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Manual on international oceanographic data exchange
Second Edition (revised)

Intergovernmental Oceanographic Commission
Technical Series No.4
UNESCO, 1967

Note: Copies of this Manual have been made available in English, French, Spanish and Russian through the kindness of IOC in accordance with a recommendation of R&S at its 1969 meeting.

Redbook 1969, Pt.I, Recommendation 19

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The Provisional Guide for the Exchange of Oceanographic Data, contained in Part II of this Manual, was approved by the Bureau of the Intergovernmental Oceanographic Commission at its meeting in Monaco in January 1967. The Scientific Committee on Oceanic Research of the International Council of Scientific Unions participated actively in the IOC Working Group which considered the revisions to the Guide and, on the recommendation of SCOR, the Comité International de Géophysique has approved the new Guide.

It is important to note that the earlier Guides listed below are now obsolete.

1. Guide to International Exchange through the World Data Centres (Section on Oceanography, pp. 48-50) issued by CIG in November 1963.
2. Supplement No. 1 to the above Guide, issued by CIG in December 1964.
3. Manual on International Oceanographic Data Exchange issued by Unesco in 1965.

The purpose of this Manual (see Part I), is to assemble in a convenient form for the guidance and use of practising oceanographers, the various documents concerned with the exchange of oceanographic data of all kinds. The full and expeditious exchange of data is essential in meaningful scientific co-operation. Investigations of phenomena and processes of global dimensions, such as those occurring in the ocean and atmosphere, are particularly dependent on the pooling of data from various sources.

A system for exchanging oceanographic data on a regional basis has been operated successfully for many years by the International Council for the Exploration of the Sea. The programme of the International Geophysical Year made necessary the creation of a world-wide system. Thus, World Data Centres A and B (Oceanography) were established in Washington and Moscow, their operations being financed by the U.S.A. and the USSR. These centres, together with those in other disciplines, are responsible to the International Geophysical Committee (CIG) of the International Council of Scientific Unions (see Appendix I to the Manual).

The Intergovernmental Oceanographic Commission has produced a "Provisional Guide for the Exchange of Oceanographic Data" (Part II of this Manual). While the terms of the Provisional Guide are voluntary, it should be recognized that order is necessary in such a rapidly expanding science, if the full advantages of this expansion are to be

widely realized in the most efficient way. Approximate time limits as well as methods for the submission of the various kinds of data remain therefore a feature of the revised Guide, although a less exacting one than before.

The "Provisional Guide for the Exchange of Oceanographic Data" is supplemented in this Manual by recommendations of the IOC Working Group on Oceanographic Data Exchange (Part III) adopted in January 1964, and approved by the Commission at its third session as well as by those adopted in April 1966 and finally approved by the IOC Bureau at its 7th Meeting in January 1967. These recommendations give details which are not conveniently included in the Provisional Guide itself.

World Data Centres will in due course receive oceanographic data, in accordance with the Provisional Guide for declared national, or international oceanographic programmes. Such programmes entail an obligation to send data to the WDCs. Part IV of the Manual is a list of existing or projected national oceanographic data centres or other designated national agencies, with their addresses, modes of operation, and, where applicable, the services offered by each to data contributors.

The oceanographic data exchange system has been established to facilitate marine research. Its success depends on the support of oceanographers, their supply and use of oceanographic data, and their suggestions for making the system responsive to their needs.

PART I

IOC RESOLUTIONS ON THE EXCHANGE OF
OCEANOGRAPHIC DATA

RESOLUTION III-11 - EXCHANGE OF
OCEANOGRAPHIC DATA

The Intergovernmental Oceanographic Commission

Desiring to foster the full and expeditious exchange of oceanographic data,

Recognizing that this desire is closely related to the intention of IOC members to co-operate in joint scientific study of the oceans,

Recognizing further that this intention expresses itself either in participation of IOC members in international co-operative expeditions or in declaring publicly their own national oceanographic programmes with a view to exchange data resulting therefrom,

Recognizing the special interest of members in the organization and operation of World Data Centres and specialized and regional centres for the collection and exchange of oceanographic data, in accordance with the principles of equality of rights and mutual assistance,

Resolves

(1) To approve the new text of the Provisional Guide for Exchange of Oceanographic Data as prepared by the IOC Working Group in co-operation with SCOR;

(2) To submit it for inclusion into the General CIG Guide to International Data Exchange through the World Data Centres; and

(3) To keep it under constant review by the Commission's working group in co-operation and consultation with SCOR and ACMRR.

