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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)

MEDAR/MEDATLAS Meeting
Istanbul, Turkey, 21-23 May 1997

SUMMARY REPORT

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1. OPENING AND MEETING OBJECTIVES

Dr. C. Maillard opened the MEDAR/MEDATLAS Meeting at the Hotel Eresin Taksim on 21 May 1997 in Istanbul, Turkey.

She welcomed participants of the Meeting and expressed thanks to the Hydrographic Service of Turkey and the Turkish Oceanographic Data Centre for hosting the Meeting and providing the necessary facilities.

Capt. H. Yuce, Head of the Hydrographic Service and IODE National Co-ordinator, welcomed the participants on behalf of the Department of Navigation, Hydrography and Oceanography of the Turkish Navy and wished them the pleasant stay in Istanbul. He then briefly described the history of the Turkish participation in IODE activities which has almost a 20-year history and emphasized the need for IOC and its IODE to provide assistance to the countries of the region in oceanographic data collection and management in order to overcome the gap between developing and developed countries of the Mediterranean. Capt. Yuce noted that much has been achieved but even more should be done and implementation of the MEDAR/MEDATLAS project may help to achieve this noble goal. He thanked the participants for the readiness to devote their valuable time and effort to this event.

Dr. I. Oliounine, Deputy Executive Secretary IOC welcomed the Meeting on behalf of the IOC Executive Secretary, Prof. G. Kullenberg and gave a short introduction to the background of the Meeting, stressed the needs for the project and presented the Meeting's objectives.

He referred the participants to Recommendation IODE-XV.10 "*MEDAR/MEDATLAS and Development and Updating of the Mediterranean Dataset*" and informed of the actions taken by the Chairperson of the Meeting, Dr. C. Maillard, and the IOC Secretariat for the implementation of the Recommendation (Annex III). This included the adoption of the Recommendation by the IOC Executive Council at its Twenty-ninth Session, organization of the planning meeting in Paris in December 1996, development of the draft project proposal and preparation for the Istanbul meeting. He pointed out that all these activities would not be implemented without the goodwill of Member States to co-operate, without readiness to share knowledge and experience, without understanding that the project will help in meeting the needs of many users and particularly modellers and forecasters, and will help in capacity building. He noted that the transboundary nature of the sea helps co-operation, and regional collaboration should be based on meeting mutual interests.

He paid special tribute to France, Turkey, EU/MAST, and those participants who contributed funds to the organization of the Meeting. As a result, the organizers were able to have the unique opportunity of bringing experts from almost all countries of the Mediterranean and Black Sea region, and invite distinguished scientists and data managers from outside the region to take part in the Meeting and share their knowledge and experience. A complete List of Participants is presented in Annex II.

Dr. Oliounine then briefly presented the Meeting objectives:

(i) Review scientific and operational needs in oceanographic data, data products and IODE services;

(ii) Identify available datasets and products in the region;

(iii) Review existing rules and capabilities for oceanographic data management;

(iv) Identify joint co-ordinated actions for facilitating data management activities for the success of regional scientific and monitoring programmes, such as MEDGOOS;

(v) Comment on and finalise the draft of the MEDAR/MEDATLAS project proposal.

He noted that the programme of 3 days was very heavy and the objectives of the Meeting could be achieved only through the consolidated efforts of all participants, constructive discussions and readiness of all to contribute to its success by being responsive to the Chairperson's requests.

Dr. Oliounine expressed his hope that recommendations formulated by the Meeting and the project proposal, will help to meet users' needs more effectively and co-operation between Member States will be strengthened.

The participants of the Meeting agreed to have two final products: a summary report which will contain abstracts of national reports, deliberations of sessional working groups and recommendations, and an adopted revised version of the MEDAR/MEDATLAS project proposal. It was the general opinion that there was no need for the inclusion of the texts of the invited talks into the summary report, as the goal of the invited talks was to provide participants with the updated information of the progress in the scientific research and data management in the region. The Meeting programme is presented in Annex I. Sets of transparencies demonstrated by invited speakers during their presentations have been distributed to all participants and are available upon request.

Mrs. M. Conkright kindly agreed to be the Rapporteur of the Meeting and help the Chairperson and the Secretary in compiling the summary report.

The Representative of the local organizing committee informed the participants of local arrangements.

2. NATIONAL REPORTS[1]

2.1 ALGERIA

The Algerian coast is zonally oriented and stretches from Marsat Ben M'hidi at west to Roux Cape in the east covering more than 1,000 km. It is characterised by a succession of bays more or less widely opened towards the Mediterranean Sea. The marine ecosystem behaviour within this region strongly depends on the interaction between open ocean and land areas.

Along the Algerian coast, and more specifically its western and central parts, the circulation is driven by Atlantic water entering the Mediterranean Sea (Algerian current). It creates coastal dynamics that ensures renewal of water in bays and gulfs. As far as the land areas are concerned, it depends on the quantity and quality of the dumping, which in turn is directly related to natural conditions.

In this framework, oceanographic studies on physical, chemical and hydraulic properties have been carried out for two sites of the Algerian coast:

- the Bay of Alger located in the central part of the Algerian coast, and has a bowl shape. Bathymetry features half circular pattern that follows the coastline. The Bay environment

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[1] Additional information on national activities in oceanographic data collection and management of the Black Sea Mediterranean countries is available in the IOC Workshop Report N°. 110 "***IOC-ICSU-CEC Regional Workshop of Member States of the Mediterranean - GODAR-IV***", published by IOC/UNESCO in 1995.

is affected on one hand by the city of Alger and on the other hand by the open ocean circulation and more specifically the Algerian current.

- the Arzew Gulf located in the western part of the Algerian coast is mainly affected by coastal properties that can enrich or pollute gulf waters. In this area, the continental shelf is 21km wide with the depth of only 20km, 1km off the shore, 50 isobath is between off the shore.

- The Algerian current in the western Mediterranean has been regularly studied in the past decade and especially along the Algerian coast during the MEDIPROD-VI experiment in June 1990. This dataset is the most recent effort for data collection in the region. Part of the data were acquired in the Bay of Alger along 3 sections for a total of 21 stations (Figure 1).

Hydrological analysis show highly turbulent motions. This dynamic induces convergence and divergence with tilted trajectories that have been observed at several stations. Because they partly compensate each other, these motions create two water cells at 50 and 150m depth with high and low concentration in nutrients respectively.

Turbulence is also responsible for the horizontal mixing and to a lesser extent for vertical mixing. This results in high heterogenous distribution of a chlorophyll and plankton. Nutrients concentration suggests land input and reveals high phytoplankton activity.

As for the Arzew Gulf, results are similar to those found in the Bay of Alger. Salinity values are quite low in comparison with typical Mediterranean waters. Temperature in the gulf is warm in summer (18.15° to 26.15°C) and cold in winter with 7° difference between seasonal average.

Finally, physical and chemical analysis of waters within both sites allow to get a more general sketch of water masses properties in the regions. Algerian current instabilities along the Algerian coast and coastal counter currents in the gulfs and bays create complex vertical motions and nutrients enrichment of the surface waters.

Institut National des Sciences de la Mer et de l'Amenagement du Littoral (ISMAL) located in Sidi-Fred, acts as the National Agency for international oceanographic data and information exchange. The Institute dates from 1983, but a Marine Laboratory exists in Alger since 1882. ISMAL inherits the infrastructure and activities of the former Centre d'Etudes et de Recherches sur les Pêches (CERP).

Its mission involves education and research in the field of:

- Fisheries and aquaculture;

- Coastal development;

- Oceanography: marine pollution, marine chemistry, microbiology and physical oceanography;

- Marine ecology.

ISMAL participates in several national and international projects: UNEP/MEDPOL, INOC/SOSMED, AVICENNE/SALTO, IOC/ASOM, MEDIPROD, Shellfish breeding with IFREMER, Brest.

ISMAL manages 4 research vessels and a shallow water unit. The staff includes 10 researchers, 11 research assistants, 8 engineers and 15 qualified technicians.

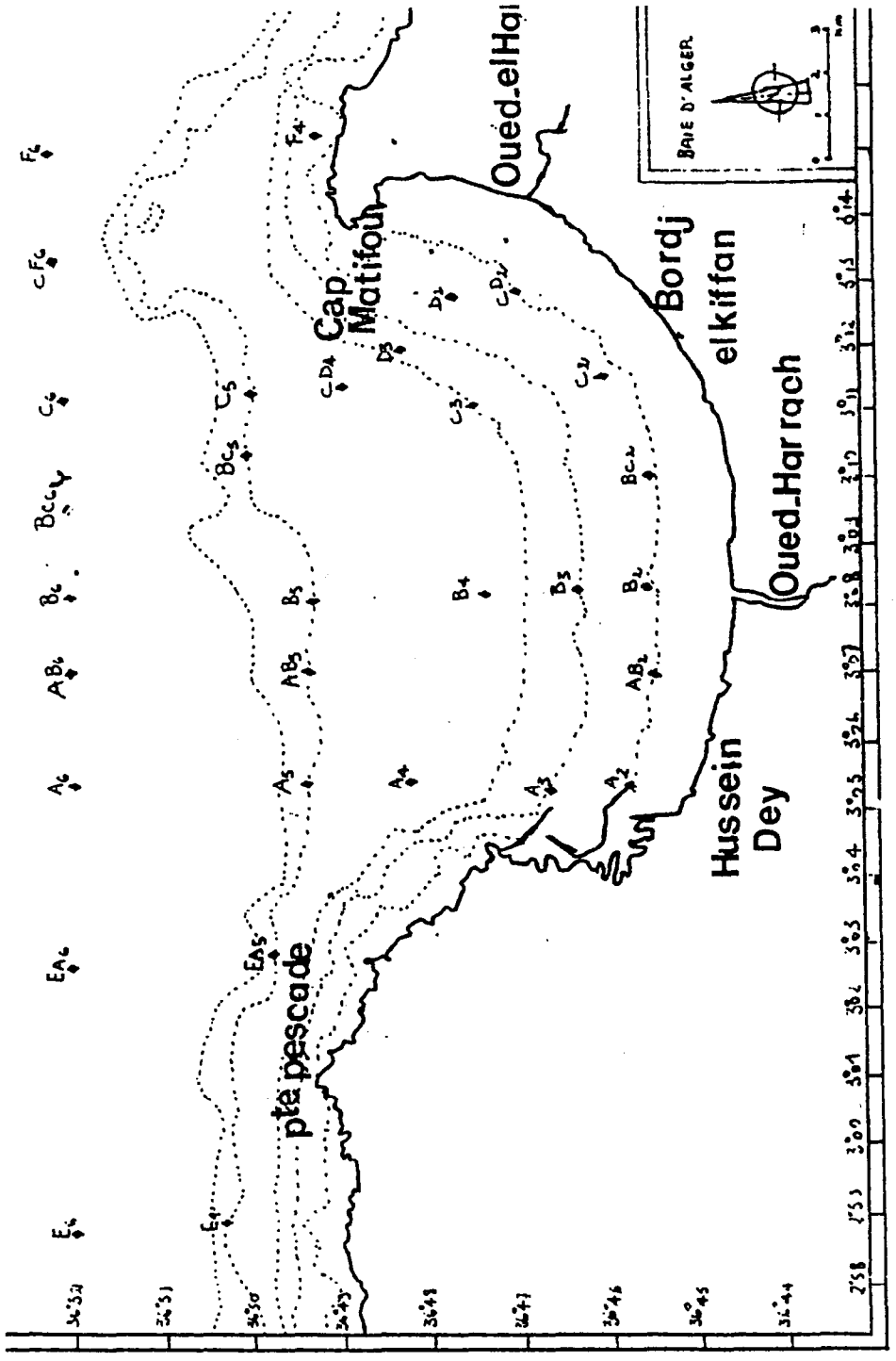


Figure 1. Map of the localization of various samplings

2.2 BULGARIA

The Bulgarian National Oceanographic Data Centre - NODC, was set up in 1995 as part of the National Institute of Meteorology and Hydrology (NIMH). The main task of the NODC is the organization of the data collection, quality control processing, archiving, exchange and dissemination. At the present time the focus is on the collection of operational data from the Black Sea distributed by GTS, organization of data exchange between Bulgarian data holders, organization of access to international data banks and data centres of IODE.

The NODC of Bulgaria is preparing an inventory of all oceanographic data kept at different Bulgarian institutions engaged in oceanographic activities such as the National Institute of Meteorology and Hydrology, Oceanographic Institute, Geological Institute, Hydrographic Service, etc. This inventory will be included in the WWW server of the NODC of Bulgaria. It will include a description of the state of digitization of data, persons to be contacted and other important information.

The purpose of the NODC is to help in the digitization of all existing data in Bulgaria. For this activity, it will begin training data managers from different institutions. The aim is the organization of a Distributed Oceanographic Database in Bulgaria.

The Bulgarian NODC is also involved in the collection of observations from 6 coastal stations, two sea-level stations, one ship - regular "ferry " Varna-Pofi with four observations every day. The NODC is responsible for the development of two types of operational products: daily forecast of winds and waves for the Black Sea, and prediction of an area of petroleum spill in case of petroleum pollution. Both products are based on satellite observations and require regular hourly observational data from automatic stations.

2.3 CROATIA

In June 1996, the Institute of Oceanography and Fisheries was nominated as the Designated National Agency (DNA). This was followed by the acceptance in January 1997, of the first national programme of oceanographic activities. In addition, all oceanographic data was declassified and can now be exchanged without any restrictions.

Several scientific programmes have been initiated which have contributed to the DNA database of more than 400 hydrographic and bio-chemical profiles from 43 stations. The MEDATLAS quality control procedures were adopted and the MEDAS (Marine Environmental Database of the Adriatic Sea) was improved. These improvements include basic quality control (position, range, stability, and duplicate checks). As a result of quality control of the temperature and salinity data, numerous duplicates in the Croatian data archives were identified.

There are still many data in manuscript form which must be digitized.

Tables 1 & 2 show the volumes of data achieved in the DNA of Croatia.

Table 1 - Classical hydrocasts

Data type	Met&Sea property	T,S	02,pH	Nutrients	CTD	BT
No of stations	23430	32000	16300	9350	473	24328
Data since	1909	1909	1965	1968	1975	1954
Data in	Data logs, reports	Data logs reports	Data logs, reports	Data logs, reports	-	Data logs
Data in MEDAS:						
-since	1909	1909	1965	1968	1975	1954
-No of profiles	12345	18453	7320	6250	205	21100
Existence of additional data	?	Yes	Yes	Yes	No	Yes

Table 2 - Time series data

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

2.4 CYPRUS

Despite numerous studies of the Mediterranean Sea, the area of the Cyprus Basin, south of Cyprus, was until recently, among the most poorly studied regions of the Eastern Mediterranean Sea.

In order to fill in the gaps in oceanographic data for the area south of Cyprus, the Cyprus Basin Oceanography (CYBO) project has been started. It is a multi-year national programme of physical oceanography implemented by the laboratory of Physical Oceanography of the Department of Fisheries.

The Laboratory of Physical Oceanography was established at the end of 1994 and is responsible for the formulation and implementation of research projects in the Mediterranean Sea, particularly in the deep coastal and open sea and of the Cyprus Basin-Hecataeus Ridge of the Levantine Basin. The Laboratory is well equipped with modern electronic equipment which enables it to undertake national, as well as international research studies and supports other environmental organizations in management, control and protection of the marine systems. The main studies are directed towards obtaining information related to the circulation, the thermohaline structure, mixing processes, fronts, dispersion processes, numerical simulations, etc.

Within the framework of the CYBO project, four seasonal oceanographic cruises were carried out in this Levantine region: (1) the CYBO-1, late Summer 1995, (2) the CYBO-2, Spring 1996, (3) the CYBO-3, late Summer 1996 and (4) the CYBO-4, Spring 1997.

