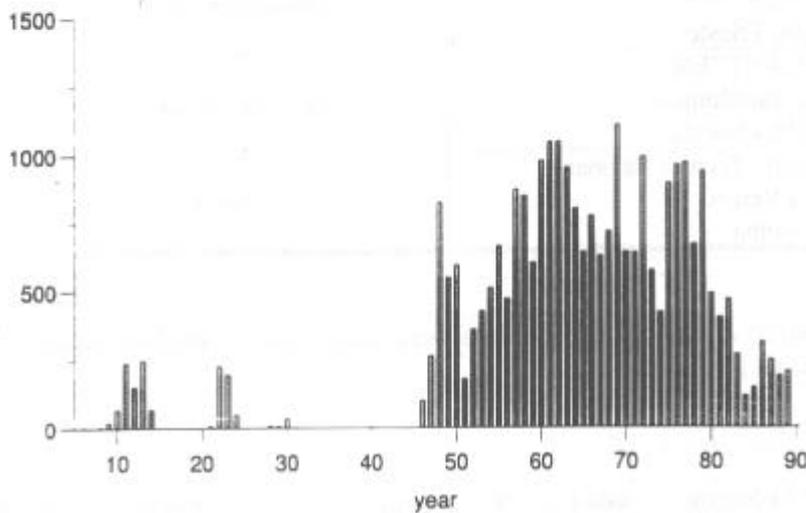


Fig. 5 - Monthly distribution of hydrological data in the ENEA-CRAM database



MALTA

Marine Research Activities in Malta

Research activities in marine sciences in Malta are currently conducted by separate organisations. The agency names, fields of research and type of collected data are given in Table 7.

There is no Marine Research Centre yet on the island although arrangements are being made and funds are being sought in order to possibly build one in the near future. There is also no National Research Fund which can adequately distribute financial support for comprehensive studies. There is also a great need for a national environmental database which amalgamates all the available information in a GIS-based system.

Most of the initiatives started only very recently and have often been undertaken in a piecemeal fashion without a co-ordinated plan of action. Moreover, lack of funding, technical personnel and priority on other interests have resulted in frequent gaps in the data series or even their complete interruption.

Historical Data

The period following the departure of the British Admiralty from Malta is exceptionally devoid of marine research and monitoring activities in the coastal area of Malta. Initiatives aimed towards localizing historical data archived in the United Kingdom have not been so far very fruitful. It is believed that the British Armed Forces, especially during the Second World War, must have collected considerable hydrographic and marine acoustic data in the strategic area around the Maltese Islands. It may also however be possible that at least a part of such data and documentation could have been lost during the dismantling of the British military base in the early 70's.

Historical records of sea water levels in the Grand Harbour have been traced at the British Hydrographic Office in Taunton and refer back to the year 1876 when the gauge was held in French Creek. The older data is recorded on thin plain roller white paper. For a period of five years starting from 1903, measurements were transferred to Ricasoli; 234 tidal sheets covering the period 3rd January 1903 to 20th March 1907 exist with each sheet containing 7 days of overlapping daily tidal records. The data set is resumed on 11th June 1908 when the tide gauge was repositioned in French Creek; according to a report of the superintending Civil Engineer at the Dockyard in Malta to the Rear Admiral, referring to a bundle of tidal records for the year 1921, the tide gauge instrument was fitted near the Boat House at the Head of French Creek. Data records on hard paper sheets exist with some gauges until 1926. Unfortunately no records were found beyond this year.

The British Hydrographic Office (BHO) is also in possession of a considerable quantity of data in the form of vertical profiles of temperature and salinity collected using bathythermographs, Nansen casts and CTD probes. In the area 35-37°N 13-16°E the database contains about 150 serial observations (Nansen and CTD) and about 2000 BTs. These data are all in a well maintained digital database and are not at any risk of loss or degradation. Plots showing the monthly distribution of station data in the area around the Maltese Islands for two instrument types, namely NEBT (XBT data) and SERD (Temperature/Salinity/Sound Velocity), have been received from BHO.

It must also be noted that the Marine Data Bank at the Meteorological Office in Bracknell, U.K., holds about 70 million observations namely from merchant ships, made throughout the world, including the Mediterranean, since the 1850s. These observations include sea surface temperature (SST), air temperature (AT) MSL pressure, wind direction and force and other parameters. Most of the SST and AT data are summarised in the Global Ocean Surface Temperature Atlas (Bottomley et al, 1990) which is freely available on paper. There is an initiative to merge this database with the slightly larger American Comprehensive Ocean Atmosphere Data Set (COADS). In addition, 8 million observations from U.K. ships have been recently located in logbooks at the Public Records Office. Nearly 25 % of this data is from the Mediterranean and funds are still being sought for their digitisation.

Table 7

<i>Agencies</i>	<i>Research Fields</i>	<i>Type of data</i>
Department of Biology University of Malta	Coastal ecology	<ul style="list-style-type: none"> • Benthic community data : - species, abundance (spreadsheets) - habitats (maps) - water quality, sediments (spreadsheets)
	Aquaculture	<ul style="list-style-type: none"> • Nutrient levels in M'Xlokk, Rinella, Mistra, Kalafrana (1975/76 manuscript/published) (1976/78 manuscript/unpublished) • Water quality parameters at fish farm sites at 3 depths+control station (WINWORD document)
	Marine ecotoxicology	<ul style="list-style-type: none"> • Monitoring of environmental levels of pollutants (maps/ charts) • Lethal toxicity levels for a range of pollutants on a range of organisms (spreadsheet)
	Plankton	<ul style="list-style-type: none"> • Counts of gelatinous zooplankton in the coastal zone of Malta (early 1980's/spreadsheet)
Meteorological Office, Luqa	Meteorology	<ul style="list-style-type: none"> • Meteorological data (analog/digital) • Sea surface data
Hydrographic Office, Malta Maritime Authority	Hydrography	<ul style="list-style-type: none"> • Coastal bathymetry (digital) • Tides (analog)
Marine Resources Network, Malta Council for Science and Technology	Meteorology/Physical Oceanography	<ul style="list-style-type: none"> • Meteorological data (digital) • Sea level, tide (digital) • Currents • CTD
Euromed Centre on Insular Coastal Dynamics (F.I.S.)	Coastal geomorphology	<ul style="list-style-type: none"> • Beach profiling (charts) • Seabed sediment • Granulometry
Department of Geography, University of Malta	Land use studies	<ul style="list-style-type: none"> • Rock type (charts) • Erosion (charts)
Oil Division, Office of the Prime Minister	Geophysical	<ul style="list-style-type: none"> • Marine seismic data
Malta Freeport Company Limited	Wave climate	<ul style="list-style-type: none"> • Wave heights and spectra (digital)

MOROCCO

The Scientific Institute of Marine Fisheries was created in 1969. Its laboratories are located in Casablanca city, and the biological stations are in the major harbours all around the kingdom. The axes of research are articulated around six main themes :

- Knowledge of resources and their dynamic aspect in the perspective of a rational management;
- Support to the Administration in elaborating management and development plans;
- Support to the profession, by developing and improving the fishing technology and also by compiling maps of fish distributions;
- Study of aquacole potentialities and monitoring of the development of aquaculture;
- Study of marine pollution and its impact on fisheries resources and marine water quality;
- Oceanographic research.

The Institute also maintains historical sets of ocean data archived both in computerised and manuscript form. Various kinds of data are available :

- Oceanographic data : temperature, salinity, dissolved oxygen, nutrients (phosphate, nitrate, nitrite, and ammonium), chlorophyll and primary production.
- Meteorological data : wind direction and speed, air temperature and pluviometry.
- Biological data about individual weight and age of fish species sampled in different sectors of the country.
- Biological data for resource evaluation, realised either on board of research ships, or by daily sampling in harbours.
- Data and information on the quality of the marine environment

PORTUGAL

Report contains information on ocean data holdings in the possession of the *Instituto Hidrografico* (IH) of Portugal. IH area of interest, 6°W - 36°W and 29°N - 45°N, includes the territorial waters and the national Economic Exclusive Zone. However, it may be expanded if needed.

Data holdings are organized according to the different collecting methods and include oceanographic cruise data, data from BT stations, current meter data, meteorological data and data collected by a wave recorder network and a national tide gauge network.

IH is in the process of implementing a computer aided cartography system. This will allow to use a powerful computer system to organize data with Ingres database management software.

In 1987 the Institute started a survey aimed at making an inventory of all existing data for the area of interest mentioned above. The results of this survey are summarized below:

- *Meteorological data.* There are 11 meteorological stations along the coast making measurements of sea surface conditions since 1980. Data are recorded every 30 minutes, have been digitised and stored on magnetic support. For some locations there are fairly long time series.
- *Tides.* Tidal data have been collected since 1935 and form the basis for national tide tables. Though original tide gauge records are being kept, all data have been digitized and are available. The new generation of tide gauges installed in Ponta Delgada-Açores, Funchal-Madeira and Cascais-Lisboa, supply data in digital format, which are made available to the GLOSS programme.
- *Wave recorders.* The network has been in operation since 1980. Part of the data is on magnetic reels from the early days. Now IH is operating five directional and seven non-directional wave moored buoys. All data are on magnetic tapes.

•*Currents*. There were about 700 current meter stations implemented since 1975. The metadata concerning the moorings is organized in a database on a Hewlett Packard series 3700 workstation. There is a plan to transfer all these data to the Ingres system, during the current year. Time series from a couple of days to six months have been acquired at these moorings. All data exist either in the original reels or digitized on magnetic tapes.

•*BT*. Bathythermographic data have been received by IH from Portuguese Navy ships since 1957 (Fig. 7). These data are filed by year and cruises. The oldest data are from the area near the coast of Africa, Cabo Verde and Mozambique. The total number of stations is about 25000. There is a peak in the number of stations between 1962 and 1968 due to a special programme during which systematic data collection was made along standard sections. In more recent years there were only very few observations made. IH has organized the data, recovered them from punched cards to PC, and after a quality control checking, a data base will be implemented on a Hewlett Packard series 3700 workstation using Ingres software. Navy ships today are equipped with new BT sensors that provide data in digital format. Figures 8 to 10 show geographic distributions of some BT data available at IH.