Recommends that all scientific data originating from "declared national oceanographic programmes" and "international co-operative oceanographic expeditions" (as defined in the above Provisional Guide), comprising results of observations and measurements by ships and recording stations outside territorial waters, as well as sea-level observations, be exchanged by the methods and under the defi-

nitions and specifications prescribed in the above Provisional Guide for Exchange of Oceanographic Data, commencing with 1 January 1960;

Recommends that in view of the great scientific value of long-time series records, mean sea-level observations should be reported back to the time of establishment of the gauge wherever practicable;

Resolves that upon acceptance by CIG, the principal documents regulating the exchange of oceanographic data between members will be the present resolution, the Provisional Guide for Exchange of Oceanographic Data approved herein, the introduction and general sections of the CIG Guide to International Data Exchange, and associated recommendations of the Commission's Working Group on Oceanographic Data Exchange;

Instructs the Secretary to prepare and distribute widely a manual on international oceanographic data exchange which will include the documents mentioned in the preceding paragraph, lists of national and specialized oceanographic data centres together with their addresses, methods of operation and services and facilities available, and such other information as will be useful in facilitating the full and expeditious exchange of oceanographic data;

Recommends that the Commission, through its Secretary, communicate the present resolution and associated documents to the CIG, at the same time indicating its desire to be represented on that body.

EXCERPTS FROM RESOLUTION IV-9

"The Intergovernmental Oceanographic Commission,

Noting with concern that the submission of data on Declared National Oceanographic Programmes is progressing slowly;

Noting further that less than half of the Member States have declared any national programmes as defined in the Manual on International Oceanographic Data Exchange;

Desiring to remedy this situation in order to promote the full and expeditious transmission of oceanographic data to the data centres and through them to the oceanographic community;

Requests all Member States to review their own oceanographic programmes since 1960 and by 1 February 1966 to inform the Secretary of the Commission on which programmes they are prepared to exchange data in accordance with the procedures provided in the Manual on International Oceanographic Data Exchange;

Requests further that Member States take the necessary steps to submit their data from such Declared National Programmes to the appropriate World Data Centre as quickly as possible;"

RECOMMENDATIONS OF THE 7th MEETING OF THE IOC BUREAU

Rec. 7.29 The Bureau took note of the extensive discussion which took place through correspondence on the Report of the 3rd Meeting of the IOC Working Group on Oceanographic Data Exchange and resolved to approve this Report and the Manual revisions contained therein with a number of amendments as specified in Annex V to the present Bureau Report.

Rec. 7.30 The Bureau approves the Revised Manual and instructs the Secretary to proceed, subject to approval by the CIG, with publishing the second revised edition of the Manual on International Oceanographic Data Exchange on the basis of the revisions provided by the 3rd Meeting of the IOC Working Group on Oceanographic Data Exchange and approved by the 7th Meeting of the IOC Bureau and Consultative Council in February 1967.

PROVISIONAL GUIDE FOR THE EXCHANGE
OF OCEANOGRAPHIC DATAWorld Data CentresOceanography

- | | |
|--|---|
| <p>A. World Data Centre A
Oceanography
Washington, D.C.
U.S.A. 20390</p> | <p>B. World Data Centre B
Oceanography
Molodezhnaya 3
Moscow B-296
USSR</p> |
|--|---|

Permanent Specialized Centres*1 Disciplinary

- 2.1.1 The Permanent Service for Mean Sea Level
The Observatory
Birkenhead, England
- 2.1.2 International Hydrographic Bureau
Monte Carlo, Monaco
- 2.1.3 FAO Fishery Data Centre,
Rome, Italy

2 Regional

- 2.2.1 International Council for the Exploration of the Sea
Charlottenlund Slot
Charlottenlund, Denmark

Oceanographic Programmes1 Declared national programmes

One important form of international co-operation in oceanography is the public declaration by an IOC member of the whole or part of its oceanographic activities with the implied intention to exchange international data resulting therefrom.

As Fisheries Commissions and councils collect and maintain data for specific regions or systematic

"Declared" national programmes should consist of lists of research cruises either planned for a certain period of time ahead or already implemented in the past and/or lists of other national oceanographic activities resulting or expected to result in data specified in 4.1 and 4.2 below.

Such "declared" national programmes are communicated to the IOC Secretariat with a statement of declaration (see 6.1) and in the format employed by the "International Marine Science" (see Appendix II (i)). Data resulting from such "declared" programmes should be exchanged in accordance with the provisions of this Guide.

3.2 International co-operative expedition

Another important form of international co-operation in marine sciences is participation in an international co-operative oceanographic expedition. The agreement to conduct such an expedition jointly is naturally associated with an intention on the part of participating countries to share its results. When such an expedition is carried out under the auspices of the IOC, the resulting data enter automatically the exchange system outlined in this Guide: in addition, special features of the exchange may be established by an appropriate international co-ordination group. If, however, such an expedition is organized by other inter-governmental or non-governmental organizations, pertinent data may enter the present scheme of data exchange either through regional and specialized centres (see 6.7) or through declared national programmes as regards IOC members participating in such an expedition.