These cruises were aimed at obtaining reliable and high resolution spatial CTD measurements simultaneously from a grid of about 90 CTD stations in the deep waters of the coastal zone and the open sea area of approximate 150 x 100nm. of the Cyprus Basin, Eastern Levantine (Figure 2).

The first cruise was carried out on board the small (20m) departmental vessel "***Triton***", while the other cruises were made on board the 50m length multipurpose "open stern" type vessels "***Sentinel***", "***Flying Enterprise***", "***Argonaut***", respectively for the second, third and fourth cruise. In less than 10 days, an area of more than 20,000 nm^2 was sampled.

Initially, the CTD systems Seabird SBE 9/11 and later the SBE 9/11plus, were used to obtain hydrographic profiles down to a maximum depth of about 1,500m at a scan rate of 24 Hz. The CTD uses a pump to draw water through the conductivity cell, which helps to minimize salinity spiking. The used CTD sensors of temperature and conductivity were calibrated before each cruise at the Meteorological Laboratory of the Seabird electronics, in order to insure the quality of the gathered data.

The overall scientific picture derived from this renewed investigations of the Eastern Levantine Basin reveals in details some new mesoscale flow features, such as: the Cyprus Basin Cyclonic Eddy and the semi-permanent warm Cyprus Coastal Current. Thanks to the new oceanographic database of the Cyprus Basin, a better definition of the seasonal variability of the bifurcation of the mid-Levantine jet, SW of Cyprus was identified. It was found that this flow jet contributing to the generation of a semi-permanent cyclonic vortex in the area NW from the Hecataeus Ridge. Furthermore, the Cyprus Basin Cyclonic Eddy is identified as an area of LIW formation. These latter waters sink along isopycnals down to 500m under the influence of the very strong Cyprus Anticyclonic Eddy. To have a dataset of high quality, the following procedures have been applied.

In order to minimize the effect of salinity spikes caused by the difference in time constants between the temperature and conductivity sensors, raw CTD data were processed based on: (a) visual examination of T, S profiles to identify extreme salinity values, which made it possible to reject unwanted raw data and (b) spiking removal statistical analysis for all CTD data in order to reduce unwanted fluctuations of the T,S profiles in the thermocline. This raw data filtering procedure is based on forward and backward low pass filtering of the temperature and conductivity.

Both, subjective and objective methods were used in order to analyse and interpret the pre-processed CTD data. After the verification of the filtered data, the temperature and salinity were interpolated at a 1m depth interval. Then several hydrological parameters such as density - sigma-t and sigma-Θ, potential temperature, geopotential anomaly and Brunt Vaisalla frequency were estimated using the algorithms recommended by UNESCO.

The vertical interpolation of the main hydrological characteristics, with 1m or 5m step was carried out with the usage of a third degree Lagrangian polynome. Stations profiles of temperature, salinity, density and T/S diagrams are plotted.

The objective method, i.e., the mathematical technique for the spatial interpolation of irregularly spaced *in situ* observations, is then applied using the successive correlation schemes of Levitus (1982). This is used to define the second horizontal and vertical displacement of the estimated hydrological parameters on a regular grid.

The second horizontal displacement of the hydrological characteristics is constructed using the geographical co-ordinate system in the Mercator projection. The application of the dynamic method, using the geostrophic (earth rotated) equations, made it possible to derive, at different layers, the geographical maps of the flow with second velocity vectors.

The raw, pre-processed and processed data from each cruise are stored on mini data cartridges tapes. The latter are compatible with PC technology and other relevant data handling software.

For each oceanographic cruise, several single passes and weekly composite NOAA-AVHRR infrared images of the Eastern Mediterranean Sea are also archived. The remote-sensing processed data are obtained from the NOAA receiving station of the KNMI (Royal Netherlands Meteorological Institute) for the same time-period as the cruises.

The increasing demand for oceanographic information in the nearshore and open regions around Cyprus, for marine environmental studies, shows the necessity for the establishment of an NODC and the "Cyprus Oceanographic and Marine Sciences Data Bank". The Laboratory of Physical Oceanography at the Department of Fisheries has already undertaken certain initiatives towards the materialization of this Centre.

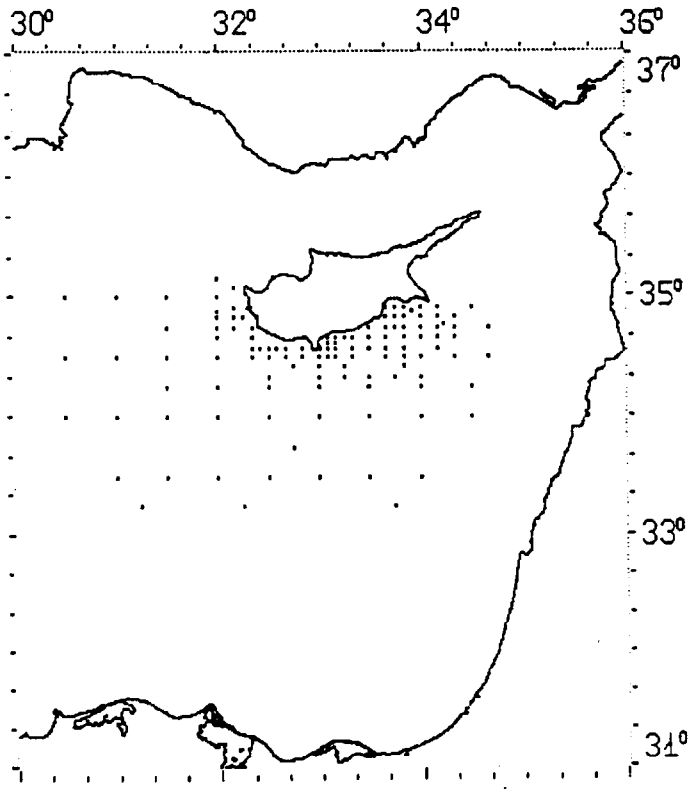


Figure 2: CTD stations in the Eastern Mediterranean Sea, CYBO project

2.5 EGYPT

The Egyptian National Oceanographic Data Centre (ENODC) is a special unit of the National Institute of Oceanography and Fisheries (NIOF). It was established in 1971 for storing and processing oceanographic data for different purposes.

A computer of the model PDP-II was installed in the Centre in 1978. In 1981, a computer IBM-PS/2 50Z was added. Four units of compatible PCs, one of them is a portable, were used in ENODC in 1989. Further steps were made in 1991, when a SUN workstation SPARC-330 was acquired. Finally, in 1992 a modern machine IBM PS/2 Ultimedia-57 SLC with audio-visual connections began working at the Centre. Connection between the SUN workstation and PCs was performed. Accessories of the Centre include: tape reader and printers. Data carriers used at the Centre include: diskettes 3.5", 5.25"; CD-ROM, 0.5 tapes and 0.25 cartridges.

The ENODC stores physical and chemical data from the Mediterranean, Red Sea and Egyptian lakes. These data are available to the scientific community and are sent to the WDC-A, Oceanography in accordance with national rules. In addition, ENODC provides assistance to researchers from NIOF with data processing.

ENODC produces a periodical series of publications which until now contains 6 publications:

- check list of Egyptian Mediterranean fish, publication N°. 1, 1992;
- check list of Egyptian Mediterranean polychaetes, publication N°. 2, 1992;
- tides at Alexandria, Egypt for the period 1993-2000, publication N°. 3, 1993;
- tides at Port Said, Egypt for the period 1993-2000, publication N°. 4, 1993;
- M2-tides in the Mediterranean, publication N°. 5, 1993;
- check list of Egyptian Red Sea fish, publications N°. 6, 1994.

The NIOF Climatological dataset includes:

- data file of NODC, Washington DC, up to 1988 (position, temperature, salinity and time);
- ENODC data files of the waters of the South Levantine Basin;
- ENODC estimates of the heat storage in the Eastern Mediterranean.

The NIOF climatological datasets (annual and seasonal files) were used for the development of the Princeton oceanographic model in Princeton and Alexandria.

Other activities of ENODC include: (i) estimation of the amount of sediment transported along the Nile Delta coast based on a calculation of waves from synoptic charts; (ii) study of the circulation of intermediate and deep waters along isopycnals surfaces; and (iii) study of the sea surface temperature anomaly in the Eastern Mediterranean Sea.

The NODC implemented the following recommendations made at GODAR-IV: development of a new database with the usage of updated quality control procedures; a branch of NODC has been established in the Suez responsible for getting data from scientists in the Gulf of Suez, Gulf of Aqaba and the Red Sea; and upgrading the computers and storing media to ensure the data will not be lost.

2.6 FRANCE

SISMER was designated the National Oceanographic Data Centre of France (French NODC) for the International Oceanographic Data Exchange system of the Intergovernmental Oceanographic Commission.

SISMER belongs to the computer department (IDT) of IFREMER, the main French governmental agency for oceanographic research. As defined in its missions, it designs and operates scientific information systems and databases in the marine domain, in collaboration with the technological services of the IFREMER computer department. This activity is project oriented. Most of the present national and international projects implemented by SISMER have a main component in the Mediterranean Sea:

- French Sea Cruises and Datasets Inventory: about 4,500 cruise summary reports (ROSCOP) and 200 datasets reports (EDMED) from 30 main laboratories;

- National Physical and Chemical Data Bank: temperature, salinity and nutrient profiles (11,776 CTD and 32,344 bottle profiles, including 1,800 CTD and 5,900 bottle casts in the Mediterranean) are systematically archived, together with time-series of current and temperature (1,486 current time-series). SISMER receives the hydrological data collected by the scientists at sea, after these data are processed and validated in the scientific laboratories (Figure 3). Once in SISMER, the data are reformatted into the unique MEDATLAS format and quality controlled before archiving and dissemination.

- Preparation of an edition of the Mediterranean Hydrological MEDATLAS Electronic Atlas, in co-operation with IEO Data Centre (Madrid), NCMR/HNODC (Athens), SHOM (Brest) and ICES (Copenhagen). This is the most comprehensive dataset presently available of the historical temperature and salinity data, collected since the beginning of the century by various laboratories and hydrographic services (16,740 temperature and salinity profiles from CTD; 33,910 from bottle casts; 76,500 MBT and 70,620 XBT) checked for quality. This Atlas also contains climatological statistics on 28 vertical levels and 0.25 degree horizontal grid (Figure 4,5).

- Other projects include the National Geophysical Data Bank: bathymetry, acoustic imagery, gravity, magnetism and navigation data collected during 337 cruises worldwide; the TOGA/WOCE Upper Ocean Thermal International Dataset (delayed mode XBT profiles); the contribution to the MTPII-MATER Mediterranean Targeted Project multi-disciplinary data management structure; the BIOCEAN-AMORES - Benthic Biology Database and the OCTOPUS Acoustic Tomography Data Bank (in preparation).

The quality control procedures applied in SISMER follow the IOC recommendations. They are performed in 3 steps which are:

- a check of the format;
- a check of the station headers (metadata);
- a check of the measured parameters (data).

Each of these steps include automatic (objective) controls followed by visual ones (subjective). As a result of these checks, a quality flag is assigned to each numerical value. The only modification of the values is to the header information (date, latitude, longitude, bottom, depth) when obvious.

Once controlled, the data are archived on-line disks, and the metadata in an ORACLE relational database system. This system is linked to a public WWW information server which gives open access to the inventories and includes an user interface for submitting data requests.