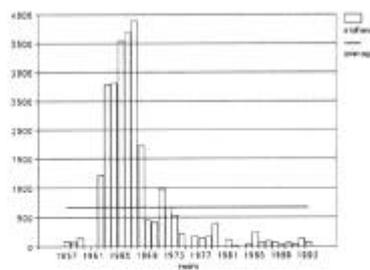


Fig. 7 - Distribution range of BT stations

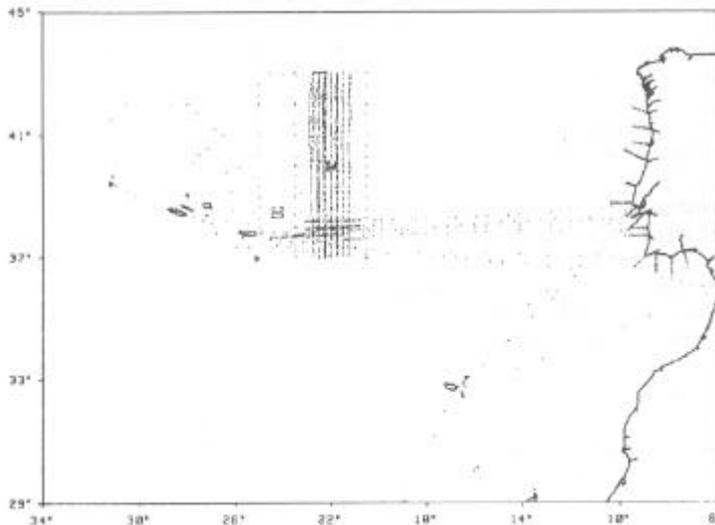


Fig. 8 - Area coverage of BT stations in 1965

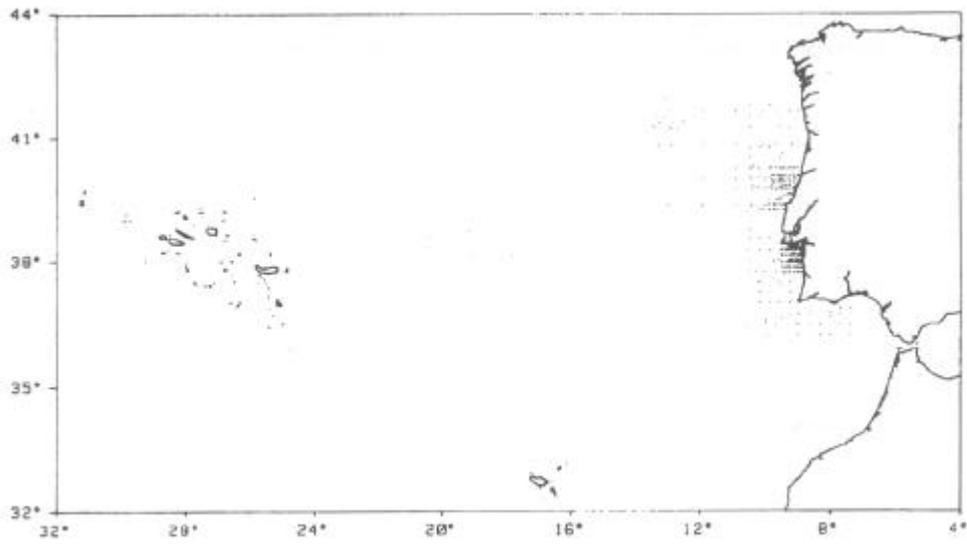


Fig. 9 - Area coverage of BT stations from 1970 to 1979

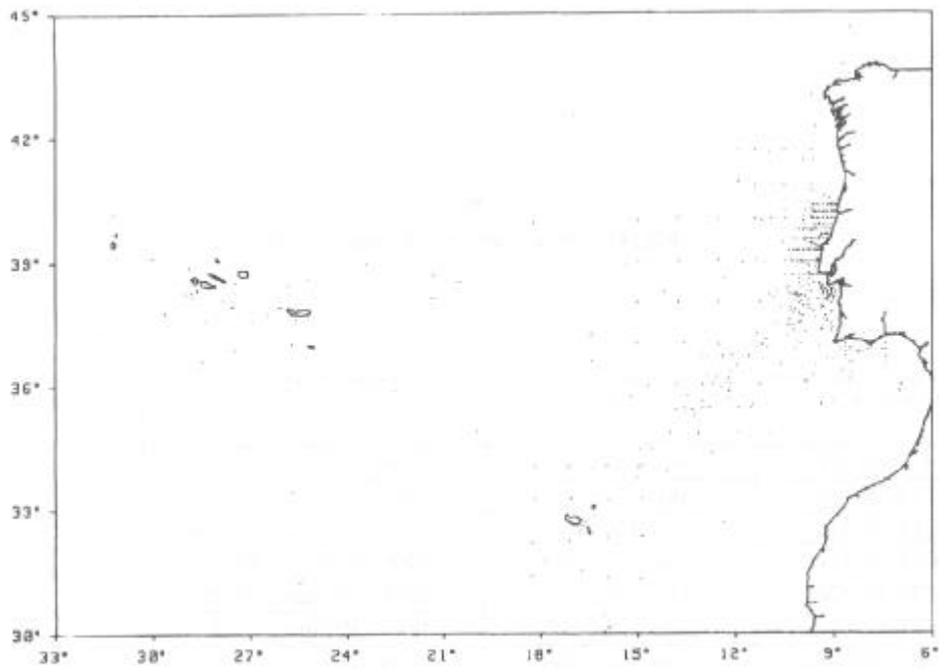


Fig. 10 - Area coverage of BT stations from 1980 to 1989

•*Nansen casts*. Some years ago IH has developed an inventory of portuguese oceanographic cruises where Nansen casts were made. Data were tracked from 1923 onwards. Historical portuguese data from WDC-A, Washington, were corrected and merged with new data up to 1986. In the IH area of interest there are 5840 portuguese stations, out of which about 1300 have been made by the portuguese Institute of Marine Research (IPIMAR). Figure 11 shows the geographical location of these stations.

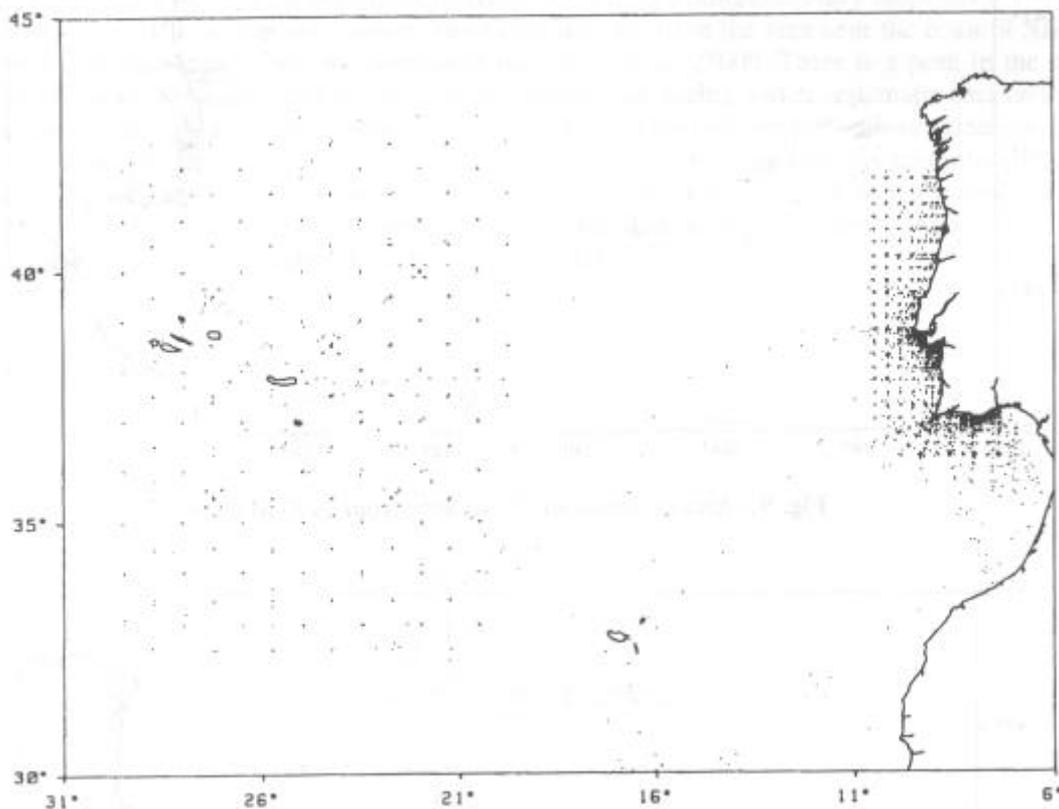


Fig. 11 - Area coverage of Nansen casts

Fig. 11 - Area coverage of Nansen casts

Table 8

Cruise names	Platform	Cruise period	Number of stations
CECIR XI	Alm. Carvalho	1986 25 Sep - 16 Oct	139
CECIR XII	Alm. Carvalho	1987 09 May - 21 May	205
CECIR XIII	Alm. Carvalho	1987 12 Aug - 20 Aug	117
CECIR XIV	Alm. Carvalho	1988 03 May - 10 May	104
CECIR XV	Alm. Carvalho	1988 07 Dec - 14 Dec	120
CECIR XVI	Alm. Carvalho	1989 30 Nov - 13 Dec	100
CECIR XVII	Alm. Carvalho	1990 26 Mar - 20 Apr	215
CECIR XVIII	Alm. Carvalho	1991 15 Jul - 05 Aug	155
CECIR XIX	Alm. Carvalho	1992 13 Jul - 31 Jul	70
CODFRA93	Arquipélago	1993 27 Jul - 29 Jul	14
SADTEX I	Auriga	1994 11 Jul - 05 Aug	31
SEFOS-9401	Alm. Carvalho	1994 27 Nov - 09 Dec	108

•*CTD*. There were 1400 CTD stations made from 1986 up to 1994. CTD data are on tapes, organized by cruise, and are generally published in reports. Table 8 lists different cruises where CTD casts were made. Figure 12 shows the area coverage of CTD stations. All data are stored in ASCII format.