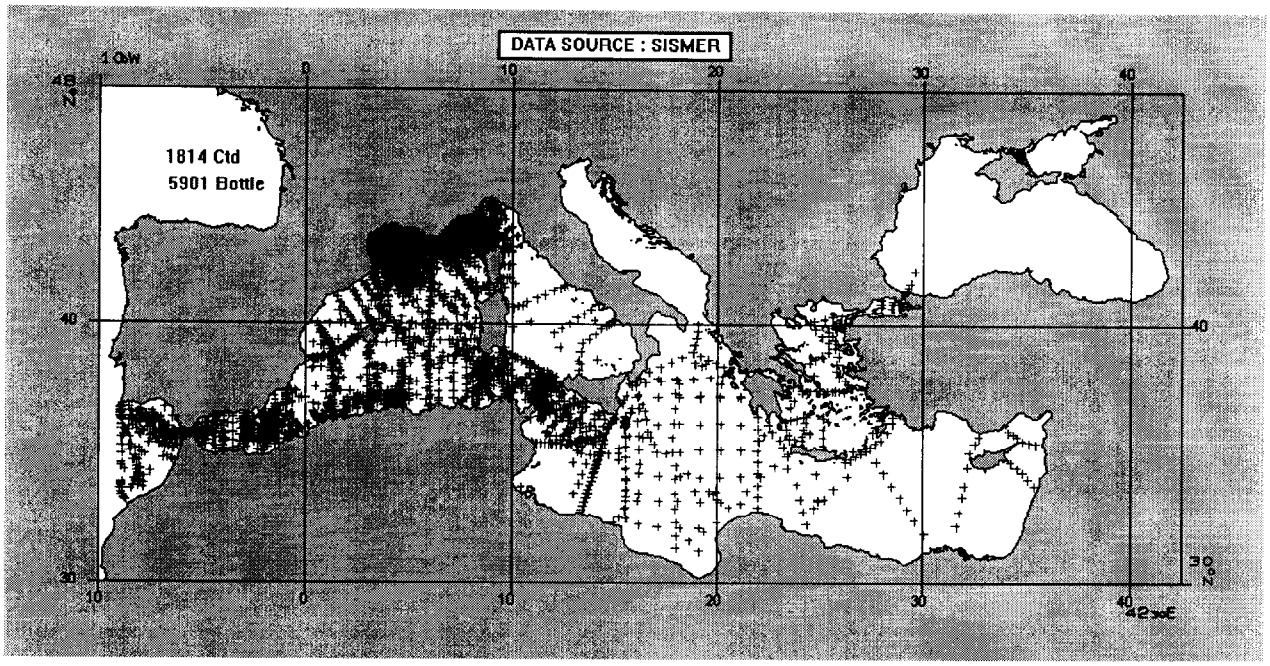


Figure 3

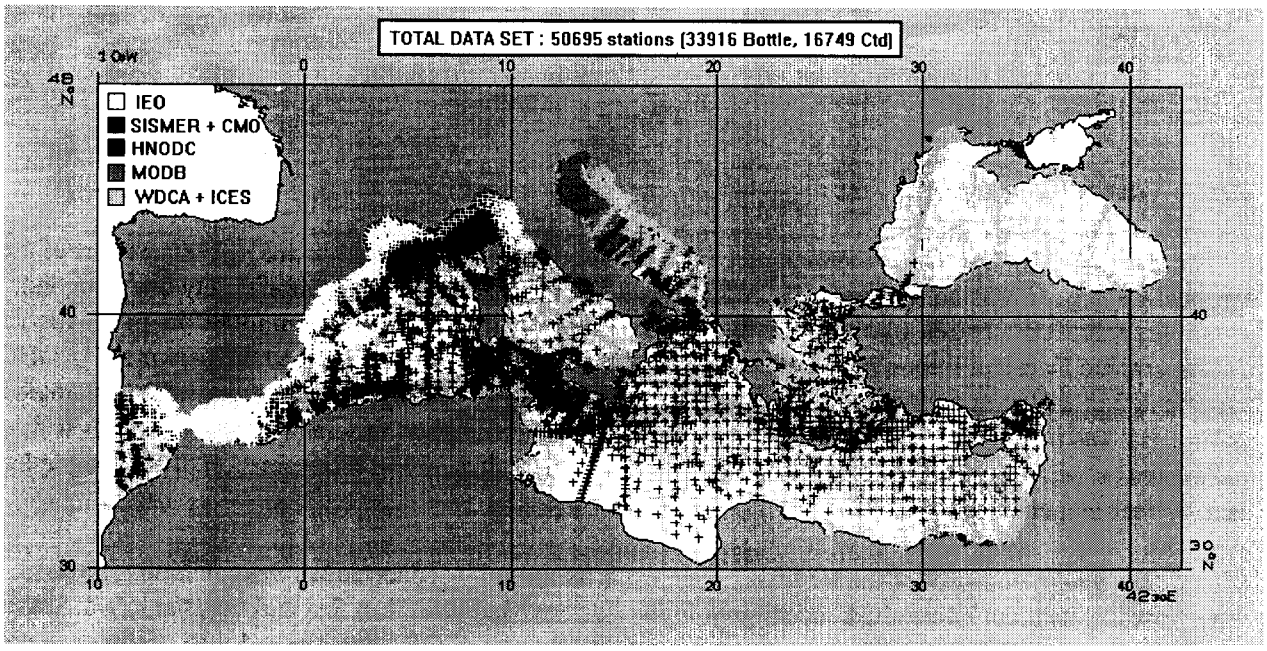


Figure 4

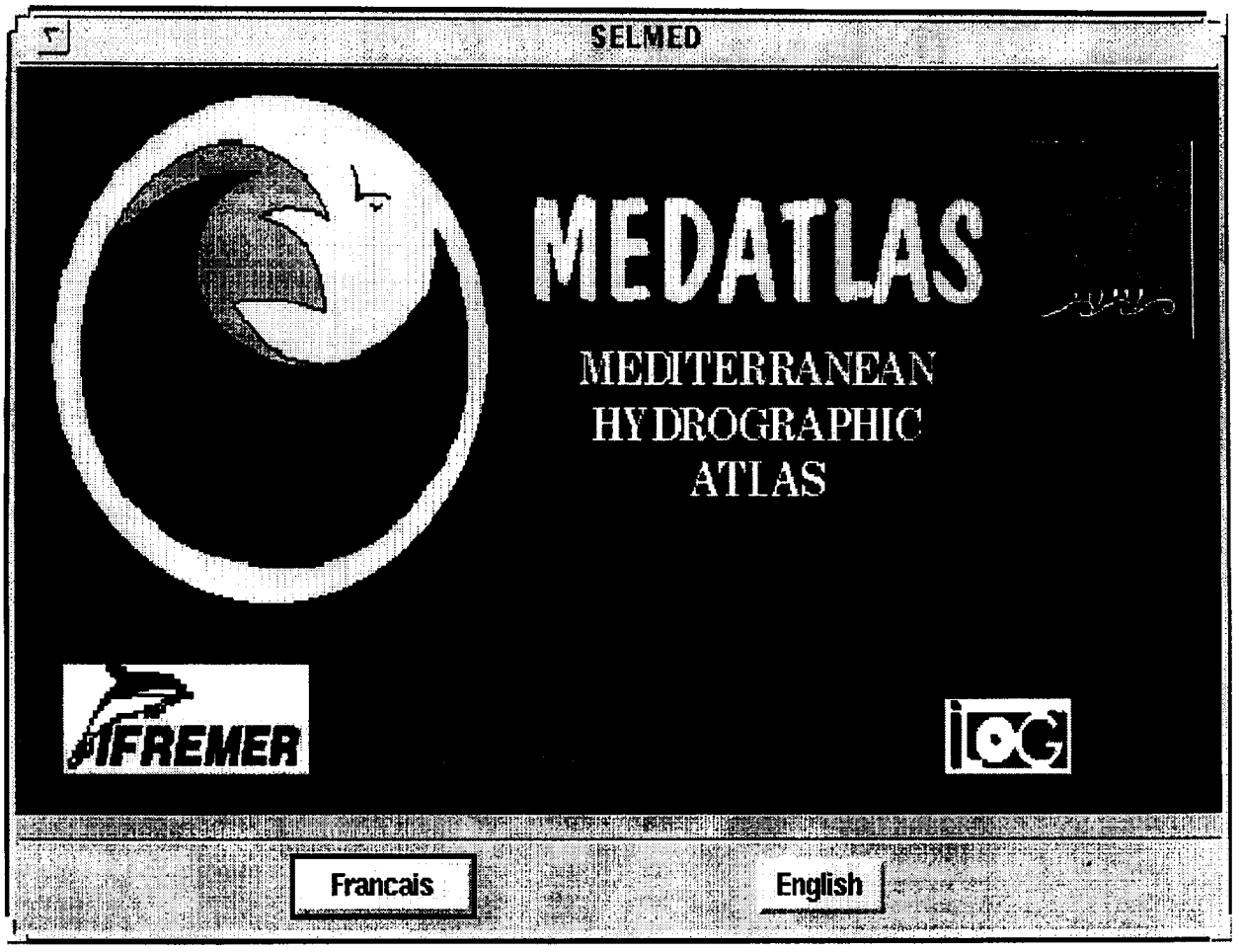


Figure 5

2.7 GREECE

The Hellenic National Oceanographic Data Centre (HNODC) was established in 1986, as part of the National Centre for Marine Research (NCMR), in Athens. It is part of an international network of national oceanographic data centres operating within the framework of the IOC's Committee on International Oceanographic Data and Information Exchange (IODE). As part of its contribution to the network, HNODC participates in different elements of the IODE system, including cataloguing, archiving and exchanging marine data and information. In addition, HNODC provides active support to scientists processing their data and carries out work in developing techniques for the processing, display and dissemination of oceanographic data, using computer technology.

The geographic area of the HNODC's interest is the overall Mediterranean Sea, including the Black Sea. However, its main interest is concentrated in the Eastern Mediterranean Sea and the Black Sea. Major data holdings of the HNODC, for these particular regions consist of CTD data (over 5,500 stations), water bottle data (over 8,500 stations), moored current meter data (over 450 series, ranging from 10 days to 6 months each), plus geophysical data (over 30,000km of track). The CTD and Hansen bottle data come from 4 main data sources: different Hellenic research institutions which collect data (NCMR, IMBO, etc.), WDC-A, ICES and the MOB CEC/MAST initiative (Figure 6). The available data cover the time period from 1901

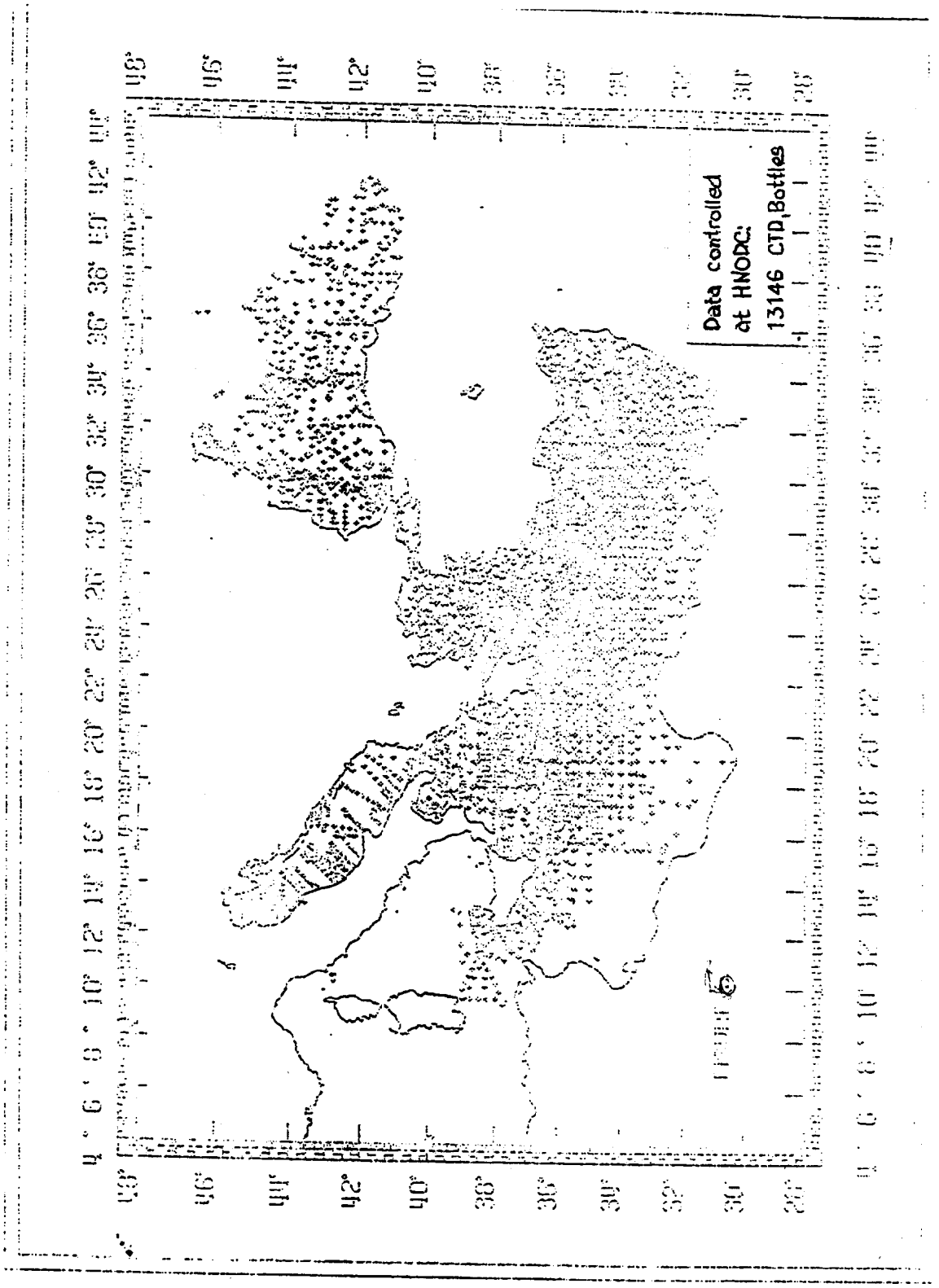


Figure 6

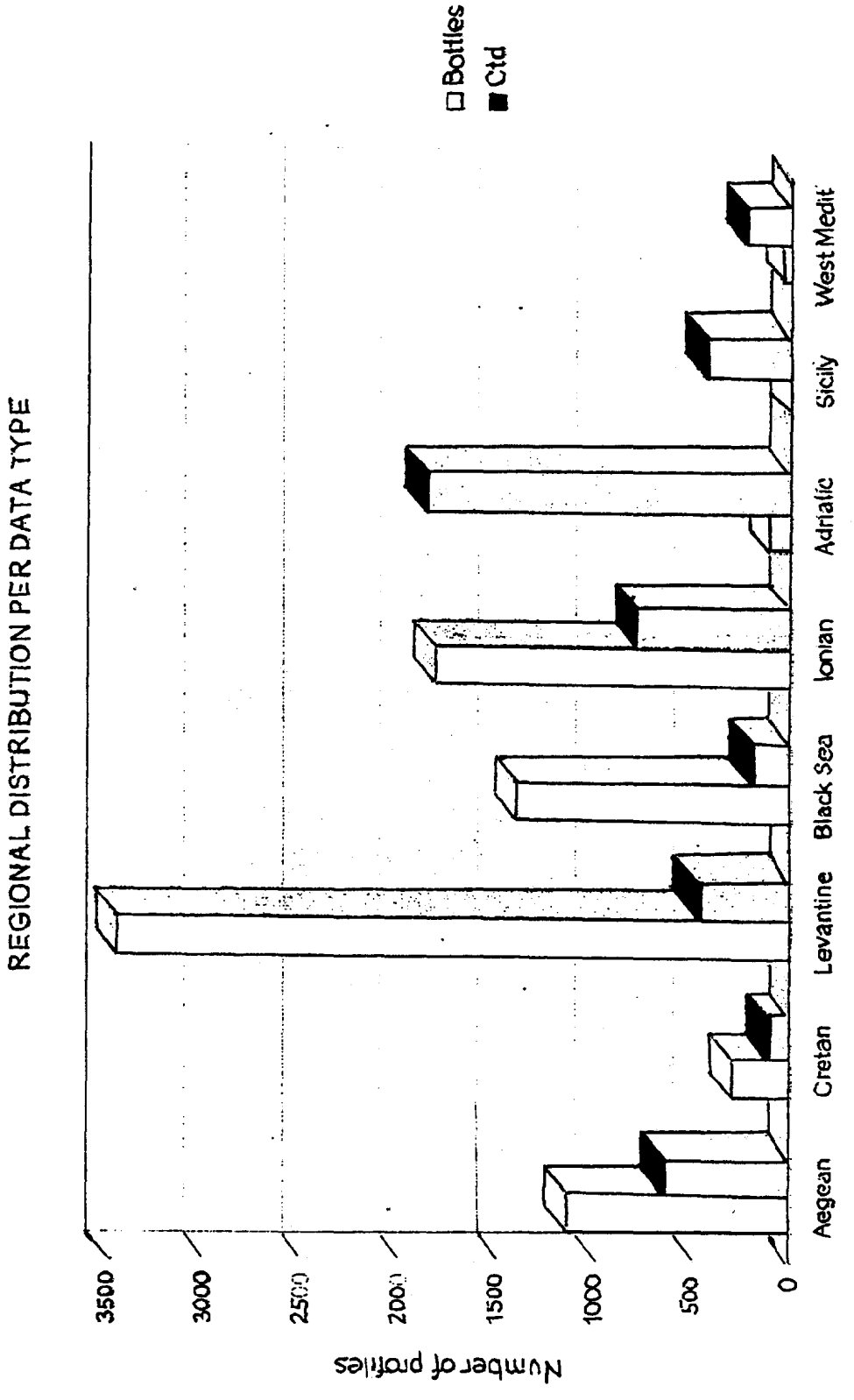

REGIONAL DISTRIBUTION PER DATA TYPE
Bottles
Ctd
Number of profiles
3500
3000
2500
2000
1500
1000
500
0
Aegean
Cretan
Levantine
Black Sea
Ionian
Adriatic
Sicily
West Medit

Figure 7

to 1995. Most of the data have been collected in the Levantine Sea and are mainly water bottle data, while the majority of the CTD data have been obtained from the Aegean, Ionian and Adriatic Sea (Figure 7). Apart from the above-mentioned data, NCMR, due to its activity, handles a great diversity of different data types, including chemical (nutrients, metals, hydrocarbons, etc.), biological (chlorophyll, phytoplankton, zooplankton, benthos, etc.), and sedimentological data.

The hydrographic data (temperature, salinity) are subjected to quality control prior to their organization in a database, using the relational database management system (RDBMS) ORACLE. The structures used for organizing the data in the database are project-cruise oriented, space-time oriented, originator oriented and subject oriented. The database supports querying with multiple searching selection criteria and in addition visualization and production of various data products.

Within the last few years HNODC has been involved in several CEC/MAST supporting initiatives. It participated in the EODAN feasibility study (implemented by the British Oceanographic Data Centre) and carried out a study of the Mediterranean requirements for the European Ocean Data Application Network. HNODC participated in the EDMED Project and compiled an inventory of the marine environmental datasets in Greece. HNODC contributed to the MEDATLAS Project, being responsible for certain tasks in the Eastern Mediterranean Sea and the Black Sea. Finally, at present HNODC is involved in data management activities within the framework of several CEC/MAST research projects (i.e., PELAGOS, CINCS, MATER, etc.).

In the coming years, NODC will be involved in developing a data collection and management infrastructure in order to implement the national GOOS and EUROGOOS programmes. According to these programmes an extended network of multi-parameter measuring buoys will be deployed, in order to monitor the Aegean Sea waters. The instruments will provide a large amount of different types of real-time marine data (physical, chemical, meteorological, etc.). To manage these data, a three-year implementation phase is being planned, during which the appropriate infrastructure will be developed.

2.8 ISRAEL

The National Institute of Oceanography (NIO) of Israel Oceanographic and Limnological Research (IOLR), located in Haifa, is the primary oceanographic research laboratory in Israel. IOLR operates the R/V *Shirmona* which is the only Israeli research vessel in the Mediterranean. The responsibilities of NIO include multi-disciplinary studies of the Eastern Mediterranean, the northern Gulf of Aqaba, and the Dead Sea. Activities conducted within these studies consist of field data collection, data analysis, and modelling (Figure 8).

Digital CTD data archived at NIO relevant to the MEDATLAS effort consist of 1,151 temperature and salinity profiles collected during the past 18 years (Table 3). These profiles were collected within the context of three series of cruises: (i) the Marine Climate (MC) cruises (1979-1984) which covered the southeastern Levantine basin (20 cruises, 560 profiles); (ii) POEM cruises (1985-1992) which covered the central and southern Levantine waters in the eastern Ionian Sea (7 cruises, 459 profiles); and (iii) the Eddy (ED) cruises (1989-1992) which covered the region of the Shibmona gyre (7 cruises, 132 profiles). Many of the POEM and ED profiles also include oxygen and nutrient data, although a detailed inventory is not currently available.

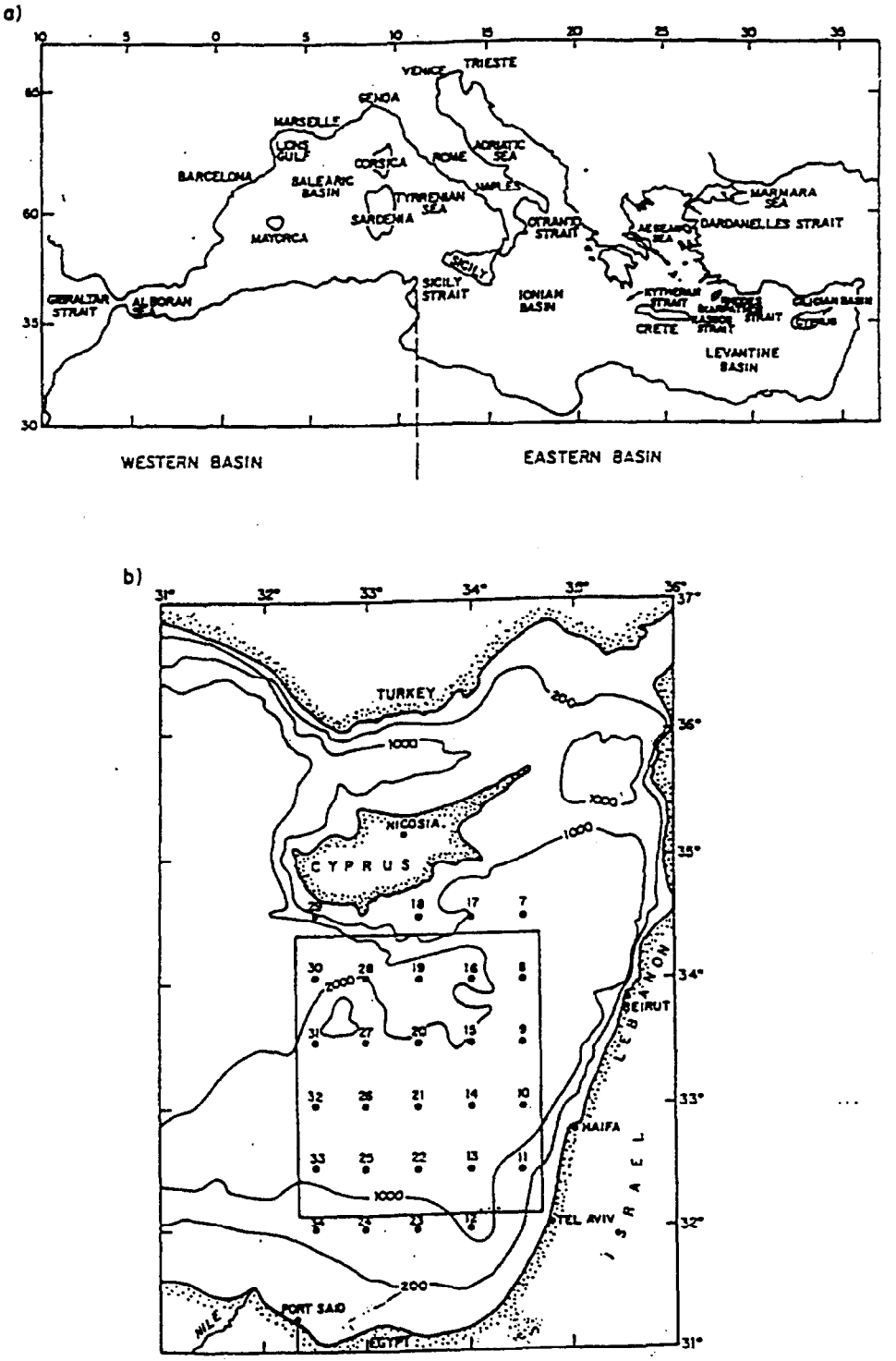


FIG. 1. (a) The Mediterranean basin geography and nomenclature of major sub-basin seas. (b) The topography of the southeastern Levantine basin is displayed together with the station locations indicated by a black circle and a number. A series of cruises, occupying some or all of the stations indicated, are described in the text. The rectangular box (220 × 270 km^2) indicates the domain in which the objective analysis is carried out.

Figure 8

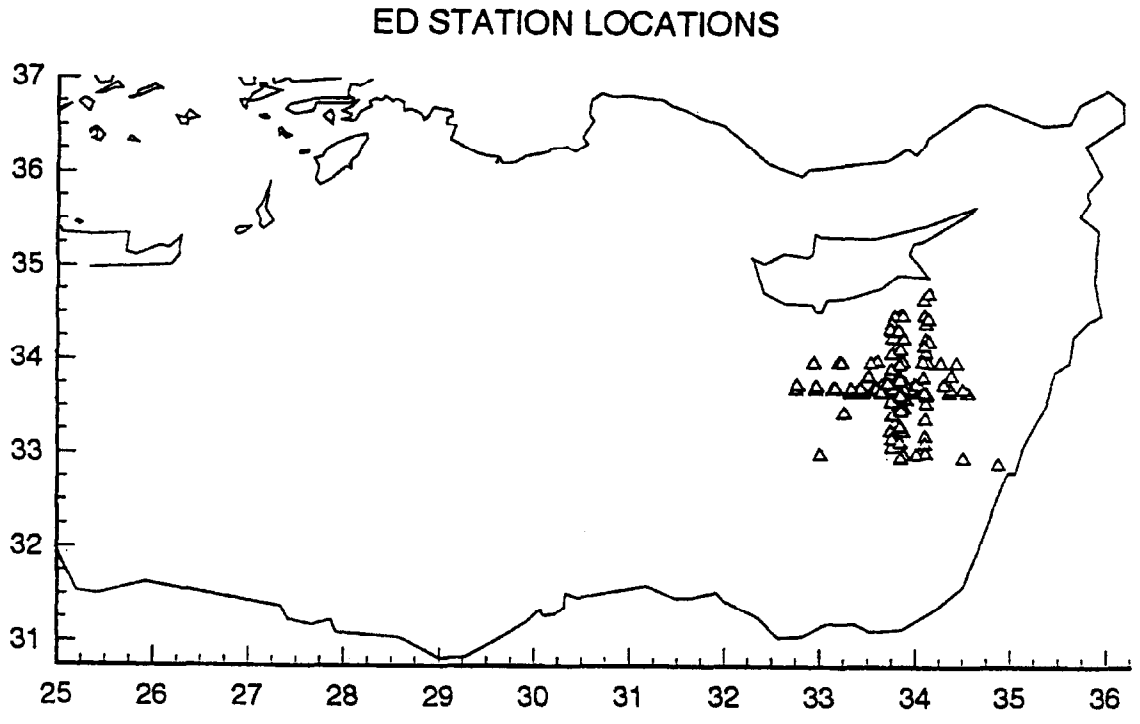


Table 3
CTD PROFILE DATA

SERIES: Marine Climate (MC)
REGION: Eastern Levantine

Cruise	Date	Profiles
MC11	1979	
.	.	
.	.	560
MC30	1984	

SERIES: POEM and LBDS
REGION: Levantine and Eastern Ionian

POEM01	15 Oct - 02 Nov 1985	80
POEM02	26 Mar - 11 Apr 1986	64
POEM05	23 Aug - 11 Sep 1987	36
POEM06	07 Aug - 27 Aug 1988	29
LBDS01	01 Mar - 18 Apr 1989	92
LBDS02	15 Jul - 16 Aug 1990	87
LBDS03	14 Oct - 10 Nov 1991	71

Table 3 (Cont.)
SERIES: Eddy (ED)
REGION: Eastern Levantine (Shikmona Gyre)

ED03	13-16 Feb 1989	20
ED04	01-03 May 1989	27
ED05	04 Sep 1989	2
ED06	13 - 16 Nov 1989	24
ED07	23 - 25 Apr 1990	22
ED08	21 - 24 Oct 1990	21
ED09	01 - 05 Mar 1992	16
		132 TOTAL:1151

2.9 ITALY

The responsibility of the Italian institutions: ENEA, Centro Ricerche Ambiente Marino, located in La Spezia, the Osservatorio Geofisico Sperimentale (OGS), located in Trieste and the CNR- Istituto per la Ricerca sulla Pesca Marina, located in Ancona, was to collect and contribute data primarily from the Western Mediterranean and Sicily Strait, the Adriatic and Eastern Mediterranean Seas. A large amount of CTD data was collected which can be included into the historical Mediterranean dataset (MED2), has already been distributed among the EU scientific community (Table 4).

Figure 9 shows the distribution of CTD stations in the Adriatic Sea archived in the MOB. A few bottle data have been included to complement the CTD stations network in the southern part of the Adriatic Sea where the data are sparse. Figure N shows the temporal distribution of CTD data. The period covered runs from 1975 to 1990. Additional bottle data which were not included in the MOB was used for the preparation of the first Adriatic climatology (Artegiani et. al., 1997, JPO).

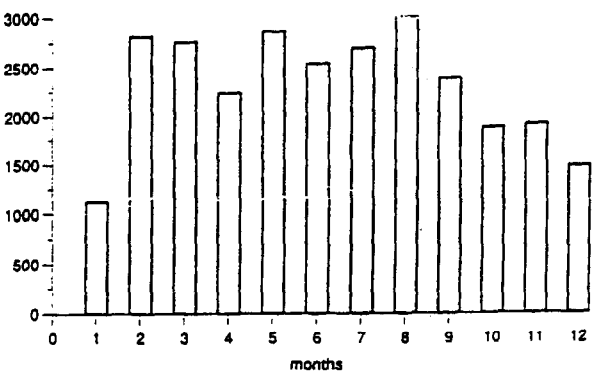
The new data will complement the CTD data in the Southern Adriatic already included in the MOB. They cover the period from 1980 until 1996 and have been collected within the framework of national and European programmes.

For the Eastern Mediterranean, the main contribution to the presently available dataset comes from the POEM (Phase I, 1985-1990) programme with more than 1,700 CTD casts made by the Member States participating in POEM (Germany, Greece, Israel, Italy, Turkey and the USA).

In 1990, POEM evolved into interdisciplinary POEM-BC to include biological and chemical data. The first basin-wide multi-ship general survey was carried out in October-November 1991, the second in January-February 1995 by the R/V *Meteor* from Germany. The 1995 general survey was carried out within the Levantine Intermediate Water Experiment (LIWEX) by 5 ships from Greece, Israel, Italy and Turkey. They sampled the Levantine Basin waters from February through April 1995. Figure 11 shows the network of hydrological stations.

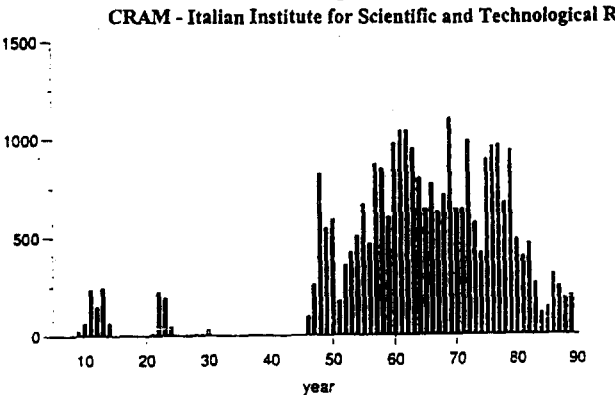
Table 4 Main institutions and types of data archived in Italy

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



- Monthly distribution of hydrological data in the ENEA-CRAM database

ENAE - Italian National Agency for New Technology, Energy and Environment
CRAM - Italian Institute for Scientific and Technological Research Applied to Sea



- Annual distribution of hydrological data in the ENEA-CRAM database

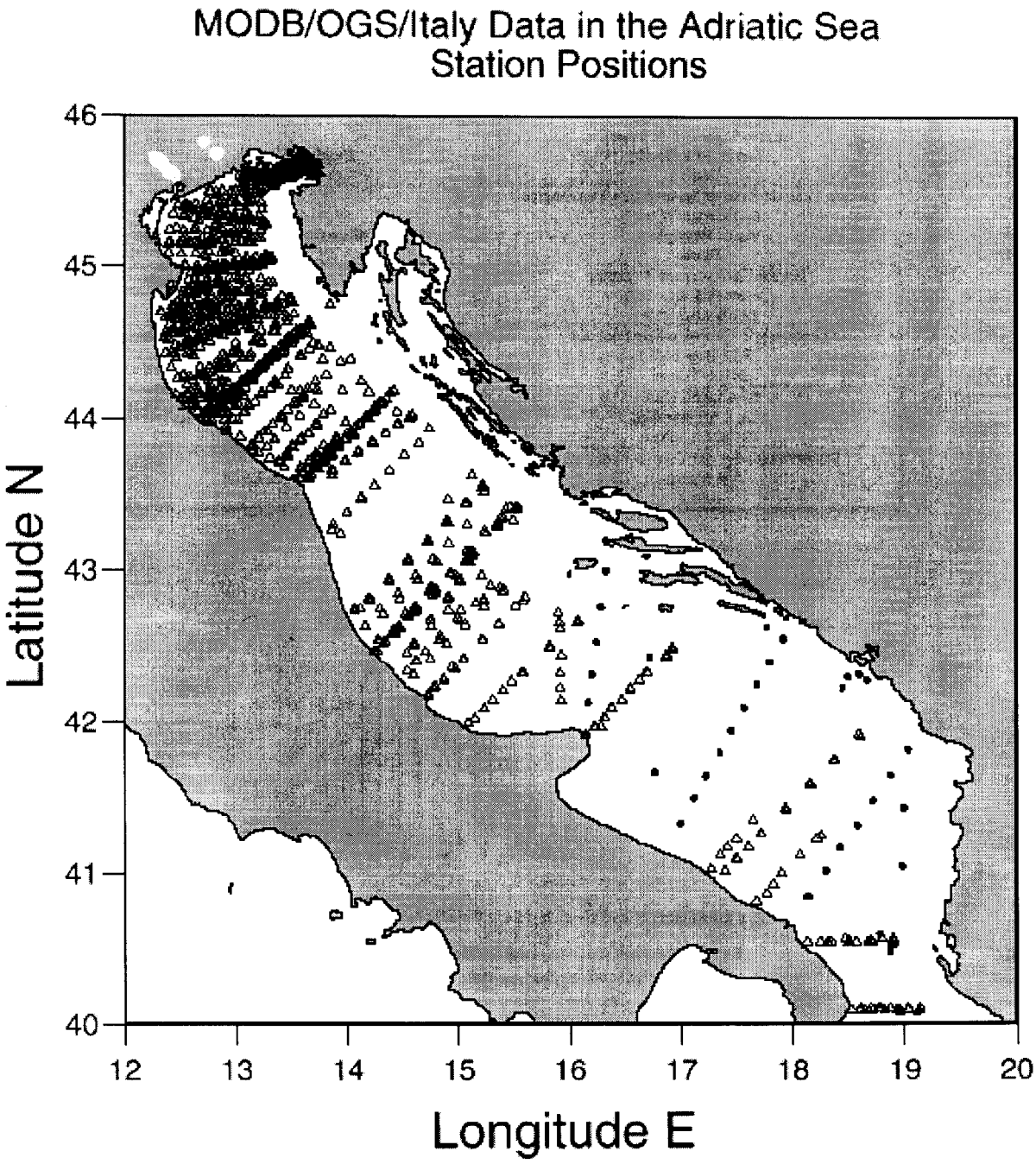

MODB/OGS/Italy Data in the Adriatic Sea
Station Positions
Latitude N
46
45
44
43
42
41
40
12
13
14
15
16
17
18
19
20
Longitude E