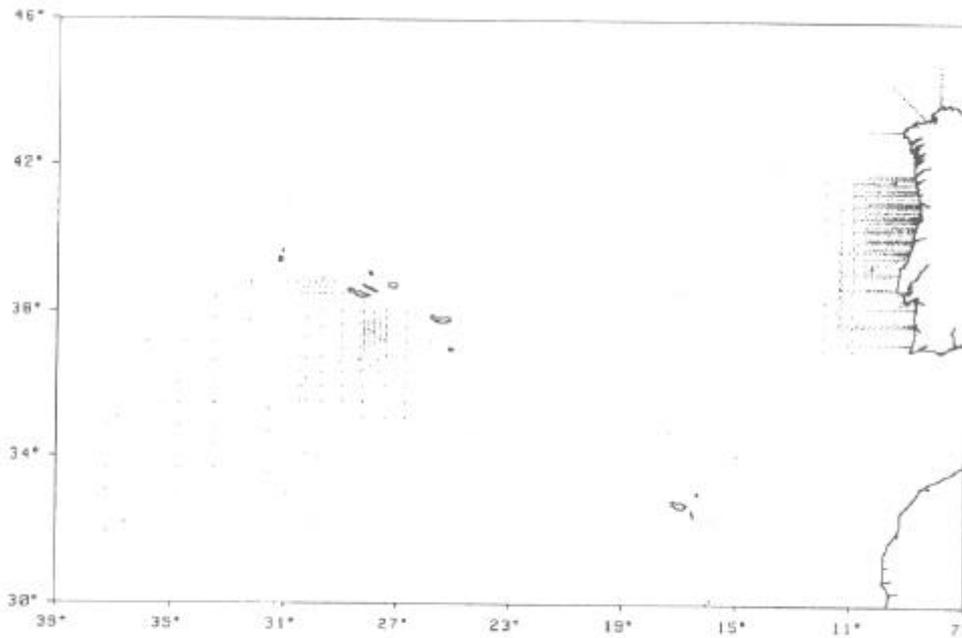


Fig. 12- Area coverage of CTD stations

RUSSIA

Introduction

Marine organizations of the former USSR started oceanographic observation in the Mediterranean Sea more than 40 years ago. Hydro-meteorological, hydrological/hydro-chemical, current meter, chemical pollution, biological observations for this area were made by 48 scientific and hydrographic ships which belonged to more than 15 national institutions. In accordance with the national data management policy, the USSR data originators were submitting oceanographic cruise data to Russian NODC (RIHMI-WDC) for inventorying, archiving, storing and dissemination of data.

At present, several centres and institutes in the Russian Federation are involved in the accumulation, management and usage of the oceanographic data for the Mediterranean Sea :

- Russian Scientific Research Institute of HydroMeteorological Information - World Data Centre B - RIHMI-WDC (Russian NODC), Obninsk, Kaluga region;
- Oceanographic Data Centre of Ministry of Defense (NAVY ODC), St Petersburg;
- Institute of Oceanology (IORAN), Academy of Science, Moscow, Gelendgick;
- Russian Research Institute of Fisheries and Oceanography (VNIRO), Moscow.

Some other institutes implemented oceanographic observations in this area during long time period :

- Arctic and Antarctic Research Institute (AARI), St. Petersburg;
- Far-East Research Institute of HydroMeteorological information (DVNIGMI), Vladivostok;
- Acoustic Institute of Russian Academy of Sciences (AKIN), Moscow;
- Moscow State University (MGU), Moscow.

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

Russian NODC holds the following oceanographic data archives for the Mediterranean sea (Table 9) :

- hydro-meteorological surface observations;
- Nansen hydrological/hydrochemical, CTD and bathythermographic observations;
- current meter observations;
- chemical pollution observations.

There are two types of hydro-meteorological and oceanographic data which are stored at RIHMI-WDC :

- data from marine organizations of Russia (from organizations of the former USSR);
- data from NODCs of other countries archived as WDC-B holdings.

Table 9 - Oceanographic data holdings of the Russian NODC/WDC-B for the Mediterranean sea (cruises number for countries and observation type excepting MEDALPEX)

Country	Period	Number of cruises	T/S ⁽¹⁾	Chem ⁽²⁾	BT ⁽³⁾	Curr ⁽⁴⁾	Pol ⁽⁵⁾
Austria	1911-12	3	3	-	-	-	-
Belgium	1961, 81-82	2	2	-	-	-	-
Denmark	1908-28	4	4	-	-	-	-
France	1926-70	76	76	4	5	-	-
Germany	1911, 67-71	4	4	-	-	-	-
Great Britain	1926, 51-57	5	5	1	-	-	-
Greece	1946-49	3	3	-	-	-	-
Ireland	1926	1	1	-	-	-	-
Israel	1962-71	18	18	11	-	-	-
Italy	1955-71	52	52	9	1	1	-
Morocco	1958	1	1	-	-	-	-
Netherlands	1929	1	1	-	-	-	-
Norway	1910, 22, 61-65	5	5	1	-	1	-
Portugal	1923-34	9	9	-	-	-	-
South Africa	1969	1	1	1	-	-	-
Spain	1915, 26, 34-81	16	16	8	-	-	-
Sweden	1948	1	1	-	-	-	-
Tunisia	1972	2	2	-	-	-	-
USA	1948-72	11	11	-	-	-	18
former USSR	1954-91	584	472	384	137	73	2
former Yugoslavia	1947-65	15	15	2	6	-	-
TOTAL	1910-1991	814					

⁽¹⁾T/S Nansen temperature and salinity

⁽²⁾Chem Nansen hydro-chemistry

⁽³⁾BT Bathythermographs

⁽⁴⁾Curr Current meter

⁽⁵⁾Pol Pollution

Table 10 - Oceanographic data holdings of the Russian NODC/WDC-B for the Mediterranean sea (cruises number for countries and years excepting MEDALPEX)

Country	before 1950	1950-60	1961-70	1971-80	after 1980	Total
Austria	3	0	0	0	0	3
Belgium	0	0	1	0	1	2
Denmark	4	0	0	0	0	4
France	0	38	25	3	0	76
Germany	1	0	2	1	0	4
Great Britain	1	4	0	0	0	5
Greece	3	0	0	0	0	3
Ireland	1	0	0	0	0	1
Israel	0	0	15	3	0	18
Italy	0	31	16	4	1	52
Morocco	0	1	0	0	0	1
Netherlands	1	0	0	0	0	1
Norway	2	0	3	0	0	5
Portugal	9	0	0	0	0	9
South Africa	0	0	1	0	0	1
Spain	8	5	2	0	1	16
Sweden	1	0	0	0	0	1
Tunisia	0	0	0	2	0	2
USA	1	2	5	3	0	11
former USSR	0	7	45	175	357	584
former Yugoslavia	6	8	1	0	0	15
TOTAL	51	96	116	191	360	814

WDC-B data

WDC-B holds oceanographic cruise data collected by 21 IOC Member States in the Mediterranean sea for the period 1950-1970:

- data collected by WDC-B from IOC projects - "The Cooperative investigation of the Mediterranean" and MEDALPEX;
- data submitted by countries to WDC-B in accordance with NOP/DNP procedures.

At present, WDC-B holdings for the Mediterranean sea consist of oceanographic data from 323 cruises (about 19000 oceanographic stations/BT profiles). Part of this data (about 65-70 %) is on technical carriers (magnetic tapes) and safeguarded in RIHMI-WDC archives.

National data

Russian NODC holds oceanographic data from 584 cruises (about 26000 oceanographic stations, 12000 BT profiles, 520 CTD profiles, 320 current meter time series, 2800 pollution casts) and surface hydro-meteorological data (660000 observations) for 1958-1991.

Data were submitted by 10 marine organizations of Russia and Ukraine. Most of these data were obtained from the Ukraine Scientific Centre of the Ecology of the Sea, which is the former Odessa branch of the State Oceanographic Institute of USSR (288 cruises from 1970 to 1991), and the Hydrographic Service of the USSR Navy (127 cruises from 1958 to 1991). Depending on data types, different amounts of oceanographic data are stored on technical carriers :

- hydrology/hydro-chemistry (20 % of the data are on technical carriers);
- current meter data (40-45 % are on technical carriers);
- pollution data (all in manuscript form);
- surface hydro-meteorology (85-90 % are on technical carriers).

Space-time distribution of oceanographic data

Analysis of distribution maps of oceanographic observations for 1908-1994 developed by NODC and Table 10 allow to conclude that :

- observations for 1908-1994 are more or less equally distributed over the Mediterranean with the exception of the southern part of the Central Basin (Gulf of Sidra) and the western part of the Eastern Basin;
- the largest density of observations is in the central part of the sea and in the Algerian-Provençal Basin;
- observations for 1908-1970 are distributed almost equally over the sea but the Adriatic Sea and Gibraltar area have the highest number of oceanographic and BT stations ;
- a large amount of observations correspond to 1981-1990 (about 45 %). The data distribution is strongly varying from place to place.

Data management

Russian NODC provides description of all submitted data in supporting reference data base : ROSCOP (about 10 % of cruise data), Russian NODC form (100 %), formats, codes tables for geographic area, parameters, units, etc. All submitted data are permanently archived at the RIHMI-WDC in the data originator formats and Russian NODC formats. Data becoming available to the Russian NODC in manuscript form are digitized by RIHMI-WDC and are written on technical carriers in Russian NODC formats. Data which were submitted on technical media (tapes, diskettes, ...) are reformatted into Russian NODC formats. All data (in manuscripts and on technical carriers) are quality controlled, structure and contents checked.

Data and information products

Russian NODC makes the following products available on users requests :

- selected (regional, for parameters, for time period) reference data base including the facilities for searching and displaying the information about data;
- selected multilevel data base : space-oriented and time-series data; climatic characteristics using robust methods of statistical analysis; climatic fields (average, deviation) for temperature and salinity.