Figure 9

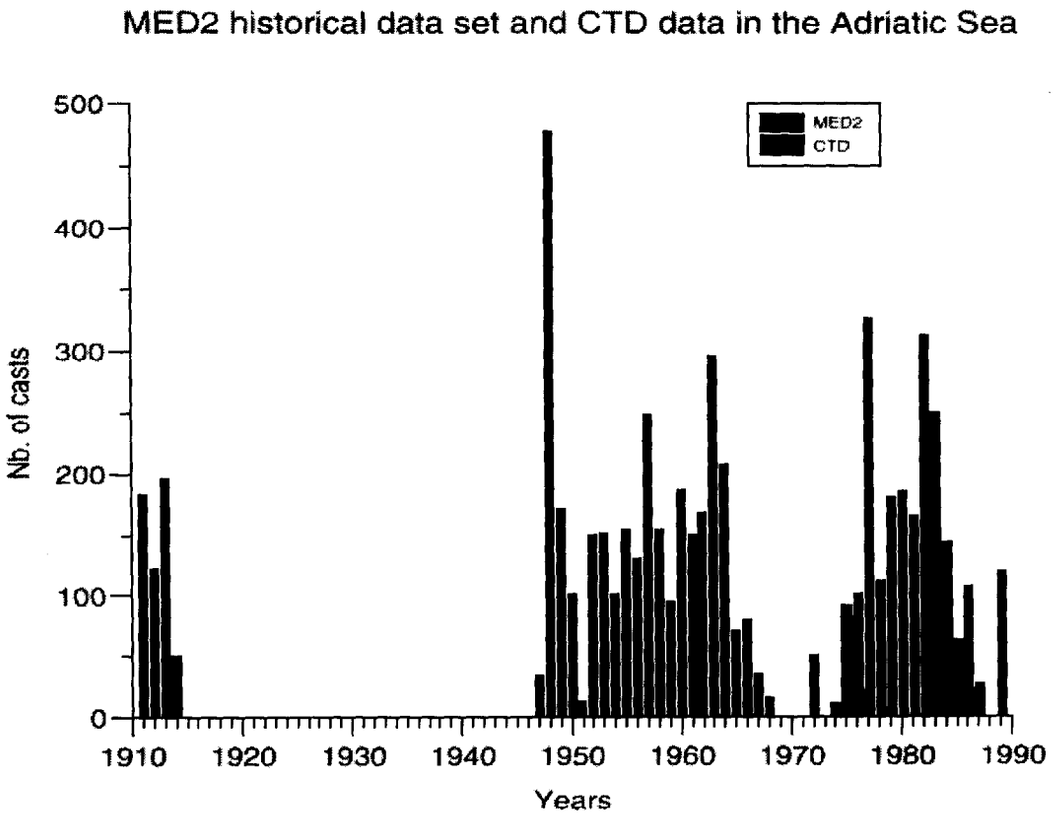

MED2 historical data set and CTD data in the Adriatic Sea
MED2
CTD
Nb. of casts
500
400
300
200
100
0
1910
1920
1930
1940
1950
1960
1970
1980
1990
Years

Figure 10

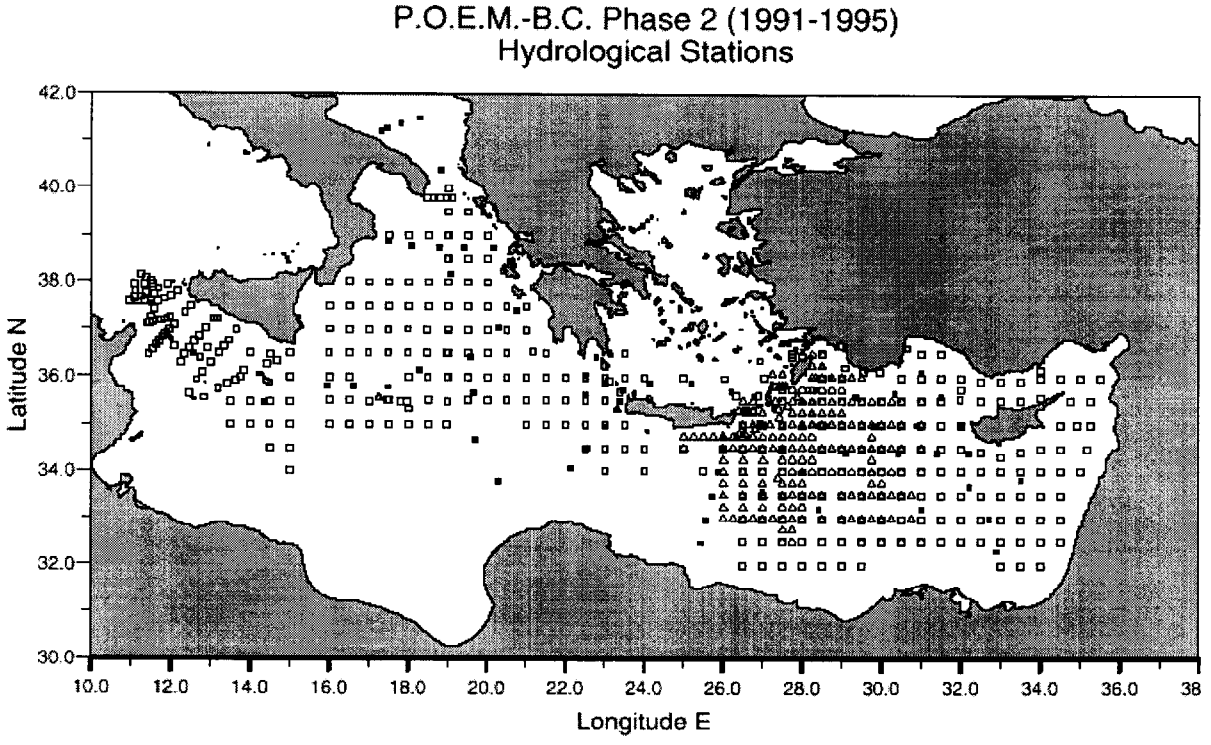

P.O.E.M.-B.C. Phase 2 (1991-1995)
Hydrological Stations
Latitude N
42.0
40.0
38.0
36.0
34.0
32.0
30.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
32.0
34.0
36.0
38
Longitude E

Figure 11

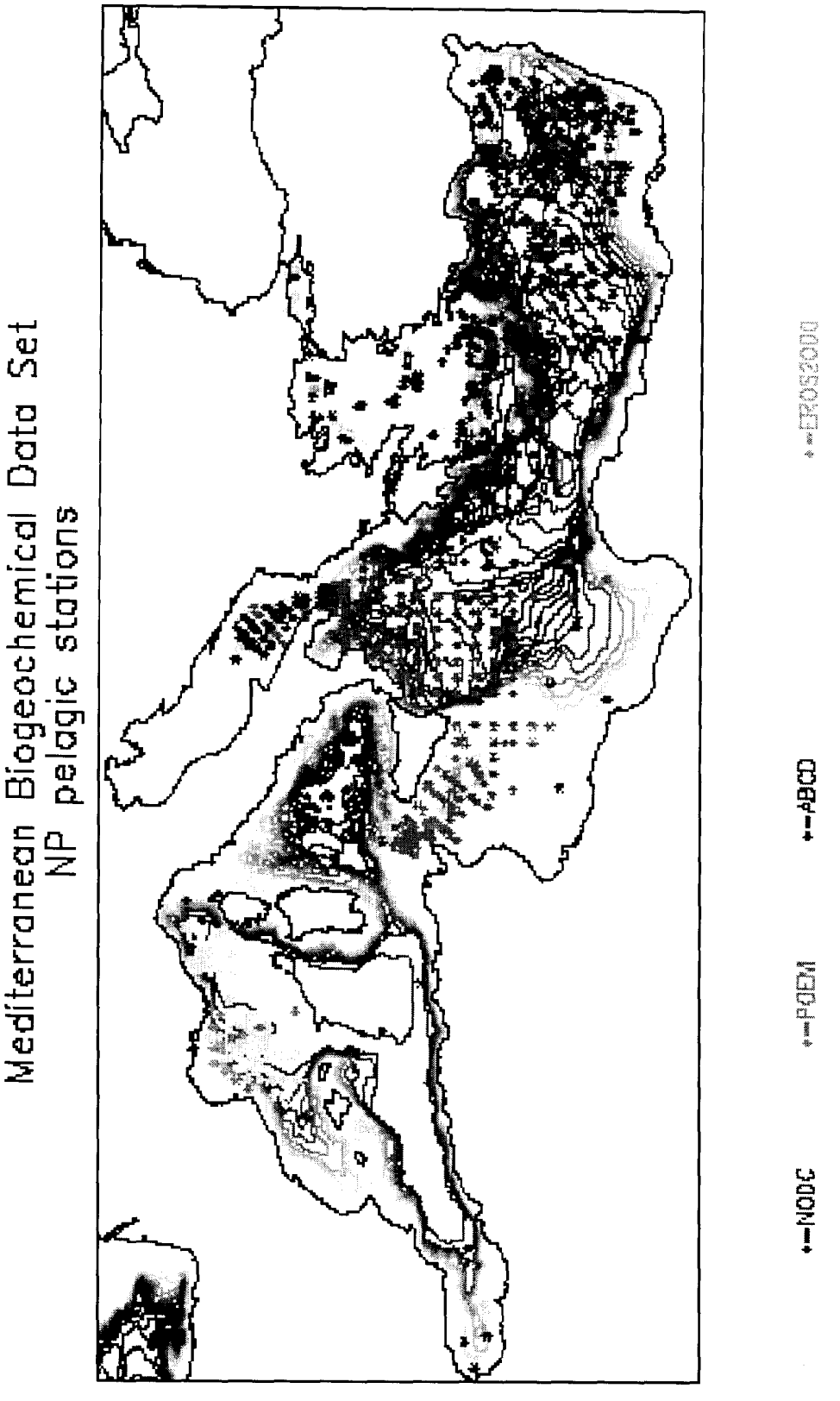

Mediterranean Biogeochemical Data Set
NP pelagic stations
+-NODC
+-POEM
+-ABCD
+-EROS2000

Figure 12

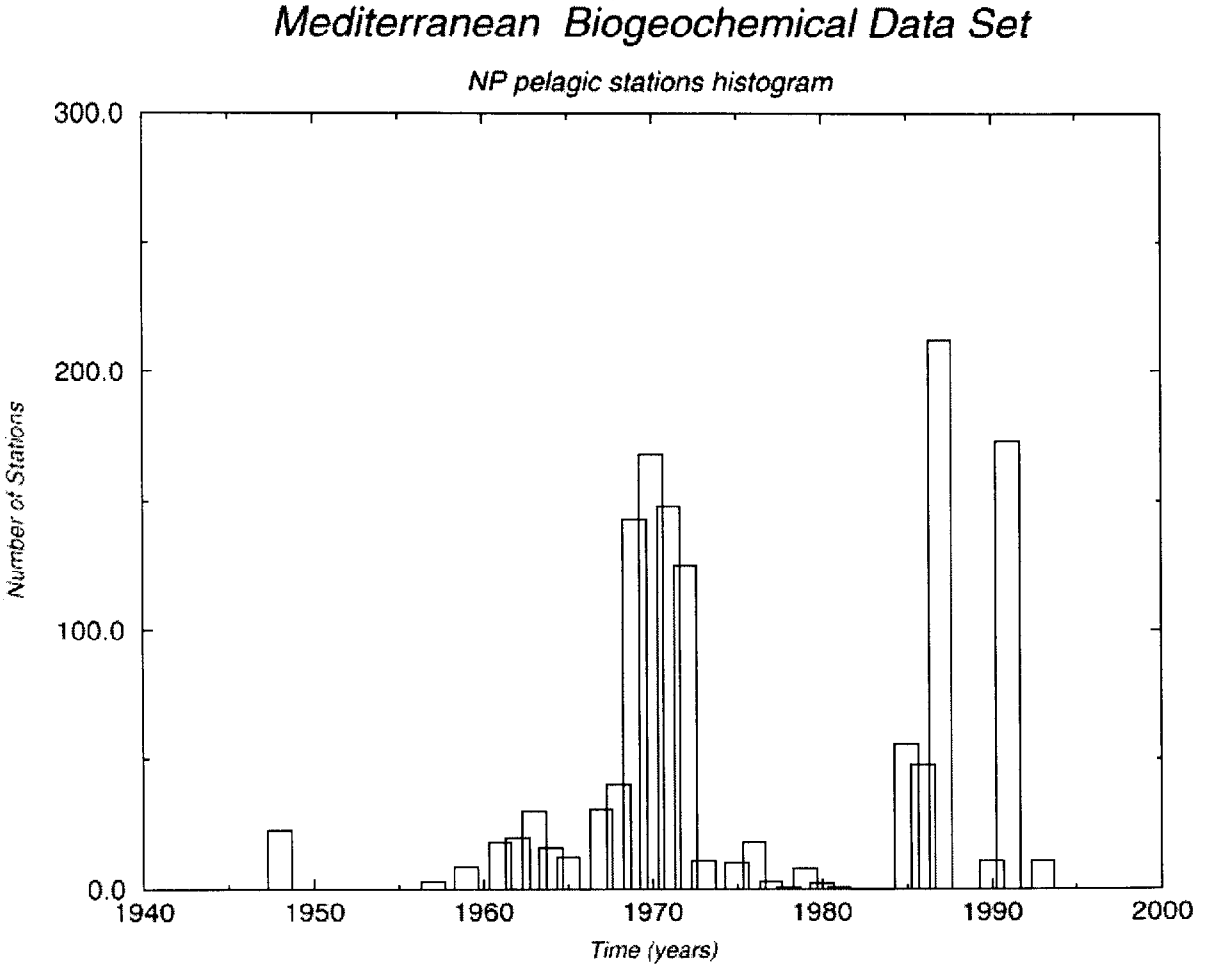


Figure 13

The first historical dataset of bio-chemical data (i.e., temperature, salinity, dissolved oxygen, nitrate, phosphate, silicate and chlorophyll-a) in the Adriatic and Eastern Mediterranean was completed for the Adriatic Sea. The Adriatic Bio-Chemical Dataset, Version 2 (ABCD.2) consists of 5,086 individual casts. Preliminary statistical analysis included the calculation of mean value and standard deviation for each parameter. The values departing from the mean by more than three times of the standard deviation were rejected. The results showed that the rejected data gave 2% for all temperature data, 3% for salinity, 4% for oxygen, phosphate, silicate and 6% for nitrates and chlorophyll-a. The finally accepted casts were included in the table which also contained information about data sources.

A preliminary check of availability of bio-chemical data for the Mediterranean Sea, has been initiated. Until now, only the data from USA/NODC and from some Mediterranean research programmes have been considered. Figure 12 presents a map where nitrate and phosphate data have been encountered. Only stations deeper than 500m (pelagic stations) are reported. An important source for these types of data is again the POEM dataset obtained mainly where the CTD casts were performed but in a coarser grid station network. Figure 13 shows the temporal distribution of the bio-chemical data in the Mediterranean. The data were mostly collected in the 1970s (historical data from USA/NODC and MEDIPROG) and from 1985 to 1990 (POEM, POEM-BC and EROS 2000 programmes). A quality control and global analysis of this data have been initiated by the ecosystem modelling group at OGS.

2.10 LEBANON

There is no National Oceanographic Data Centre in Lebanon. The Department of Oceanography at the Faculty of Sciences, Lebanese University, plays this role in collaboration with the National Centre for Marine Sciences (LNCSR). Before 1968, very few cruises in Lebanese waters were done occasionally. Hydrological and biological data were scarce. Little information concerning the taxonomy and distribution of marine organisms for this period are available. The results of some expeditions to the Levantine Basin in the East Mediterranean were published.

After 1968, the regular collection of samples and data have begun from the Lebanese coastal and neritic waters. Monitoring programmes and small research projects provided a large amount of hydrographic and plankton data which are stored in the plankton ecology laboratory of INCSR. The majority of these data were published in annual reports or in international scientific journals and conferences proceedings. A national project for archiving and managing these data is under study.

Most of cruises were carried out within coastal areas and neritic waters because of the lack of an equipped oceanographic vessel. Monthly cruises (some times weekly) were carried out within a costal line of 100km between Beirut and Tripoli in neritic waters and up to 5 miles from the coast, beyond the narrow continental shelf (Figure 14). The 14m length oceanographic vessel SETA-III, which have been used until 1988 is now actually out of operation At present only small fishing boats are used to continue monitoring surveys. The collected and stored data include the following parameters:

Hydrological data (since 1969) include the following parameters:

- temperature and salinity are measured *in situ* using a STD probe;
- oxygen-temperature is measured *in situ* with an O-T probe;
- phosphates, nitrates are measured in laboratory by standard colorimetric methods. A technicon auto-analyser was used until 1976 for measuring nutrients in water samples;

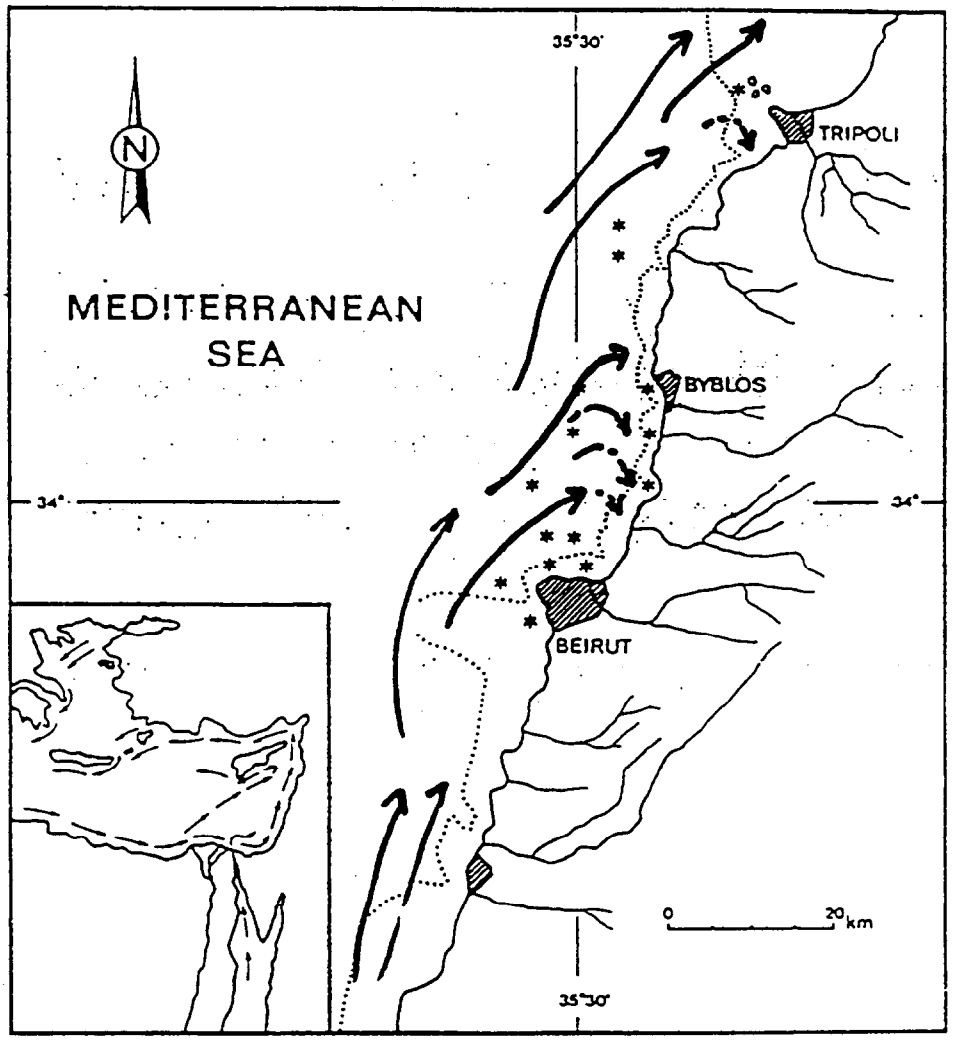


Fig. 14 - Location of sampling stations along the Lebanese coast; the dotted line indicates the limit of the continental shelf. Inserted chart shows the general circulation of surface currents in the eastern Mediterranean.

Figure 14

- surface currents are measured by floating drifts; deep currents - by Andrea current meters;
- chlorophyll concentration is estimated by a standard method recommended by UNESCO (1966).

Biological data include plankton, benthos, fishes and fish parasites:

- plankton is measured by standard plankton and closing nets with different mesh size: 20μ,50, 100, 180, 300 and 500 μ. Surface and deep samplings were carried out at fixed stations. Occasionally sampling hauls were done during cruises. Water samples were collected at different depths by reversing Neskin and Hansen bottles for microplankton count;

- Phytoplankton cell counting is carried out by Utermohl technique using inverted and ordinary optic microscopes. Identification is made up to species types.

- Zooplankton biomass is measured by identification of sedimented biovolume, wet weight and dry weight. Taxonomical study is made by identification up to species.

- benthos survey is made by direct observations and collections of samples from supra-littoral and medio-littoral zones. For infra-littoral and circa-littoral levels collections are made by diving. There are no data from deep water zones because of lack of collecting techniques and gears;
- Fish biology samples are taken from fishermen and from a fish market for the taxonomy studies and distribution of species. The study of fish parasites was also carried out on these samples.

All the collected samples are preserved, analysed and stored in the laboratory. All hydrographic and biological data resulting from these cruises are stored in PC's in the table forms.

2.11 MALTA

Research activities in the marine sciences have progressively gained momentum especially after 1991.

To date, activities are being conducted by separate organizations, the names of which, fields of research and types of collected data are given in Table 5. Private and public agencies are also participating in marine related activities. A physical oceanography unit has been established at MCST. It has permitted the acquisition of valuable knowledge on the physical processes characterizing the north western coastal areas of Malta and the Comino Channels. A tide gauge station in Mellieha Bay and an automated meteorological unit Ramla tal-Bir have been set up and permit the acquisition of time-series of the relevant parameters.

Oceanographic measurements have been mainly project oriented. Data collection activities are very often related to coastal development planning and to monitoring programmes at fish farm sites and bathing areas. No baseline data on a coarse grid scale is yet available for any of the oceanographic parameters.

The local scientific community lacks the necessary infrastructure and facilities for marine research. A well equipped oceanographic vessel is necessary for open sea studies. Except for marine biology there is a general lack of trained personnel and the University needs to extend its range of scientific fields of interest in order to include all branches of oceanography.

The establishment of a National Marine Science Centre in Malta will certainly resolve these problems. One of the main planned activities of the Centre will be establishing a marine environmental database which combines all available information in a GIS-based system. The National Marine Science Centre is expected to be designated as the National Oceanographic Data Centre for Malta and will be responsible to implement the local oceanographic data management strategy. The MCST together with the University of Malta is currently engaged in promoting an improved co-ordination in national marine research in order to facilitate multi-disciplinary initiatives in line with the needs of the country. This plan of action will also address the problems related to data access and availability.

Agencies	*Research Fields*	*Type of data*
Department of Biology University of Malta	Coastal ecology	• Benthic community data : - species, abundance (spreadsheets) - habitats (maps) - water quality, sediments (spreadsheets)
	Aquaculture	• 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	• Monitoring of environmental levels of pollutants (maps/ charts) • Lethal toxicity levels for a range of pollutants on a range of organisms (spreadsheet)
	Plankton	• Counts of gelatinous zooplankton in the coastal zone of Malta (early 1980's/spreadsheet)
Meteorological Office, Luqa	Meteorology	• Meteorological data (analog/digital) • Sea surface data
Hydrographic Office, Malta Maritime Authority	Hydrography	• Coastal bathymetry (digital) • Tides (analog)
Marine Resources Network, Malta Council for Science and Technology	Meteorology/Physical Oceanography	• Meteorological data (digital) • Sea level, tide (digital) • Currents • CTD
Euromed Centre on Insular Coastal Dynamics (F.I.S.)	Coastal geomorphology	• Beach profiling (charts) • Seabed sediment • Granulometry
Department of Geography, University of Malta	Land use studies	• Rock type (charts) • Erosion (charts)
Oil Division, Office of the Prime Minister	Geophysical	• Marine seismic data
Malta Freeport Company Limited	Wave climate	• Wave heights and spectra (digital)

Table 5

2.12 MOROCCO

Morocco has an Atlantic, as well as a Mediterranean coast. Oceanographic data have been collected in these two areas since 1974 by the National Institute of Fisheries Research created in 1950.

Since then it is in charge of fisheries research. Its laboratories are located in the city of Casablanca and there are biological stations in all major harbours of the Kingdom. The Institute's activities cover five main scientific areas:

- Assessment of pelagic and demersal stocks;
- Knowledge of resources and their dynamic aspect leading to a rationale management;
- Support of professionals by developing and improving fishing techniques and maps;
- Study of potential environment changes on aquaculture activities;
- Study of marine pollution and its impact on fishery resources and marine water quality.

There are two oceanographic units in the Institute working on marine (Mediterranean and Atlantic) and coastal zone (lagoons, estuaries and bays) problems.

The Institute operates an oceanographic laboratory, the role of which is to describe ecosystems, study an upwelling process along the Moroccan coast and develop a database of oceanographic observations including long-time series of temperature and salinity observations.

Three research vessels (*El Idrissi, Ibn Sina, Charif al Idrissi*) have carried out cruises in the Mediterranean Sea since 1974. After each cruise, the data are processed through FoxPro software and exploited by using Arcview geographic information system and Winsurfer to draw parameter distribution.

Most of the data are collected along the Atlantic coast within the framework of research programmes dedicated to the study of upwelling and the relationship between fish stocks and environmental conditions. However, there are also data from 150 stations in the Mediterranean Sea (Tables 6 and 7).

The stations consist of CTD profiles and water samples at different depths. Parameters include temperature, salinity, nitrate, silicate, chlorophyll-a and primary production. Surface climatic data and currents at different depths are currently archived in a PC database at the Institute, which is acting as the Moroccan NODC.

List of data concerning the Moroccan Atlantic Coast

VESSEL	Period	number of stations	Oceanographic data
El IDRISSI	February 1974	55	Temperature, salinity and water density
	May 1974	76	"
IBN SINA	September 1985	68	"
	April 1986	38	"
CHARIF AL IDRISSI	August 1992	42	Temperature, salinity, dissolved oxygen and water density
	July 1993	47	"
	Winter 1993	69	"
	Summer 1993	47	"
ATLANTNIRO	Winter 1994	112	Temperature, salinity, dissolved oxygen, phosphates, % oxygen chlorophyll, primary production and water density
	Summer 1994	90	"
	Winter 1995	114	Temperature, salinity, dissolved oxygen, phosphates, % oxygen, nitrates, silicates, chlorophyll, primary production and water density
	Summer 1995	90	Temperature, salinity, dissolved oxygen, phosphates, % oxygen, chlorophyll, primary production and water density.
	Summer 1996 (june)	48	"
	Winter 1997	95	"
CHARIF AL IDRISSI	Summer 1996 (July, August and September)	115	Temperature, salinity and water density

Table 6

List of data concerning the Mediterranean Sea

Vessel	Period	number of stations	Oceanographic data
EL IDRISSI	February 1974	18	Temperature, salinity and water density
	May 1974	19	Temperature, salinity and water density
IBN SINA	September 1985	46	Temperature
	April 1986	22	Temperature
CHARIF Al IDRISSI	August 1996	43	Temperature, salinity and dissolved oxygen

Table 7

2.13 RUSSIAN FEDERATION

Ocean data management activities for the Mediterranean Sea are carried out by Russian NODC co-located with the All-Russian Institute of Hydrometeorological Information. These activities include:

- improvement of information about existing data for the Mediterranean Sea. A reference database was developed which can carry out the different requests;
- improvement of data quality. The data for the Mediterranean Sea were transferred from the mainframe computers to PCs and software was developed to carry out the GTSPP procedures for QC data;
- accumulation of the Mediterranean Sea data. Presently data holdings include 814 cruises for 1910-1991 (41,000 ocean stations, 14,000 BT, 520 CTD, 320 current meter time-series);
- improvement of the data management means by developing GIS and DBMS applications for data search, processing and presentation;
- development of information products by using methods and software for calculation of a grid set.

During 1964-1995, the Russian NODC received oceanographic data from over 30,000 R/V cruises of 64 countries (including the former Soviet republics) for the period of 1890-1995. These contain data from over 1,850,000 oceanographic stations (among them 80,000 stations with chemical pollution), 565,000 BT profiles, 25,000 CTD profiles, 4,000 deep-sea current meters and 26,500,000 marine ship observations.

The Russian NODC accumulated the coastal hydrometeorological data from 485 stations for 1977-1992 and from 283 Russian stations for 1993-1995. In the last 3 years, the Centre began to accumulate new types of observations - surface temperature from satellites, derived maps from satellites, and aircraft observations.

The above-mentioned data are placed in 12 archived datasets of the state holdings.

The Russian NODC develops the following products on user requests:

- inventories for regions, institutes, parameters and time periods;
- supporting software (Electronical Reference, SHIP v.2.0) for management, sampling and viewing the summarized oceanographic metadata such as data distribution maps and tables, descriptions of marine institutions, R/V ships, results of statistical processing of the data, etc.;
- multi-level derived datasets to study climatic variability of the selected regions of the World Ocean and time-periods including:
  - space-oriented and time-series data,
  - climatic characteristics using robust methods of statistical estimation,
  - climatic fields (average and deviation for 5- or 1-degree grid and a month) for temperature and salinity.

- software for PCs (Information-Reference System, OCEANOGRAPHY v.4.1) for data input, QC, sampling, graphical and textual data viewing, preparing the derived datasets and statistical analysis of oceanographic (water-bottle, BT, current meter, coastal, marine ship) data in an interactive mode.

2.14 SPAIN

The Spanish Institute of Oceanography (IEO) was established in 1968 and is responsible for archiving and distributing the data produced by different research groups of the Institute.

The IEO freely exchanges its data with other national centres on the basis of bilateral agreements, but holds the right to charge the other users with marginal costs for copying material and mailing. The availability of recent data is restricted and is subjected to the authorization of a scientist who was responsible for a data collection.

The IEO activities focus on maintaining the inventory of cruises, sea-level and current meter time-series for quality control and banking of data. The procedures used for quality control of most parameters are standard, described in the ICES/IOC recommendations. For the hydrological data, the QCMED software was developed for PCs under DOS according to the criteria agreed upon by the members of the MEDATLAS consortium. For sea-level data, the TOGA methodology is being used. A few years ago, the Simrad NEPTUNA software was implemented in the IEO for quality control of the multi-beam bathymetry. During the last year, a database for ecology was developed using ORACLE RDBM running in a HP server under DOS.