An atlas of climatic characteristics (T, S, O₂ for months and standard depths) was developed in 1984 and was published by Russian NODC and the southern branch of the Institute of Oceanology, Academy of Science. Today, Russian NODC can provide users with derived data base along with PC software to access, search, process (using statistical methods) oceanographic data, to display data and calculate statistics in textual and graphic forms.

Oceanographic data holdings in other organizations of the Russian Federation

A few marine organizations of Russia have oceanographic data for the Mediterranean Sea, which were not included into Russian NODC holdings :

- the ODC of the Navy now holds about 5000 oceanographic stations and 10000 MBT profiles (declassified data) in manuscript form;
- IO has 350-400 oceanographic stations and CTD casts in manuscript form;
- Moscow University has about 1000 oceanographic stations in manuscript form;
- VNIRO holds biological data sets which were obtained from regional branches of the institute (UgNIRO, AtlantNIRO). These data might be lost due to financial problems and lack of facilities for archiving.

Oceanographic data search and rescue

Procedures and rules have been developed for the search of oceanographic data on national basis by comparing data holdings inventories in NODC and other marine organizations. The compared data sets of NODC, Navy ODC and IO allowed to find additional data including those for the Mediterranean Sea. Now Russian NODC concentrates the efforts to digitize oceanographic data for the open parts of the World Ocean and former USSR seas. Financial support is needed to carry out the search and digitization of data for the Mediterranean Sea.

SPAIN

The data on the marine environment existing in Spain are dispersed in collections maintained by different institutes, academic departments, laboratories, and private companies. The formats range from professionally managed holdings and computer databases to *ad hoc* files, hard copy data, analog records, images, and geological and biological samples.

The Spanish Inventory of Marine Data Sets (IEDO) was developed to provide users with the relevant information about data sources, with the aim to set up appropriate strategies for managing and exploiting the data. IEDO is maintained and updated by the Instituto Español de Oceanografía (IEO) Data Centre. The information contained in the inventory has been derived from questionnaires sent out to almost all marine scientists within Spain.

IEDO includes information of Spanish collections of marine data and describes their contents, location, format and accessibility conditions. The inventory covers physical, chemical and biological oceanography, natural resources, marine meteorology, ecology, underwater acoustics, environmental quality, marine geology and geophysics.

Although the inventory is targeted primarily at data sets that can be accessible to other users, encouragement is also given to holders of data with confidential or restricted availability, in order to make them known through the inventory.

The largest sector which contributed information for the inventory was academic with 23 responses to the questionnaire. Over 25 % of information was contributed by central government departments or research institutes. The local government agencies comprise 17 % and the port authorities and the private and commercial sectors account for less than 3 % of the total number of responses. It is important to understand that these figures represent percentage of responses provided by different users groups and do not give any indication of the volume of marine data held in each group.

When categorizing the data by disciplines, one finds a large number of sets in marine resources (76), biological oceanography (59), marine geology (46), environmental quality (45), and physical (42) and chemical oceanography (41). At the same time, there were relatively few sets dedicated to marine meteorology (4), remote sensing (2) and underwater acoustic (2). It was noted that these figures do not indicate the size of data collections. Indeed, the largest volumes of data correspond to physical oceanography.

The inventory includes also information on the storage media adopted for archives which vary from one group of data holders to another. The data from academic institutions appear to be stored mostly on floppy disks and hard copy tables. The central government group uses a combination of magnetic tape, floppy disk, hard copy, charts and maps. The remaining groups use a variety of storage formats. For recent data sets, the use of computer technology is prevalent in all the contributing bodies.

The data in this inventory are classified as either *freely available*, *restricted* or *confidential*. *Restricted data* typically means that availability depends on who requires it and more importantly, what use is intended. The *confidential data* category usually applies to work commissioned to certain industries. Most of the data collected by government institutions are *freely available*. Most data from the academic institutions are categorized as *restricted* or *freely available* at almost the same percent level. Finally, data from private and commercial sectors are usually classified as *confidential* or *restricted*.

There is evidently a strong awareness of the importance of quality control of data, but with a few exceptions to date, the practice of interlaboratory calibration and application of standard quality control procedures are not properly used. The degree to which quality assurance (QA) is achieved by the users is highly variable. Depending on training, professionalism and the importance of projects, scientists perform quality control procedures to some degree; however there are no formal procedures established in the current data management practice.

Growing concern over the quality of data in the marine environment has resulted in an increased demand for formal quality control procedures. Organizations require that data used in decision-making accurately describe the situation. Inaccurate data restrict the ability to draw valid conclusions and may even lead to false or misleading conclusions.

UKRAINE

In Ukraine, activities aimed at the establishment of a national system for compiling, transfer, storage, analysis and dissemination of oceanographic data and information (project "National oceanographic data bank") were initiated in 1993 in the framework of the national scientific-and-technological program for the exploration and utilization of the World Ocean for the benefit of Ukraine's economy and science. The program was funded by the State Committee for Science and Technology. Since 1994, these activities are being conducted in the framework of the national program for the study and use of resources of the Azov Sea - Black Sea basin and other World Ocean regions. Financial support is provided by the National Agency for Marine Investigations and Technologies.

The leading institution of the project is the Marine Hydrophysical Institute (MHI) of the Ukrainian National Academy of Sciences (Sevastopol). Other participants of the project are :

- Institute of Geological Sciences (IGS), Ukrainian National Academy of Sciences (Kiev);
- Southern Scientific Research Institute of Marine Fisheries and Oceanography (SSRIMFO), Ministry of Fisheries of Ukraine (Kerch),
- Ukrainian Scientific Centre of Ecology of Sea, Ministry of Environment of Ukraine (UkrSCES), former Odessa Branch of the State Oceanographic Institute (Odessa),
- Institute of Biology of Southern Seas (IBSS), Ukrainian National Academy of Sciences (Sevastopol),
- Odessa Branch of the Institute of Biology of Southern Seas, Ukrainian National Academy of Sciences (Odessa),
- Marine Scientific-Information Association, State HydroMeteorological Committee of Ukraine (MSIA), former Sevastopol Branch of the State Oceanographic Institute (Sevastopol),
- Experimental Branch of the Marine Hydrophysical Institute (MHI) of the Ukrainian National Academy of Sciences (Katsiveli, Crimea),
- Ukrainian Scientific Centre of Water Protection, Ministry of Environment of Ukraine (Kharkov).

Software and technology for the national oceanographic data bank are being developed by :

- Institute of Cybernetics, Ukrainian National Academy of Sciences (Kiev),
- Scientific-trade Centre "ORBITA" of the Institute of Cybernetics, Ukrainian National Academy of Sciences (Odessa),
- Scientific-trade Union "TOPAZ-INFORM" (Kiev).

The concept and principles of constructing a national distributed oceanographic information system have been developed, which included the foundation of four oceanographic data centres for:

- oceanographic and satellite data at MHI,
- nonliving marine resources at IGS,
- living marine resources at SSRIMFO,
- marine environment pollution at UkrSCES.

At the end of 1994, the first version of the data catalogue on sea environment and resources was developed in Ukraine on the basis of data provided by all marine institutions of Ukraine referred to above. To date, the catalogue comprises information about 515 data sets: 45 sets pertaining to marine geology and geophysics, 74 to marine biology and living resources, and 14 to marine environmental pollution. The rest of the sets contain hydrophysical, chemical and meteorological data.

The oceanographic data for the Mediterranean Sea are being stored in the archives of the following Ukrainian institutions:

Marine Hydrophysical Institute (MHI)

Research vessels of MHI carried out measurements in the Mediterranean Sea during 48 cruises, primarily in the eastern part of the Aegean and Levantin Seas, in the Alboran Sea and in the Gulf of Lions (Fig. 13). Overall about 1600 stations had been made. The measurements were performed from 1968 up to 1994 during all seasons (Fig. 14). The following parameters were measured:

- temperature and salinity (Nansen bottles, MBT, CTD);
- currents (moorings);
- meteorological data;
- actinometric data;
- chemical parameters (dissolved oxygen, pH, alkalinity, phosphate, nitrate, nitrite, ammonium, silicate);
- hydro-optical parameters (Secchi disk depth, vertical profiles of spectral transparency, color index, scattering function, radiance index spectra, bioluminescence);
- radioactivity (Sr-90, Cs-134, Cs-137, Ce-144, Rn-222);
- biological data (chlorophyll primary production, phyto-, zoo-, and ichthyoplankton, squid, etc).

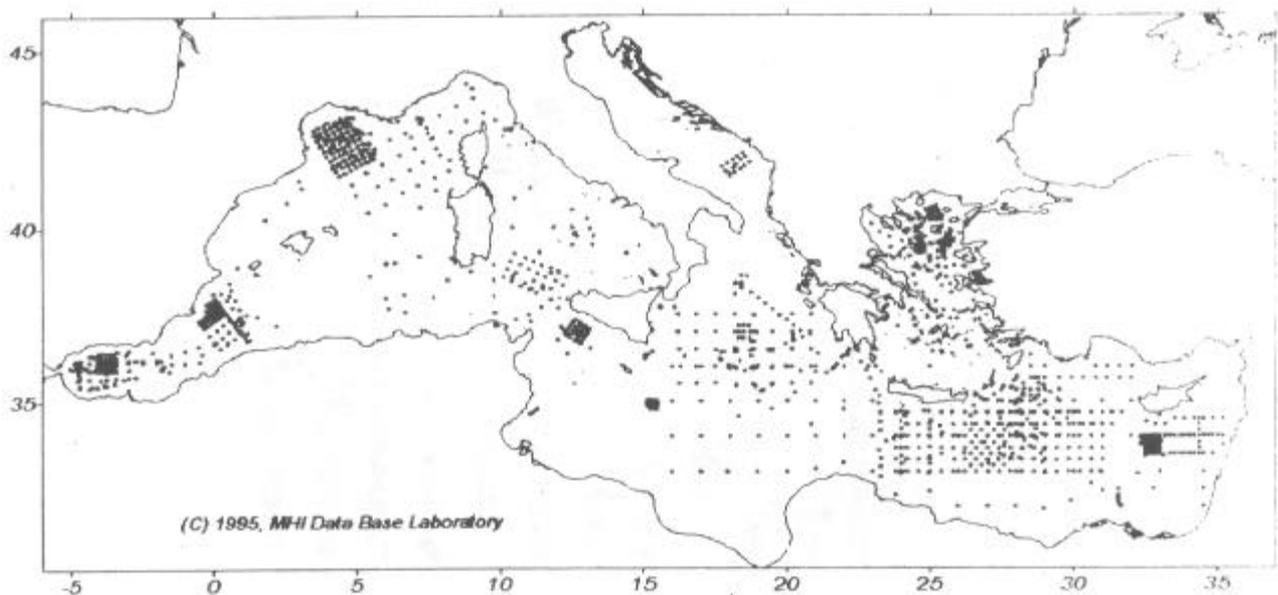


Fig. 13 - Position of stations occupied by MHI's Research Vessels (1968-1994)

Biological data were obtained by the scientists of the Institute of Biology of Southern Seas (IBSS) and the data are kept in IBSS. Additional measurements were made in some cruises, for example, continuous measurements of the fine structure of temperature in the surface layer.