Other important activities are related to the collaboration within the national and international projects such as:

- Spanish Integrated Sea-Level Networks (RIMA);
- Spanish Exclusive Economic Zone Programme (SEEZ) for the development of a multi-beam gridded bathymetry;
- Global Observing Sea-Level System (GLOSS);
- Data management in collaboration with the Irish Marine Data Centre for CANIGO.

The plans for the new activities include the development of a relational database for all the parameters and an interface between the relational database and the formatted files in order to quality control the data using the in-house software.

2.15 TUNISIA

Research in the field of marine science (mainly marine biology) is conducted by several institutions in Tunisia. The National Institute for Marine Science and Technology (INSTM, ex-INSTOP) is the main one and the only one devoted to marine research and development. It includes the Laboratory of Physical Oceanography, which was created in 1994.

The Laboratory of Physical Oceanography is solely involved in studying water mass properties and circulation along the Northern Tunisian shelf. Within this framework, high quality CTD profiles have been collected on the Tunisian side of both Tunisia-Sardinia and Tunisia-Sicily channels with the collaboration of the hydrographic service of the Tunisian Navy. A total of 140 (T, S, O, p) profiles have been collected;

70 of them during the spring of 1995, and 70 during the autumn of 1996. Analyses and interpretation of the data are presently under way.

2.16 TURKEY

The Turkish NODC was established in 1993 at the Department of Navigation, Hydrography and Oceanography of the Turkish Navy. The NODC is responsible for oceanographic data archiving and dissemination. Marine research has a long history in Turkey. Four leading institutions carry out multi-disciplinary oceanographic researches (Institute of Marine Science, Erdemlý; Institute of Marine Science and Technology, Izmir; Institute of Marine Science and Management, Istanbul; Department of Navigation, Hydrography and Oceanography, Çubuklu/Istanbul).

These institutions have been involved in international projects and programmes such as MEDPOL, COMSBlack, NATO TU-Black Sea, NATO TU-Wave and POEM, as leading or active partners.

Data from National Oceanographic Observation and Research Programme, started in 1986, are stored in the institutional databases and since 1993 also at the Turkish National Research Council as a sponsoring agency. This programme included seasonal cruises conducted in the Black Sea, Sea of Marmara, Aegean Sea and Levantine Sea and the permanent network of at least 35 hydrological stations in each basin.

At present, there are two main national programmes:

- Oceanographic Observation and Monitoring Programme;
- Marine Geological and Geophysical Research Programme.

Within these programmes, high quality oceanographic, hydrographic, marine geological and sedimentological data are collected, processed and analysed to be used for research, technology, and environmental issues. These programmes are under revision to meet national and international needs and requirements of operational projects, such as regional GOOS.

Data from the MED-POL Programme has been submitted to the MED-UNIT through the Ministry of Environment which is the national co-ordinator. Data quality control was under the responsibility of an originating institute. There is national policy for data and information exchange issued by a Ministerial Decree of the Turkish Government dated 1 May 1995 which is in line with the IOC/IODE strategy. Historical data, collected by the Department of Navigation, Hydrography and Oceanography are made available for international exchange through the WDC-A, Oceanography.

Recently, the Turkish NODC has been involved in the planning of the following pilot projects in the Black Sea through the IOC Black Sea Regional Committee:

(i) Black Sea GOOS : Step Towards Observational and Prediction System;

(ii) Assessment of the Sediment Flux in the Black Sea Mechanisms of formation, transportation, dispersion and ecological significance.

2.17 UKRAINE

Marine Hydrophysical Institute (MHI) of the National Ukrainian Academy of Sciences was founded in 1929, when a stationary hydrophysical station was established in Katsively (Crimea) on shore of the Black Sea. In 1948, Marine Hydrophysical Institute affiliated to the USSR Academy of Sciences was set up in

Moscow on the basis of the Black Sea Hydrophysical Station (Katsiveli) and Marine Hydrophysical Laboratory (Moscow). In 1961, MHI was re-affiliated to the Ukrainian Academy of Sciences, and in 1963, was transferred to Sevastopol. About 200 researchers work in the MHI, amongst which 26 are professors and 120 persons are PhDs. Scientific journal "Physical Oceanography" published in MHI, since 1989 is re-published in English by the VSP Company in the Netherlands. MHI has 14 scientific departments including Department of Marine Information Systems and Technologies with the Database Laboratory. In 1994 MHI was nominated by Ukraine as a Designated National Agency (DNA) for management of marine data.

The main tasks of the DNA include:

- Development of the scientific basis, algorithms and software for the oceanographic data quality control, processing, and database management systems;
- Creation, loading and maintenance of the regional, special and multi-disciplinary oceanographic databases;
- Provision of the necessary data and metadata to all scientific projects carried out by MHI.

Research vessels of MHI carried out measurements in the Mediterranean Sea during 48 cruises, primarily in the eastern part of the Aegean & Levantine seas, in the Alboran Sea & the Gulf of Lions (Figure 13). Overall, about 1,600 stations had been made. The measurements were performed from 1968 up to 1994 during all seasons (Figure 15) . The following parameters were measured:

- temperature & 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, colour index, scattering function, radiance index spectra, bioluminescence);
- radioactivity (Sr90, Cs-134, Cs-137, Ce-144, Rn-222);
- biological data (chlorophyll primary production, phyto-, zoo- & ichtyoplankton, squid, etc.).

All main Ukrainian oceanographic institutions are involved now in the creation of the Ukrainian National Oceanographic Data Centre (NODC). The leading organization for this project is the Marine Hydrophysical Institute. The NODC will be created as a distributed system with nodes in the Marine Hydrophysical Institute - MHI (oceanography and satellite data), Southern Scientific Research Institute of Fisheries and Oceanography - YugNIRO (living resources), Institute of Geological Sciences - IGS (non-living resources), Ukrainian Scientific Centre of the Ecology of Sea - UkrSCES (pollution of the sea).

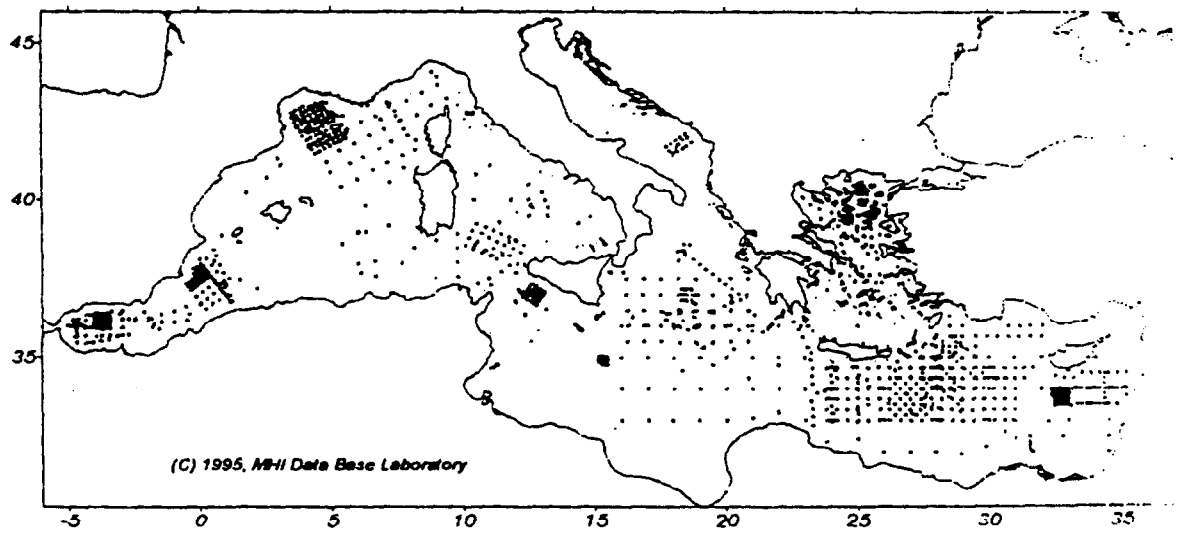


Figure 15: Position of stations occupied by MHI's Research Vessels (1968-1994)

At the Marine Hydrological Institute of the Ukraine, work is mostly achieved within the framework of international projects:

(i) GEF BSEP programme. A BlackSIS information system was developed jointly with BSEP PCU (Istanbul), Delft Hydraulics and MARIS (Netherlands). The system contains an inventory of scientists, institutions, ROSCOP forms, datasets, and bibliography for the Black Sea. It is available through the Delft Hydraulics FTP server.

(ii) NATO TU-Black Sea Project, an inventory of the project data was compiled jointly with IMS/METU (Turkey). It is available through the IMS/METU FTP server. Work on preparation of the project database and DBMS has been completed. The first version of this database will be ready by July 1997.

(iii) Co-operative Marine Science Programme for the Black Sea, COMSBlack of IOC.

3. MEDITERRANEAN DATA BANKING IN THE INTERNATIONAL DATA CENTRES

WDC-A

World Data Centre A (WDC-A) Oceanography is a centre of a global network of discipline world data centres that facilitate international exchange of scientific data. In accordance with principles set forth by ICSU, WDC-A for Oceanography acquires, catalogues, and archives data, publications, and data inventory forms and makes them available to requesters in the international scientific community. The Centre collates, qualify and publishes historical archives and time-series of oceanographic data related to the climate change.

The Global Ocean Data Archaeology and Rescue Project, whose objective is to increase the volume of historical oceanographic data available to researchers and other uses, by locating datasets not yet in digital

form and ensuring their submission to one of the national data centres is one of the projects where WDCs play a leading role. This project has been approved and endorsed by the Intergovernmental Oceanographic Commission (IOC) within the IODE programme (International Oceanographic Data and Information Exchange). A significant number of observed data have been rescued in this frame since 1993, when the project was launched. The 1994 release of the WDC-A physical and chemical data holdings (World Ocean Atlas, 1994) has been communicated to the MEDATLAS consortium and was included in the database. The 1998 release will include bio-geochemical parameters.

The World Ocean Data Base 1998 (WODB98) will represent the most complete ocean profile data base in existence. An additional 1,000,000 Bathythermograph profiles & 600,000 Nansen casts will be included that are made available from the IOC/GODAR project. In addition to the standard NODC parameters, new parameter types such as chlorophyll & plankton will be included. Table 8 presents a comparison of WOA94 & WODB98.

The World Ocean Atlas 1998 (WOA98) will include objectively analyzed fields of the parameters included in WODB98. Paper atlases will present fields for individual ocean basins so as to show greater detail as compared to WOA94 maps.

COMPARISON OF WOA94 AND WODB97

WOA94	**WODB98**
1. Temperature	Temperature
2. Salinity	Salinity
3. Oxygen	Oxygen
4. Phosphate	Phosphate
5. Nitrate	Nitrate
6. Silicate	Silicate
7. Obj. Analyzed fields	X
8. X	All NODC SD2 data & metadata
9. X	Nitrite
10. X	Alkalinity
11. X	pH
	New parameters
13. X	Chlorophyll & phaeophytin
14. X	Plankton & primary productivity
15. X	POC & DOC

Table 8

International Council for the Exploration of the Sea (ICES), Denmark

ICES is the main source of marine scientific advice on fisheries and environmental issues in the North Atlantic area. Its wide ranging activities seek to ensure an international consensus by a complex system of working groups and committees, and by hosting databases on fisheries, environmental and oceanographic issues. It is a main proponent of the international standards on which projects such as MEDATLAS depend. Since its inception, it has served as organ to ensure that international data are collected in comparable ways, and has therefore been involved in the establishment and maintenance of standards. In this and other areas ICES is working very closely with IODE/IOC.

The Secretariat of the International Council for the Exploration of the Sea has housed an oceanographic data centre since the establishment of ICES in 1902. Its special geographical area of concern is the North Atlantic and adjacent seas, and many of its oceanographic datasets extend into the Mediterranean. The unit participating in MEDAR/MEDATLAS is the ICES Oceanographic Data Centre. This is an integral part of the ICES Secretariat which can draw on a wide range of professional expertise available in the Secretariat as a whole.

The Data Centre promotes and encourages the employment of standard and practices, and as such operates as the RNODC-Formats of the IOC. As a major centre for the compilation of quality assured classical oceanographic data it is able to contribute to the development of international data standards required for most of the data type to be handled within the MEDATLAS Project.

4. RECOMMENDATIONS

The general opinion of the participants was that MOB/MEDATLAS (MEDATLAS-I) has produced inter-compared high quality climatologies for temperature and salinity up to the monthly time-scales by the usage of advanced methods such as variational interpolation and krigging. It was noted that collected data allow computations of monthly climatologies used in hydrodynamical and ecosystem modelling efforts at global and regional Mediterranean scales. However, there is still a big gap in data for the southern Mediterranean and there are considerable volumes of data for the northern Mediterranean which have not been fully exploited, have not been included in MOB/MEDATLAS project and have not been mapped at sub-optional space/time resolution.

The Meeting acknowledged that future work should be based on the close partnership between scientific and data management communities and the cornerstone principle of the IODE data policy procedures - free exchange and open access to data should be pursued in the future and enforced even more than in the past.

The Meeting reviewed the adequacy of the products being used in MEDATLAS-I and considered what extensions may be acquired to address the additional needs of MEDATLAS-II. In addition, a number of issues were discussed during the plenary and by the three sessional working groups which were established to deal with scientific needs, quality assurance and products.

The sessional groups were headed by Prof. N. Pinardi (Climatology, Statistical Analysis and Gridded Data Products), Dr. G. Manzella (Data Products in the World of New Technology and Needs), and Dr. H. Dooley (Quality Assurance). The recommendations of the groups as approved by the Workshop are given below.

4.1 SCIENTIFIC REQUIREMENTS

The future work cannot be successful without continuing liaison between scientists and data managers from the region. Only through this close co-operation it will be possible to specify standard sets of statistical characteristics which describe the Mediterranean Sea climate and further develop procedures to disseminate the information to user communities. The goals of the future work will be to produce:

- periodical updated monthly mean climatologies for temperature and salinity at rather coarse resolution (1/4 x 1/4 or 1/8 x 1/8 degrees and vertical standard levels);
- higher space resolution climatology in near-coastal areas where possible;
- climatology of biochemical processes for the entire water column;
- more advanced analyses products, such as high order statistical parameters and multi-variate schemes.

It was the general understanding that to achieve these goals there will be a need for NODCs in the region to reconsider their terms of reference and make their activities transferred from primarily archiving function to those of data analysts. The experience of the data management procedures gained during the implementation of WOCE which was based on co-operative scientific/data management should be explored. The data centres in the region should continue and extend their archiving effort, especially in the southern and near-coastal Mediterranean areas. They should support assimilation of climatological data into numerical models and ensure multiple data dissemination tools, such as web sites, CD-ROMs, diskettes, etc. Jointly with scientists, data managers should be ready to evaluate assess/applicability of present statistical interpolation methods to biochemical data and to define the procedures of verification and intercomparison of current and new methods applied to all the parameters. If the increase of data collection is large enough, there will be a need to explore new analyses methods for the physical parameters, such as updating procedures of secured versions, 3-D statistical interpolation at monthly time-scales and intercomparison with previous methods, isopycnals mapping, etc.

The Meeting requested the Chairman of the IOC Committee on IODE to explore the ways of meeting these recommendations through the IODE Subsidiary Bodies and to make a survey among NODCs on their readiness and ability to extend their terms of reference in order to include new activities.

The Meeting recommended the Chairman IODE and the Deputy Executive Secretary IOC to bring to the attention of the relevant GOOS bodies in order to envisage ways of connection with the growing needs of the GOOS community for real-time and near real-time data dissemination and usage and to establish links of co-operation in the implementation of the above recommendations.