MHI has a special reference database, which includes all information about R/V cruises (time, scientific staff, types of measurements, used instruments, coordinates of stations).

Regretfully, only part of the data collected by research vessels after 1983 is stored in a computer readable form. The data are being kept in the form of tables, punched cards, etc. As of today only 20 % of the data have been transferred onto modern data carriers.

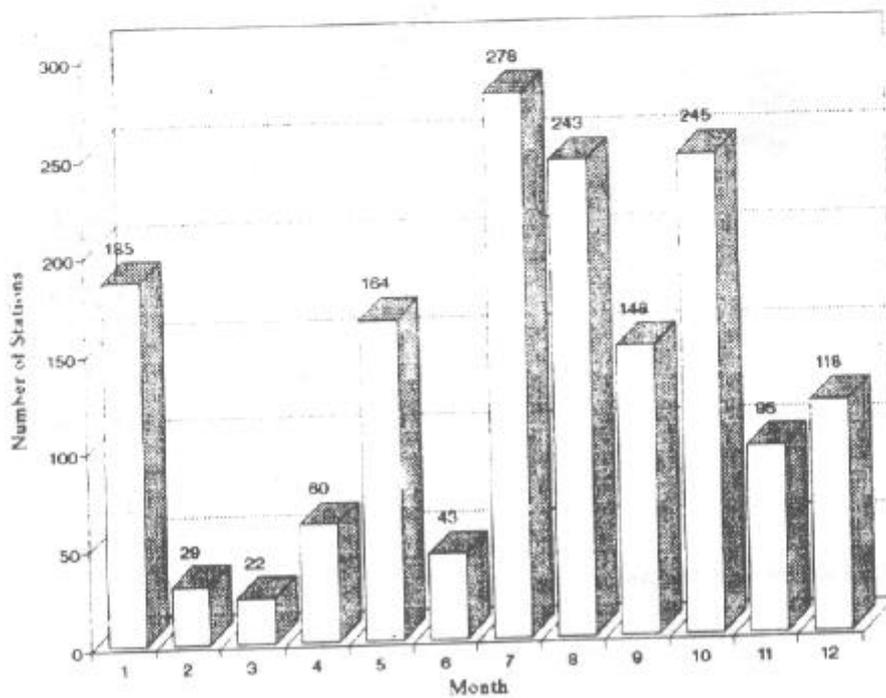
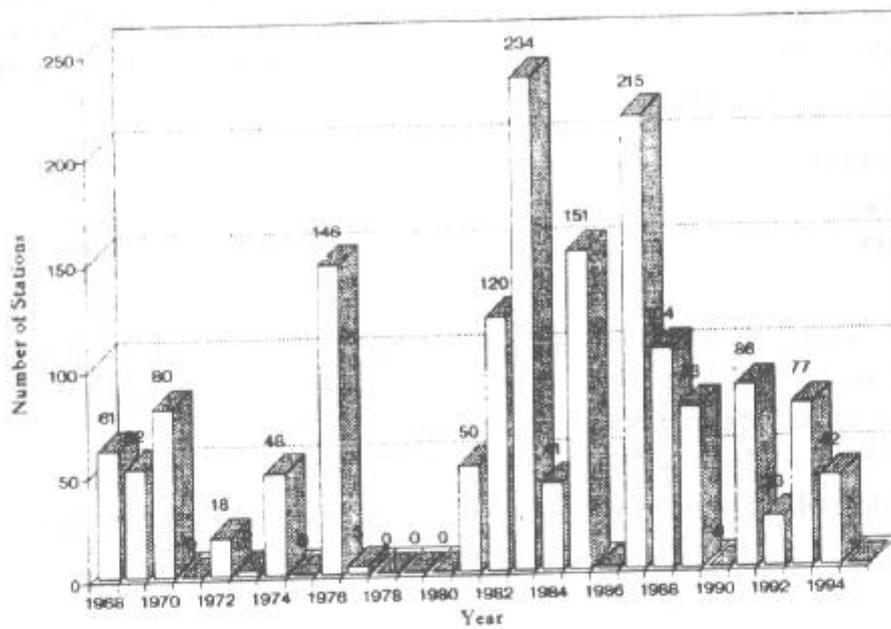


Fig. 14 - Time distribution of stations

Southern Scientific Research Institute of Marine Fisheries and Oceanography (SSRIMFO)

Research vessels of SSRIMFO carried out measurements in the Mediterranean Sea from 1959 to 1984 during 8 cruises. The following parameters were measured:

- temperature 339 stations
- salinity 325 stations
- dissolved oxygen 286 stations
- phosphate 228 stations
- silicate 230 stations

The Mediterranean Sea was not the main research interest for SSRIMFO and all data are still stored in the form of tables. For loading in a database these data have to be checked and transferred onto modern data carriers.

Ukrainian Scientific Centre of the Ecology of Sea (UkrSCES)

Research vessels of UkrSCES carried out measurements in the Mediterranean Sea during many cruises. Most measurements were done in the eastern part of the sea. The measurements were performed from 1985 up to 1991. More than 8000 stations had been made and the following parameters were measured:

- temperature and salinity
- meteorology
- chemistry.

Most data are being kept in the form of tables and reports.

Institute of Biology of Southern Seas (IBSS)

Research vessels of IBSS carried out measurements in the Mediterranean Sea during more than 65 cruises. The measurements were made by research vessels "Akademik Kovalevsky" (1958-1990) and "Professor Vodyanitsky" (1977-1989) at approximately 1000 stations in the Aegean, Ionian, Adriatic, Tyrrhenian and Ligurian seas. The following parameters were measured:

- temperature and salinity (Nansen bottles, MBT, CTD);
- currents;
- bioluminescence;
- hydroacoustics;
- chemical parameters
- pollutants in particulate and dissolved forms;
- primary production, phytoplankton pigments;
- benthic organisms;
- phyto-, zoo-, and ichthyoplankton;
- fishes by species;
- microbiological parameters;
- biochemical parameters.

Only 10 % of data are kept in the institute archives, other data are kept by the principal investigators. An inventory of data is currently being prepared. All data are still stored in form of tables and reports. For loading in a database the data have to be checked and transferred onto modern data carriers.

Odessa Branch of the Institute of Biology of Southern Seas

Research vessels of the Odessa Branch of IBSS carried out measurements in the Mediterranean Sea during 65 cruises. Most measurements were made in the Aegean Sea, from 1972 up to 1990. The following parameters were measured:

- temperature and salinity;
- currents;
- waves;
- Secchi disk and Forel Ule color scale;
 - chemical parameters (dissolved oxygen, pH, 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 parameters;
- biochemical parameters.

Only 10 % of the data have been transferred onto modern data carriers, other data are being kept in the form of tables and reports.

Marine Scientific-Information Association (MSIA)

Research vessel of MSIA carried out measurements in the Mediterranean Sea during 14 cruises, primarily in the eastern part of the sea. The measurements were made from 1973 to 1989 and the following parameters were measured:

- meteorological parameters;
- temperature and salinity;
- currents;
- chemical parameters;
- pollutants.

Most data are being kept in the form of tables and reports.

4. WORKSHOP CONCLUSIONS AND RECOMMENDATIONS

Noting the importance of marine biochemical data for the studies of marine living resources, climate changes and ocean dynamics; being aware of the difficulties in processing and exchange of this type of data, **the Workshop requested** the Project Leader and Member States to give high priority in the GODAR project to the search and rescue of this data.

The Workshop urged the IODE Chairman and GODAR Project Leader to implement an IOC Seminar on management of historical biochemical oceanographic data at the end of 1995 or beginning of 1996. It was recommended to have it prior to IODE-XV. **The Workshop emphasized** that this Seminar, if successfully implemented, will be an important contribution to the Convention on Biodiversity in the field of data management.

Realizing that in order to convince decision-makers from the region to increase funding to the GODAR project, there is a need for demonstrating the project's benefits through the development and distribution of useful products, **the Workshop recommended** that the publication of the following GODAR project product be considered and implemented by the nations of the Mediterranean as a priority issue:

Lists of distribution of oceanographic parameters. These lists should be included on an annual basis in the technical reports of WDCs on data distribution of parameter types and should be used by the WDCs for the development of an Atlas of Databases for the Mediterranean Sea. Data products should be made available without time delays to all Mediterranean countries.

Noting dramatic changes in the fresh water inflow to the Eastern Mediterranean and the increase in characteristics of water salinity which may trigger major ecological changes, **the Workshop urged** the Executive Secretary IOC to support intensive studies of the physical, chemical and biological changes in the area. **The GODAR Project Leader was requested** to help scientists in their research by starting a GODAR sub-project for the area of historical data identification.

The Workshop acknowledged the progress made by ICOD in the development of the Mediterranean Marine Information Network Directory and **recommended** that this be further extended to include information on availability of electronic facilities, like Internet, in Member States, for information exchange and dissemination of archived marine information to the end users.

To enrich the list of publications referred to in the Directory, **it was further recommended** that holders of required information located outside the geographical area under investigation should also be surveyed and results of the survey should be included in the Directory. Priority should be given to those libraries and archives, where the existence of required literature is known, a priori.

The Workshop stressed the need for distribution of the Directory not only inside but also outside the region, and **urged** IOC to co-operate with Malta in the project development and make the public aware of this initiative through the UNESCO/IOC IMS.

Recognizing that many scientific and sea-monitoring activities have been and are being implemented in the Mediterranean Sea by Member States and international organizations on national, bilateral and international basis, **the Workshop recommended** that IOC make a survey and prepare an inventory of past and on-going programmes. This survey will include, as a minimum, information on the goals and objectives of the programmes, description of sampling and analytical methodologies, references to used quality control procedures, necessary bibliographic references, etc. **The Workshop agreed** that it will be a very useful tool for the development of ocean data policy in the region and will meet especially GODAR objectives.

The Workshop noted that the European Environmental Agency in Copenhagen possesses and provides on request information on available environmental data. **The GODAR Project Leader was recommended** to establish contacts with the Agency in order to identify areas of interest and ways for mutual beneficial co-operation. **The Workshop called on** Dr. Manzella from Italy to help the GODAR Project Leader in establishing these contacts.

The Workshop noted the need for a plan of activities in the Mediterranean for future comprehensive management of the entire sea basin. Based on a sustainable use of resources, this plan will create a platform for future scientific and monitoring programmes and for the development of regional data and information networks. A complete historical dataset for the Mediterranean will undoubtedly be a pre-requisite and a solid foundation for such a plan. The plan must contemplate the enhancement of national capabilities in marine sciences and will finally reduce current inequalities especially between the Southeastern Mediterranean countries (SEM) and the Mediterranean countries of Europe (EUM). This will open the way to the implementation of a Mediterranean-wide operational oceanographic programme in line with the goals of GOOS. It will also provide a physical mechanism for the preservation of newly acquired data, in order to avoid the need of recovering data in future.

The Workshop noted the decision of the IOC-ICES Working Group on Dynamics of Harmful Algal Blooms, held in May 1994, in Spain, to establish a HAB programme database and **recommended** that the GODAR Project Leader investigate ways of co-operation between GODAR and the HAB programme in this endeavour.

The Workshop appreciated the progress achieved in the implementation of the EDMED project by the Member States of Europe. Recognizing that the EDMED format is compatible to that of MEDI, **it was recommended** that the possibility of inclusion of EDMED entries into a planned new issue of the MEDI Directory should be explored by IOC and implemented. **The Workshop expressed belief** that the results of the EDMED surveys in the European countries will be made available to a wide international community.

The Workshop acknowledged the efforts made by Croatia in the search and rescue of oceanographic data in the framework of the MEDAS project and agreed that its results will constitute an important contribution to GODAR. **The Workshop further noted** that due to political changes in the former Yugoslavia and the establishment of the Croatian State, the Government is now considering an adoption of a new national policy in marine data management and exchange. **The Workshop recommended** that the Executive Secretary IOC and the IODE Chairman address the Government of Croatia, encouraging it to acquire in national policy, internationally agreed procedures for ocean data exchange and inviting to establish an NODC in the country.

The Workshop appreciated the support provided by some Member States and international organizations in cash and kind to the GODAR project. **It noted** however, that financial contributions are limited and irregular. **It was recommended** that Member States of the Mediterranean make respective governments and decision-makers aware of the benefits which will give them participation and contribution to IODE in general, and particularly to the GODAR project. The IODE National Co-ordinators from the region were requested to recommend a wide use of the IOC Trust Fund arrangements. **It was further recommended** that the financial issue be given special attention at IODE-XV and a "funds pool" approach should be investigated. Oceanographic data centres are able to organize timely and effective data processing and exchange only if adequate support is provided by Member States and international agencies to their activities. The National Co-ordinators for IODE and the Officers of the Committee should take every opportunity for arranging support to the data centres system.

The Workshop noted that in spite of the fact that the framework of the IODE rules and procedures for the international ocean data exchange is well defined, in the IOC-ICSU Manual on IODE and in accordance with them, certain types of data should be internationally available one year after data collection, there is still a big delay of several years in data submission to NODCs and WDCs. This is the case with many data collected during

scientific programmes implemented in the Mediterranean such as Medalpex, POEM, PRIMO and others.

The Workshop recommended that these concerns should be brought to the attention of IODE-XV.

The Workshop noted the opinion of the expert from Egypt who recommended to take urgent measures for arranging training courses, providing fellowships and individual training for the Member States in the field of oceanographic data collection and management.

The Workshop urged the Technical Secretary to bring this request to the attention of the Executive Secretary IOC and the Director of ROPME and try to secure the necessary funding for providing support in training.

The Workshop was concerned that countries of North Africa (Algeria, Tunisia, Libya) and of Asia (Lebanon, Syria) who were invited for the Workshop, did not respond to the invitation. It was noted that one of the reasons could be the lack of IODE contact points in these countries and under-developed marine data and information management infrastructure. **The Chairman IODE was invited** to consider ways for improving these countries' participation in the IODE programme. Experts from neighbouring countries who took part in the Course were invited to help the Chairman IODE in making the above-mentioned countries aware of the IODE programme and particularly of the benefits they can obtain through their participation in IODE.

Meanwhile, data managers and scientists from neighbouring countries present at the Workshop were recommended to exploit personal contacts as widely as possible and inform the Technical Secretary and Chairman IODE on the progress.

The Workshop noted that under POEM and PRIMO there have been established special data management arrangements with the time-frames for data submission into the international domain much wider than those of the IOC-ICSU IODE rules (Annex V). However, even these arrangements are not being kept in force. **The Workshop invited** POEM and PRIMO co-ordinators to submit data to the IODE/WDCs system without additional delays.

Noting that the most complete set of POEM data is available at the Harvard Modelling Laboratory, USA, **the Workshop requested** the GODAR Project Leader to contact the Laboratory and investigate the possibility of accessing these data and making them internationally available.

The Workshop appreciated the efforts made by the former Soviet Union in the development and publication of the CIM Data Atlas in 1982.

The Workshop agreed that data and information contained in the Atlas are important for different types of research. **The Workshop was concerned** that the Atlas is now out of stock and numerous requests for acquiring publications received by the Russian NODC can not be satisfied. **The Workshop invited** Russia to consider publication of an Atlas in a hard cover and in a digitized form and **requested** the Executive Secretary IOC to provide support to these activities if there is a need.

The Workshop appreciated the efforts made by the CEC-MAST project, MEDATLAS and by the MODB Group in updating and information on available Mediterranean hydrological datasets. It was noted that only a limited number of the European IODE Data Centres are involved in the project. **It was recommended** that MEDATLAS should incorporate information from all IODE data centers possessing Mediterranean Sea data. **IOC was invited** to give support to these efforts under the GODAR project in order to:

- (i) enhance rescue of relevant national datasets;
- (ii) improve the quality of data;
- (iii) make data available rapidly to the international community;
- (iv) improve co-ordination between the project centres and others in developing high quality data products for users.

Recognizing that rescuing and preserving data activities are particularly important and urgent for the Member States of the Mediterranean, and noting that:

- (i) a lot of data is still available only in hard copy and manuscript forms;
- (ii) magnetic tapes used by many centres cannot be used as long-term data carriers for archiving purposes;
- (iii) knowledge of implemented and planned cruises is crucial for planning effective data rescue operations;
- (iv) many cruises have been implemented by research vessels of the former Soviet Union and collected data are archived in the NODC of the Russian Federation and WDC-B;
- (v) WDC-B has already digitized a few datasets for the Mediterranean.

The Workshop recommended that a high priority be given for inventorying data (CTD, bottle casts, BT and time-series of physical and chemical data) collected by cruises of Russian research vessels. To achieve good results, the following actions were proposed:

- (i) build a prototype inventory of the cruise data archived in Russian NODC/WDC-B based on ROSCOP forms information in an abbreviated version (e.g., Medatlas cruise descriptor). This inventory will include information on "digitized and non-digitized data", number of profiles per data type, observed or interpolated standard levels in the datasets, etc;
- (ii) identify and arrange access to historical data the newly established Member States of the former Soviet Union;
- (iii) send a prototype cruise data inventory corresponding to each Mediterranean Member State to the IODE National Contacts and/or to data originators of relevant countries;
- (iv) request IODE National Contacts, DNA/NODCs in each of these countries to check data contained in the inventory for duplicates and recommend what data should be kept in a final version. Send cruise descriptions which were not included in the prototype inventory to WDC-B, Oceanography.

The Workshop invited the Executive Secretary IOC to consider providing support to this important initiative.

ANNEX I
WORKSHOP PROGRAMME

25 April

09.00 - 10.00

Registration

10.00 - 10.30

Official Opening

10.30 - 12.30

Lecture 1

Subject

IODE and Global Oceanographic Data Archeology and Rescue Project

Speaker

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

Lecture 2

Subject

IOC Programme Activities in the Mediterranean Region and Regional Ocean Data Management

Speaker

I. Oliouline, Head, Ocean Services Unit, IOC

12.30 - 14.00

Lunch

14.00 - 17.30

Lecture 3

Subject

Medatlas, A Hydrographic Data Bank for the Mediterranean Sea

Speaker

C. Maillard, French NODC

Lecture 4

Subject

The Mediterranean Oceanic Database: A Tool for Scientific Investigations in the Mediterranean Sea using Historical Data and Climatological Analysis

Speaker

P. Brasseur, University of Liège, Belgium

Lecture 5

Subject

Interdecadal Variability of Levantine Intermediate Water

Speaker

A Hecht, IOLR National Institute of Oceanography, Israel

26 April

09.00 - 12.30

Lecture 6

Subject

Harmful Algal Blooms Studies in the Mediterranean and what Data is needed to make them more effective

Speaker

M. Estrada, Instituto de Ciencias del Mar, Spain

Lecture 7

Subject

CIM-Atlas of Oceanographic Data Coverage, 1900 - 1980

Speaker

N. Michailov, Director NODC, Russia

National Report of Croatia
National Report of Egypt
National Report of France

12.30 - 14.00 Lunch

14.00 - 17.30 **Lecture 8**

Subject

Use of Dissemination of Historical Data in the Mediterranean : Role for Malta

Speaker

A Drago, Co-ordinator, Marine Sciences Network, MCST

National Report of Israel
National Report of Italy
National Report of Malta
National Report of Morocco

27 April

09.00 - 12.30 **Lecture 9**

Subject

Scientific Results made possible by GODAR - World Ocean Atlas 1994

Speaker

S. Levitus, Director WDC-A, Oceanography

GODAR Project Leader, USA

Lecture 10

Subject

Mediterranean Marine Information Network

Speaker

C. Galdies, Foundation for International Studies, Malta

National Report of Portugal

National Report of Russian Federation

12.30 - 14.00 Lunch

14.00 - 17.30 **Lecture 11**

Subject

Referral Systems - What, Where and How ?