4.2 DATA PRODUCTS

The Meeting acknowledged the development of the inventories of data holdings in some Member States of the Mediterranean area within the framework of the EU/EDMED project and the IOC/ MEDI initiative, as well as the development of a prototype inventory for the Mediterranean Sea implemented by the Russian NODC/WDC-B, Oceanography. **The Meeting agreed** on the need to have a common cruise catalogue based on the CSR (ROSCOP) form. **It was also recommended** that the MEDATLAS-II project should include a concise inventory of existing data which will be electronically available and regularly updated to include on-going and future projects. The NODCs were recommended to compute from the archived data:

- coastal-oriented climatological analyses where possible;
- climate-related indices (occurrence of events, extremes and anomalies);
- trends, inter-annual/decadal variability of archived time-series to be constructed from datasets;
- space time-scales of structures from datasets (space time correlation lengths, etc).

4.3 QUALITY ASSURANCE

The decision was steered under the headings (i) exchange format, (ii) documentation, (iii) automatic and visual checks, (iv) software availability and requirements.

(i) Exchange Format

The MEDATLAS format was seen as a successful element of MEDATLAS-I. Thus, it was **recommended** that the MEDATLAS format should continue to be used in MEDATLAS-II. The structure of the format was such that it could readily be expanded to a broader range of data types. However, some additional features were requested by the Workshop and these included:

- provision for the recording of station end time and date;
- use of only internationally approved GF3 (IOC) parameter codes;
- information on whether profiles are expressed in pressure (decibar) or depth (metre).

Agreement was reached on those parameters that should additionally be included in MEDATLAS-II and which should be subjected to quality assurance procedures. It was **recommended** that the core additional parameters to be handled in MEDATLAS-II should be in priority: oxygen, nitrate+nitrite, nitrite, chlorophyll-a, phytoplankton, backetical and zooplankton biomass, sediment structure and biochemistry, phosphate, silicate, ammonia, pH, alkalinity, H_2S, total phosphorous and total Nitrogen. These parameters were identified by virtue of the fact that significant quantities of these data are currently available in many institutes in the Mediterranean area. Furthermore, it was considered that significant knowledge of the distribution of the parameters was available to allow for quality assurance procedures to be applied to these parameters.

Since the MEDATLAS format has the capacity to accommodate a wide range of data types, it was agreed that a supplementary list of parameters be identified which should be included with any submission of data. These parameters, which would not be assessed for quality included: primary production, total suspended matter, DOC and DON. Secchi Disk measurements would also be accepted and these observations would be held in the Comment Header of the MEDATLAS format.

(ii) Documentation

There was a wide ranging discussion on the need for the availability of documentation describing all the stages of data management from the data collection phase through to the final archiving phase. It was appreciated that the MEDATLAS format was designed to facilitate the storage of and access to such information and this would become even more important for the additional parameters that will be acquired during MEDATLAS-II. However, since much of these data types to be added are historical and are already available from within the MEDATLAS-I dataset and other datasets such as WDC-A/WOA 1994, acquisition of additional information may be difficult to acquire. However, where datasets are to be obtained from source, information in handling and processing methodologies should be acquired at the same time. Many

institutes also participate in intercalibration exercises and such information about participation in these should be provided.

It was recommended that whenever possible ,CRS-ROSCOP forms, the data from which has been acquired from source (e.g., institutes), should be completed and should include all information describing the parameters collected, including methods of analysis.

(iii) Automatic and Visual Checks of Data

The system of quality assurance practised in MEDATLAS-I was re-examined. The system provides a flexible interaction between visual and automatic checks and it was recognized that this is an important feature that will be required when additional (chemical) parameters are to be assessed. The IEO software will have to be extended to accommodate additional parameters but this is not seen as a difficulty. **It was** therefore **recommended** that the IFREMER and IEO quality control software should be used for data quality assessment on MEDATLAS-II.

The basis of the checks on chemical data will be range check set for various regions of the Mediterranean. As a first step, appropriate minimum and maximum values will be chosen on an analysis to be completed by WDC-A later this year. The quality control procedures should be updated and raw data flagged.

The Meeting recommended that scientists with expert knowledge in any of the additional parameters should be identified and invited to provide peer review or expert guidance on the needs of the quality control of the individual parameters.

(iv) Software Availability and Requirements

As many of the additional parameters to be included in MEDATLAS are from datasets acquired from the Black Sea region, **it was recommended** that, in addition to IFREMER (France), IEO (Spain) and NCMR/HNODC (Greece) who were the regional QC centres for MEDATLAS-I, one of the centres in the Black Sea region will additionally act as a regional quality control centre with special responsibilities for the Black Sea region. This centre will adapt its procedures to allow control of data in the MEDATLAS format.

The IFREMER system SCOOP has been developed only for UNIX platforms and is available for installation on most other UNIX platforms in the Mediterranean region. The IEO quality control software has been developed for the PC and thus can be made widely available. An important initial task of MEDATLAS-II must be to upgrade this software to accommodate additional parameters.

4.4 CAPACITY BUILDING

The Meeting recognized that the level of technology is very different around the Mediterranean, in particular for data processing and networking facilities. It was recommended that a capacity building component should be well presented in the project proposal and the instruments of UNESCO (e.g., participation programme) and the European Union should be used for improving technical facilities of regional data collection and management.

The Meeting recognized further that a very important objective of MEDAR/MEDATLAS is to ultimately produce a data management system for the Mediterranean that will allow the region to meet medium and longer term needs for a network of operational data management, as will be required by GOOS. MEDATLAS-II can contribute to this process by enabling and developing contacts between the national data

centres themselves and with the institutes. The aim of this must be to encourage the use of a common formatting system and common quality control across the whole region.

Such an initiative should be backed up by the instigation of training courses and workshops as appropriate. This could be undertaken, e.g., via the IOC Training Programme and EC/MAST training courses.

It is therefore **recommended** that IOC consider the conducting of a training course on data management in the Mediterranean region with the specific objective of providing training in the use of the MEDATLAS Oceanographic format and its associated quality control software.

5. CONCLUSIONS

The Meeting agreed that the overall goal of developing MEDAR/MEDATLAS (MEDATLAS-II) project proposal was achieved and the Project Leader received enough constructive and useful recommendations and guidance which could help her with the assistance of selected experts to finalize the project proposal by the end of June for submission to the funding agency. There seemed to be enthusiastic support for the project and the issues and actions cited above should provide important guidelines to the EU, IOC, particularly its IODE and GOOS, and other sponsors. Just as important as the recommendations is the bonding that accrued between representatives of almost all data centres of the Mediterranean and Black Sea countries during the Meeting which will certainly be most beneficial to the success of the project.

ANNEX I

WORKSHOP PROGRAMME

AGENDA AND OBJECTIVES

The objectives of the present Meeting were to review and discuss:

- scientific and operational needs in oceanographic data management;
- presently available datasets and data products (physical and chemical *in situ* data);
- existing national capabilities in data handling;
- possible joint actions to develop reference datasets in order to facilitate further analysis and assessments for the success of the GOOS regional programmes implementation and other development initiatives, MEDAR/MEDATLAS project proposal.

Agenda

21 May
Opening of the Meeting, welcome address from local organizers.
Introduction to the Meeting (I. Oliounine).
Information on local arrangements.

1. Invited Talks

21 May
Morning and afternoon until the coffee break

Data products needed for the operational oceanography and GOOS (N. Pinardi - MEDGOOS).
Role of IODE products in the management of oceanographic data at ICES (H. Dooley).
GODAR project in the Mediterranean (M. Conkright).
Oceanographic Data Management in the Black Sea (H. Yuce).
MOB initiative (M. Rixen).
MEDATLAS including the introduction of the draft MEDAR/MEDATLAS project proposal. (C. Maillard).

2. National Data Management Initiatives

21 May afternoon, after coffee break
22 May mornings

Presentation of national activities
- recent oceanographic cruises and data archived since GODAR-IV held in Malta in 1995;
- quality control procedures used for the oceanographic datasets development;
- national policies for archiving and dissemination of oceanographic data.

Morocco	J. Larissi
Algeria	N. Eddalia
Tunisia	S. Gana
Egypt	S. Madgy
Israel	S. Brenner
Lebanon	S. Lakkis
Cyprus	G. Zodiatis
Russia	N. Michailov
Ukraine	A. Suvorov/V. Vladimirov
Turkey	H. Yuce
Bulgaria	M. Popova
Greece	E. Balopoulos
Croatia	V. Dadic
Malta	A. Drago
Italy	G. Manzella/B. Manca
France	M. Fichaut
Spain	M-J. Garcia-Fernandez

3. Workshops

22 May afternoon, *23 May* morning

(a) Quality assurance in order to insure a coherent level of quality for the data archiving of temperature, salinity, oxygen and nutrients observations among the data centres.

M-J Garcia-Fernandez: IEO/MEDATLAS quality control procedure
H. Dooley: OceanPC quality control software
M. Conkright: GODAR experience

Discussion:
- exchange format;
- documentation;
- automatic and visual checks;
- software availability and requirements;
- training and transfer of knowledge.

(b) Data processing methodology to prepare gridded data products.

M. Rixen: Variational methods.
D. Jourdan: MEDATLAS krigging.

Discussion:
- 2D standard levels or 3D interpolation;
- estimation of the correlation function: global or local;
- gridding: finite elements/neuronal network...;
- the variational/krigging interpolation method;
- the possible local adjustments;
- software availability and software libraries requirements;
- costs in computer resources;
- training and transfer of knowledge.

(c) Data products in the world of new technology and needs.

N. Michailov: Mediterranean Atlas.
J-P. Rebert: MEDIAS CD-ROM
G. Maudire: MEDATLAS CD-ROM and Web products
N. Pinardi: MEDGOOS needs for products.
G. Manzella: Requirements for the Mediterranean Action Plan.

Discussion:
- common cruise catalogue based on ROSCOP information;
- CD-ROM (content: observed profiles, gridded profiles, maps, software);
- WWW server (content, frequency of updates);
- training and transfer of knowledge.

4. Action Plan

23 May afternoon

- report of workshop 1 on quality assurance
  actions to be included in the project proposal;
- report of the workshop 2 on data processing
  actions to be included in the project proposal;
- report of workshop 3 on data products
  actions to be included in the project proposal.

5. Adoption o f the revised version of the MEDAR/MEDATLAS project proposal.

ANNEX II

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ANNEX III

RECOMMENDATION IODE-XV.10

MEDAR/MEDATLAS AND DEVELOPMENT AND UPDATING OF THE MEDITERRANEAN DATASET

The IOC Committee on International Oceanographic Data and Information Exchange,

Recognizing a need to:

(i) safeguard a large number of marine datasets held by the bordering countries of the Mediterranean including the Black Sea;

(ii) improve the data flow between the scientific organizations in the region;

(iii) improve the communication among different data holding centres.

Recognizing further the lack of necessary resources for oceanographic data management in several Mediterranean countries,

Noting

(i) the existence of several limited regional initiatives, such as the MEDATLAS project to facilitate the Mediterranean data banking;

(ii) the value of close co-operation of the data managers to improve data quality standards and access to data;

(iii) large number of involved countries.

Considering the need to create appropriate national capabilities in data handling and develop reference data sets in order to facilitate further analysis and assessments for the success of the GOOS regional programmes implementation,

Accepts the project proposal presented in Document IOC/IODE-XV/23 as the basis for future development and **requests** the Delegate of France and GODAR Project Leader with the assistance of the Secretariat to finalize its formulation,

Recommends

(i) implementation of the GODAR project for the Mediterranean region, through the co-operative effort of data managers of the bordering countries;

(ii) implementation of archiving and data management tasks including: development of inventories, digitization, QC and encoding by means of a common exchange format.

Invites the IOC Executive Secretary and Heads of other international agencies to provide support to a major data rescue programme for the Mediterranean region,

Also invites Member States to provide complementary support to improve national and regional data management capabilities,

Requests NODCs and responsible data holders in each country to report to IOC on the necessary actions required to implement such a project,

Invites the IOC Executive Secretary to arrange a 2-3 day meeting in order to consider responses from Member States, identify other data banks outside the region including those in WDCs and other international organizations and prepare the implementation plan and schedule.

ANNEX IV

LIST OF ACRONYMS

AVHRR	Advanced Very High Resolution Radiometer
BT	Bathythermograph
CEC	Commission of the European Communities
CERP	Centre d'Etudes et de Recherches sur les Pêches (Algeria)
CNR	Conseil National des Recherches
COMSBLACK	Co-operative Marine Science Programme for the Black Sea
CRS	Coastal Radio Station
CSR	Cruise Summary Report
CTD	Conductivity-Temperature-Depth Probe
CYBO	Cyprus Basin Oceanography
DBMS	Data Base Management System
EC	European Community
EDMED	European Directory of Marine Environment Data
ENODC	Egyptian National Oceanographic Data Centre
EPSHOM	Etablissement Principal du Service Hydrographique et Oceanographique de la Marine (France)
EU	European Union
EUROGOOS	European Global Ocean Observation System
GEF	Global Environment Facility
GF3	General Format N°. 3 (A General Oceanographic Data Exchange Format)
GIS	Geographic Information System
GODAR	Global Oceanographic Data Archeology & Rescue Project
GOOS	Global Ocean Observation System
GTS	Global Telecommunication System
GTSPP	Global Temperature-Salinity Pilot Project
HNODC	Hellenic National Oceanographic Data Centre (Greece)
ICSU	International Council of Scientific Unions
IEO	Spanish Institute of Oceanography
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IGS	Institute of Geological Sciences (UK)

IMS	International Marine Science Newsletter
INOC	Inter-Islamic Network on Oceanography
INSTM	Institut National des Sciences et Technologies de la Mer (Tunisia)
INSTOP	Institut National Scientifique et Technique de l'Oceanographie et de la Pêche (Tunisia)
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IODE	International Oceanographic Data & Information Exchange
IOLR	Israel Oceanographic & Limnological Research
ISMAL	Institut National des Sciences de la Mer et de l'Amenagement du Littoral (Algeria)
JPO	Joint Planning Office
KNMI	Royal Netherlands Meteorological Office
LIWEX	Levantine Intermediate Water Experiment
LNCSR	Lebanese National Centre for Scientific Research
MBT	Mechanical Bathythermograph
MCST	Maltese Council for Science & Technology
MEDAR	Mediterranean
MEDAS	Marine Environmental Database of the Adriatic Sea
MEDATLAS	Mediterranean Atlas
MEDGOOS	Mediterranean Global Ocean Observation System
MEDI	Marine Environmental Data Information Referral System
MEDPOL	Mediterranean Pollution
METU	Middle East Technical University (Turkey)
MHI	Marine Hydrophysical Institute (Ukraine)
NCMR	National Centre for Marine Research (Greece)
NIMH	National Institute of Meteorology and Hydrology (Bulgaria)
NIO	National Institute of Oceanography
NIOF	National Institute of Oceanography & Fisheries (Egypt)
NOAA	National Oceanic & Atmospheric Administration
NODC	National Oceanographic Data Centre
OCEANPC	Ocean Personal Computer Project
OGS	Osservatario Geifisico Sperimentale (Italy)
ORSTOM	Intitut Français de Recherche Scientific pour le Développement en Coopération
QC	Quality Control
QCMED	Quality Control of the Mediterranean
RDBM	Relational Data Base Management System
RNODC	Responsible National Oceanographic Data Centre
ROSCOP	Report of Observations/Samples Collected by Oceanographic Programmes

SEEZ	Spanish Exclusive Economic Zone Programme
SHOM	Service Hydrographique et Océanographic de la Marine (France)
SISMER	Systèmes d'Informations Scientifiques pour la Mer (France)
SOSMED	Study of the South Mediterranean Sea
STD	Salinity, Temperature, Depth Probe
UKRSCES	Ukrainian Scientific Centre of the Ecology of Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific & Cultural Organization
WDC	World Data Centre
WOCE	World Ocean Circulation Experiment
WWW	World Wide Web
XBT	Expendable Bathythermograph