Speaker

I. Oliounine, Head, Ocean Services Unit, IOC

National Report of Spain
National Report of Cyprus
National Report of Ukraine

Social Event

28 April

09.00 - 12.30 Round-Table Discussions: Discussion of the Composition of the Summary Report, Recommendations and Conclusions

12.30 - 14.00 Lunch

14.00 - 17.30 Discussions (cont.) : Adoption of the Recommendations and Summary Report of the Workshop

ANNEX II
LIST OF PARTICIPANTS

BELGIUM

Mr. Pierre Brasseur

(Lecturer)

Geo-Hydrodynamics & Environment Research
(GHER)

University of Liège

B5 Sart Tilman

B 4000 Liege.

Tel: 0032 41 663354

Fax: 0032 41 662355

E-mail: brasseur@modb.oce.ulg.ac.be

CROATIA

Mr. Vlado Dadic

(Nat. Rep. Contributor)

Inst. of Oceanography & Fisheries

Setaliste Ivana Mestrovica, 63

P.O. Box 500

58000 Split

Tel: 00385 21 358688

Fax: 00385 21 358650

E-Mail: dadic@jadran.izor.hr

CYPRUS

Ms. Lina Athanassiadou

(Nat. Rep. Contributor)

Fisheries Officer

Ministry of Agriculture;

Natural Resources and Environment

Dept of Fisheries

Aeolou 13

1416 Nicosia

Tel: 00357 2 303360

Fax: 00357 2 365955

EGYPT

Mr. Sherif Magdy el-Agami

(Nat. Rep. Contr.)

National Institute of Oceanography & Fisheries

Kayet-Bey; AnFoshy - Alexandria

Tel: 0020 3 807138

Fax: 0020 3 801174

FRANCE

Dr. Catherine Maillard

(Lecturer, Nat. Rep. Contr.)

Interface Systemes d'Informations Scientifiques
pour l'Exploration de la Mer (SISMER)

National Oceanographic Data Centre

Inst. Francais de Recherche pour l'Exploration

de la Mer (IFREMER)

Centre de Brest

B.P. 70; 29280 - Plouzane

Tel: 0033 98 224279

Fax: 0033 98 224644

E-Mail: maillard@ifremer.fr

ISRAEL

Dr. Artur Hecht

(Lecturer; Nat. Rep. Contr.)

Israel Oceanographic & Limnological Research
Ltd.,

Tel Shikmona

P.O.Box 8030

Haifa 31080

Tel: 00972 4 515202

Fax: 00972 4 511911

E-Mail: euben@vmsa.technion.ac.il

ITALY

Mr. Giuseppe Manzella

(Nat. Rep. Contr.)

Centro Ricerche Ambiente Marino,

ENEA

P.O. BOX 316

19100 La Spezia

Tel: 0039 187 53 62 15

Fax: 0039 187 53 62 73

E-Mail: figms@est409.santateresa.enea.it

Dr. P. Picco

Centro Ricerche Ambiente Marino

ENEA

P.O. BOX 316

19100 La Spezia

Tel: 0039 187 53 62 15

Fax: 0039 187 53 62 73

E-Mail: fisaps@est409.santateresa.enea.it

Dr. Paola Di Manzano

Servizio Tecnico per L'Archaeologia Subacquea.
Ministero per I Beni Culturali e Ambientali.
Via di S. Michele, 22
Roma
Tel: 0039 6 58431
Fax: 0039 6 5894795

Dr. Claudio Mocchegiani Carpano

Servizio Tecnico per L'Archaeologia Subacquea.
Ministero per I Beni Culturali e Ambientali.
Via di S. Michele, 22
Roma
Tel: 0039 6 58431
Fax: 0039 6 5894795

MALTA

Mr. Anton Micallef

Euro-Mediterranean Centre on Insular Coastal
Dynamics
Foundation for International Studies
University of Malta
St. Paul Str.,
Valletta
Tel: 00356 240746
Fax: 00356 230551

Mr. Charles Galdies

Euro-Mediterranean Centre on Insular Coastal
Dynamics
Foundation for International Studies
University of Malta
St. Paul Str., Valletta
Tel: 00356 240746
Fax: 00356 230551

Ms. Antonella Vassallo

Euro-Mediterranean Centre on Insular Coastal
Dynamics
Foundation for International Studies
University of Malta
St. Paul Str.,
Valletta
Tel: 00356 240746
Fax: 00356 230551

Mr. Aldo Drago

(Lecturer; Nat. Rep. Contr.)
Co-ordinator, Marine Resources Network
Malta Council for Science and Technology
112, west Str.,
Valletta
Tel: 00356 241176
Fax: 00356 241177

MOROCCO

Ms. Jamila Larissi

(Nat. Rep. Contr.)
Bureau National des Peches
Institut scientifique des Peches Maritimes
2, Rue Tiznit
Casablanca
Tel: 00212 2 268192
Fax: 00212 2 266967

PORTUGAL

Ms. Sara Loureiro de Almeida

(Nat. Rep. Contr.)
Portuguese Hydrographic Office
Rua das Trinas, 49
1296, Lisbon CODEX
Tel: 003511 3955119
Fax: 003511 3960515

RUSSIA

Mr. Nikolai Mikhailov

(Nat. Rep. Contr.)
Director, National Oceanographic Data Centre
All Russian Scientific Research Inst. of
Hydrometeorological Information (RIHMI)
6, Koroleva Str., Kaluga District
Obninsk 249020
Tel: 007 095 2552194
Fax: 007 095 2552225
E-Mail: nodc@storm.iasnet.com

SPAIN

Prof. Marta Estrada

(Lecturer)
Instituto de Ciencias Del Mar (CSIC)
Passeig Joan de Borbo s/n
08039 Barcelona
Tel: 0034 3 2216450
Fax: 0034 3 2217340
E-Mail: marta@masagran.uab.es

Dr. Demetrio De Armas

(Nat. Rep. Contr.)
Co-ordinator, National Oceanographic Data
Centre
Istituto Espanol de Oceanografia
Av. a San Andres, Km7
38120 S.C. Tenerife,
Canary Islands
Tel: 0034 22 549400/01/39
Fax: 0034 22 549554
E-Mail: dap3@ca.ieo.es

UKRAINE

Dr. Alexander Suvorov

(Nat. Rep. Contr.)

Chief, Dept of Marine Information Systems &
Technologies

Marine Hydrophysical Institute;
Ukrainian National Academy of Sciences

2, Kapitanskaya Str.,

335000 Sevastopol

Tel: 007 0692 525276

Fax: 007 0692 444253

E-Mail: ocean@mhi.sebastopol.ua

or ocean@mhi2.sebastopol.ua

USA

Dr. Sydney Levitus

(Lecturer, GODAR Project Leader)

Director, WDC-A, Oceanography
National Oceanic and Atmospheric
Administration (NOAA)

Mail Code E/OC5,

Universal Building

1825, Connecticut Ave. NW

Washington DC, 20235

Tel: 001 202 6064507

Fax: 001 202 6064586

E-Mail: slevitus@nodc.noaa.gov

IOC SECRETARIAT

Dr. Iouri Oliouline

(Lecturer)

Senior Assistant Secretary

Head, Ocean Services Unit, IOC/UNESCO

7, Place de Fontenoy

75700 Paris

FRANCE

Tel: 0033 1 45683978

Fax: 0033 1 40569316

E-Mail: i.oliouline@unesco.org:

ANNEX III

GODAR PROJECT PROPOSAL

Recommendation IODE-XIV.3

DATA ARCHAEOLOGY AND RESCUE PROJECT

The IOC Committee on International Oceanographic and Information Exchange,

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

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

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

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

Recommends that:

- (i) IOC establish a Global Oceanographic Data Archaeology and Rescue Project under the IOC Committee on IODE as presented in the Annex to this Recommendation subject to condition that the additional funds be made available;
- (ii) A Project Leader be designated by the Secretary IOC in consultation with the Chairman of the IOC Committee on IODE to supervise its implementation;
- (iii) IOC invite Member States and international organizations to participate in and support this project, including the possibility of direct funding ear-marked for this purpose within the IOC Trust Fund.

Annex to Recommendation IODE-XIV.3

Introduction

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

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

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

Recognizing that oceanography is an observational science and that the world ocean is a major component of the earth's climate system, it is suggested that the IOC sponsored activities will result in more

complete global oceanographic databases. These activities should be viewed as an enhancement of existing IODE activities. The new and enhanced oceanographic databases will be available without restriction to the international science community. We call this effort the "*Global Oceanographic Data Archaeology and Rescue Project*" (GODAR). To do the most thorough job possible, this project must have a lifetime of 5 to 10 years. Funds to support the activities of this project will be obtained through as many sources independent of IOC as possible, including foundations.

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

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

Physical, chemical and biological oceanographic data as well as surface marine meteorological observations are the specific types of data this project will focus on. These are the data types of greatest concern to IODE and climate research activities. Advances in computer technology, both hardware and software (e.g., Relational Database technology) now allow for the construction of integrated global oceanographic databases that included 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 catastrophes, 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 database 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 the 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 co-operating 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 the highest priority of all activities.
- (ii) Ensuring that all oceanographic data available for international exchange is achieved at two or more international data centers in digital forms.
- (iii) Preparing catalogues (inventories) of:

- (a) Data now available only in manuscript form;
 - (b) Data now available only in analog form;
 - (c) Digital data not presently available to the international scientific community.
- (iv) Making all data accessible on various media including CD-ROMs, as well as standard magnetic tape.

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

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

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

Proposed Activities

- (i) The 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) A Workshop on GODAR will be arranged in Russia for Eastern European 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 requests its Member States to 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 IV

MEDALPEX DATA AND POEM DATA MANAGEMENT ARRANGEMENTS

MEDALPEX DATA

"The MEDALPEX datasets stored in data banks are divided in time-series extending to the major part of the AOP, such as tides, buoy and ship-of-opportunity data, and in episodic meteo-oceanographic datasets collected by oceanographic ships during the SOP. The PSMSL (Permanent Service for Mean Sea Level, in Bidston) succeeded in assembling digitized tide data on magnetic tapes from 40 stations of different countries bordering the western Mediterranean and Adriatic Seas.

The Deutscher Wetterdienst Seewetteramt in Hamburg succeeded in intensifying, to a certain extent, the ship-of-opportunity reports on surface meteorological data and the IADC (International ALPEX Data Centre, at the ECMRWF in Reading) stored 3 hourly synoptic datasets and maps. The synoptic time was taken plus or minus 1.5 hours.

About 20 buoys were moored or released to drift over periods ranging from few hours or days to few months mostly in the Ligurian Sea and the Minstral area. The resulting current measurements from surface (Lagrangian and Eulerian) to 1,000 meters depth, depending on the location, were analyzed by each institute that deployed the buoys.

Data from 2,000 hydrographic stations, 500 XBTs and sea surface meteo-observations transmitted to GTS are available at the RNODC-MEDALPEX in GF3 on magnetic tapes or in tabulated form. The apparent lack of co-ordination and the missing intercalibration exercises are due to the fact that MEDALPEX was not a centralized oceanographic experiment (like the previous MEDOCs), but an aggregation of national on-going programmes partially suited to contribute to MEDALPEX. The RNODC has made however, all efforts to gather the most reliable data to make up a dataset as coherent as possible.

In conclusion, the marine meteorology data are now in the ALPEX dataset at the US International Data Centre and at the ECMRWF in Reading. The tide gauge data and their analysis have been published in the IOS (Institute of Oceanographic Sciences of UK) Report N^o. 209. The hydrographic casts are stored at the RNODC-MEDALPEX; the current data can be found through Millot and Manzella."

(An extract from IOC Workshop Report N^o. 43, pp. 4-5 of Annex III)

POEM DATA MANAGEMENT ARRANGEMENTS

"Data acquired through the present research programme will be limited for the use of the generator for the period of one year after the completion of the preliminary analysis but not in excess of 2 years after acquisition. Sympathetic attention will be given by the organizing committee to protect the needs of students in the process of writing their thesis. Efforts will be made to supply the Harvard Dynamic Modelling Centre with the data they need at the earliest possible moment on the understanding that the data will be used solely for their particular needs.

The preliminary analysis of data will be carried out with agreed algorithms common to the entire group and data will be stored and exchanged in internationally formats."

(An extract from UNESCO reports in Marine Science N^o. 35, pp. 19)

Scope and Status of Data

"To produce for the first time an objectively analyzed dataset for the Eastern Mediterranean.

- # Establish data format using common medium.*
- # Establish common basis for transfer.*
- # Intercalibration of common stations.*
- # Distinctive data comparison."*

Data Exchange Programme

"The recommendation was made that due to the amount of data, it be essential that data exchange and pooling be accomplished prior to the Trieste Workshop, 31 May - 4 June 1988. The pooled dataset produced will be shared by those participating in the POEM Mapping Meeting, March 1988, Israel, Turkey, Germany, Greece, Italy and USA are contributing data and analysis models. The tapes containing the pooled dataset be made available to the principal scientists from each of these institutions at the end of the Trieste meeting; the pooled datasets for the 3 designated POEM cruises be made available to these principal scientists at the end of the Trieste Workshop. These data tapes will be proprietary and for use by the POEM scientists."

(An extract from UNESCO Reports in Marine Science N^o. 51, pp. 4-5)

"For a period of 3 years from distribution, the dataset is proprietary. The Co-Chairpersons of the POEM Steering Committee will designate the official distribution date for each collective dataset. For modelling studies and large-scale synthetical studies, authorship will be first the names of the scientists who carried out the specific research, followed by an alphabetized list of those responsible for collecting the data. Collaborations are encouraged and should be worked out in the normal manner. During this 3 year period, studies in progress based on the collective dataset should be brought to the attention of the Co-Chairpersons, who in turn will communicate the information to the Steering Committee. A major collectively authored paper is expected to be produced following the Venice Workshop (August - September 1990). After 3 years, the data will be considered common database and no rules have been established. After 5 years, it will be distributed to data centres."

(An extract from UNESCO Reports in Marine Science N^o. 53, pp. 24)

ANNEX V

LIST OF ACRONYMS

AARI	Arctic and Antarctic Research Institute, St Petersburg
AKIN	Acoustic Institute of the Russian Academy of Science, Moscow
AT	Air Temperature
BHO	British Hydrographic Office
BNDO	Bureau National des Données Océaniques, France
BRGM	Geophysical Survey Data Centre, France
BT	BathyThermograph
CARNET	Croatian Academic Network
CEC	Commission of the European Communities
CIM	Co-operative Investigation in the Mediterranean Sea
CMRR	Centre for Marine Research, Rovinj
CMRZ	Centre for Marine Research, Zagreb
CNR	National Research Council, Italy
COADS	Comprehensive Ocean/Atmosphere Data Set
CODATA	Directory of Data Sources for Sciences and Technology
CRAM	Institute for Scientific and Technological Research Applied to the Sea, Italy
CSIC	Institute of Marine Sciences, Spain
CSPR	Centre for Sea Protection, Rijeka
CTD	Conductivity, Temperature, Depth
DHIS	Hydrographic Institute, Split
DSP	Diarrhetic Shelfish Poisoning
DVNIGMI	Far-East Research Institute of HydroMeteorological Information, Vladivostok
EDMED	European Marine Datasets
EEC	European Economic Community
EEZ	Exclusive Economic Zone
ENEA	National Agency for New Technology, Energy and Environment, Italy
ENODC	Egyptian National Oceanographic Data Centre
ENSO	El Nino Southern Oscillation
EROS	European River Ocean Systems
EU	European Union
EUM	Mediterranean Countries of Europe
FAO	Fisheries and Agriculture Office, Cyprus
FIS	Foundation for International Studies, Malta
GHER	GeoHydrodynamics and Environment Research laboratory, Belgium
GIPME	Global Investigation of Pollution in the Marine Environment
GIS	Geographic Information System
GLOSS	Global Sea-Level Observing System

GODAR	Global Oceanographic Data Archaeology and Rescue Project
GOOS	Global Ocean Observing System
GPDMS	GeoPhysical Data Management System
GPS	Global Positioning System
HAB	Harmful Algal Bloom
HI	Hydrographic Institute of Portugal
IBSS	Institute of Biology of Southern Seas, Ukraine
ICES	International Council for the Exploration of the Sea
ICOD	Euro-Mediterranean Centre on Insular Coastal Dynamics
ICSEM	International Conference for the Scientific Exploration of the Mediterranean
ICSU	International Council of Scientific Unions
IEDO	Spanish Inventory of Oceanographic Datasets
IEO	Spanish Institute of Oceanography
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer (France)
IGS	Institute of Geological Sciences, Ukraine
IGY	International Geophysical Year
IMS	International Marine Science newsletter
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IOFS	Institute of Oceanography and Fisheries, Split
IOLR	Israel Oceanographic and Limnological Research
IORAN	Institute of Oceanology, Academy of Science, Moscow
IPIMAR	Institute of Marine Research, Portugal
IRBZ	Institute Rugjer Boskovic, Zagreb
MARSIS	Marine Remote-Sensing Information System
MAST	Marine Science and Technology
MBT	Mechanical BathyThermograph
MC	Marine Climate cruise, Israel
MDC	Marine Data Centre
MEDALPEX	Mediterranean Alpine Experiment
MEDAS	Mediterranean Environmental Database of the Adriatic Sea
MEDI	Marine Environment Data Information Referral System
MEDNET	Mediterranean Automated Environmental Monitoring Network
MEDPOL	Mediterranean Pollution and Research Programme
MGU	Moscow State University
MHI	Marine Hydrophysical Institute, Ukraine
MMCS	Marine Meteorological Centre, Split
MODB	Mediterranean Oceanic Data Base, Belgium
MSIA	Marine Scientific Information Association, Ukraine
MSL	Mean Sea Level
NDC	National Data Centre

NIOF	National Institute of Oceanography and Fisheries, Egypt
NODC	National Oceanographic Data Centre
ODS	Ocean Data Centre
OGS	Experimental Observatory of Geophysics, Italy
OIS	Oceanographic Information System
ORV	Oceanographic Research Vessel
OSNLR	Ocean Science in relation to Non-Living Resources
OSLR	Ocean Science in relation to Living Resources
PRIMO	International Research Programme in the Western Mediterranean
POEM	Physical Oceanography of the Eastern Mediterranean
PSP	Paralytic Shellfish Poisoning
QA	Quality Assurance
RIHMI	Russian Institute of HydroMeteorological Information
RNO	National Monitoring Network, France
RNODC	Responsible National Oceanographic Data Centre
ROSCOP	Report of Observations/Samples Collected by Oceanographic Programmes
SEM	SouthEastern Mediterranean countries
SHOM	Service Hydrographique et Océanographique de la Marine, France
SISMER	Marine Scientific Information Systems, France
SSRIMFO	Southern Scientific Research Institute of Marine Fisheries and Oceanography
SST	Sea Surface Temperature
SSTA	Sea Surface Temperature Anomaly
STD	Salinity, Temperature, Depth
TCP/IP	Transmission Control Protocol / Internet Protocol
TOGA	Tropical Ocean/Global Atmosphere
UkrSCES	Ukrainian Scientific Centre of Ecology of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VCP	Voluntary Co-operation Programme
VNIRO	Russian Research Institute of Fisheries and Oceanography
WDC	World Data Centre
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
WWW	World-Wide-Web
XBT	eXpendable BathyThermograph

(end of document)