3.3 Other oceanographic programmes of international interest

Countries receiving assistance under the United Nations Development Programme or other multilateral technical aid programmes, which involves the conduct of oceanographic research, are urged to arrange, in co-operation with the Executing Agency in each case, for the exchange of all relevant data from these activities through the World Data Centre System. Countries not members of IOC are encouraged to exchange oceanographic data through the World Data Centre system in accordance with the provisions of this Guide.

4. Types of observations and description of data

4.1 Standard observations

These are environmental observations or measurements made from oceanographic ships, other mobile platforms, shore or fixed stations (except moored buoys) with generally accepted types of instruments and methods widely known and described in scientific literature. Data of this classification, when submitted for general use, either require no further correction, or the corrections are well known and generally available. It should be clearly indicated whether these data are "corrected" or "uncorrected". Data resulting from these observations or measurements should be exchanged through the World and Specialized Data Centres System according to the principles specified in Sections 5, 6 and 8.

The following are the major kinds of standard oceanographic and marine meteorological data recorded in connexion with oceanographic programmes:

- 4.1.1 Values of air temperature, ocean surface temperature, atmospheric pressure, humidity, speed and direction of wind, precipitation and visual observations of cloud cover and weather, visibility, sea ice and other atmospheric phenomena.
- 4.1.2 Visual observations of sea and swell (scale numbers and/or estimated directions, heights and periods).
- 4.1.3 Colour and transparency values.
- 4.1.4 Soundings either on plotting sheets or in tabulation.
- 4.1.5 Values of temperature, salinity (or its measures) and chemical properties at surface and at depth, including continuous records such as bathythermograms and mean monthly and annual values for shore and fixed stations.
- 4.1.6 Mean monthly and annual sea levels computed from hourly observations from recording gauges or tide-staffs.

4.1.7 Information on bottom samples:

Cores: length and short qualitative description. Where possible, estimates of the probable age of top and bottom parts are especially desirable.

Other samples: short qualitative description.

4.1.8 Values of Plant Pigments, Primary Production, Zooplankton biomass, and Micro-nekton biomass.*

The methods used in obtaining these and any other biological data exchanged should be described in detail.

4.1.9 Upper air data from oceanographic vessels: air temperature, humidity, pressure and speed and direction of wind at various heights.

The above standard observations make part of both "declared national programmes" and international co-operative expeditions. It is understood that in the latter case other types of less standardized observations (e.g. current measurements) might be included in the above list by international co-ordinating groups when these expeditions make such observations on a routine basis. It is also understood that the above list does not prevent originating countries from sending in to World Data Centres and Specialized Centres other types of data which might correspond to the general definition of standard observations.

4.2 Non-standard and experimental observations

These cover all observations and measurements made by devices and instruments of experimental types or in accordance with experimental procedures; observations and measurements made for specific research projects and those observations which, due to their nature and volume, can be processed only by elaborate computing or analytical techniques.

Data resulting from these observations or measurements are generally to be retained by originating countries and exchanged only upon requests according to the principles specified in 5.6 and 8.5. Originating countries are encouraged to report to World Data Centres and/or Specialized Centres information on the availability and sources of these data.

No detailed specification for such kinds of observations and resulting data is needed. The following list serves only to exemplify some of them:

- 4.2.1 Instrumental measurements of various physical (optical, acoustic, electric, etc.) properties of sea water including those from moored buoys.
- 4.2.2 Results of chemical analysis of trace elements.
- 4.2.3 Instrumental measurements of waves and swell, including long-waves observations and recordings.
- 4.2.4 All kinds of current measurements and studies of turbulence (e.g. velocity spectra). Continuous recordings of currents from moored buoys.
- 4.2.5 Bottom photographs, topographic profiles, interim bathymetric charts, biochemical analyses, etc.
- 4.2.6 Gravity and geomagnetic field measurements, heat flow, seismic refraction and reflection observations, etc.
- 4.2.7 Specialized meteorological observations: solar radiation, gradient measurements of wind velocity, temperature, humidity, etc. Meteorological recordings from moored buoys.

* Phytoplankton and benthos biomass are temporarily omitted from the list of standard data pending the development of better standardized methods.

- 4.2.8 Biological data such as measures of abundance of marine organisms, collections for taxonomic and ecological studies, surface observations of marine life, biological echo traces, underwater sounds and bioluminescence.

5. Supplementary information and form of presentation required

5.1 Each submitted record should contain the date, time, position, depth at station and the name of the observing ship or station. Records from shore and fixed stations carrying out regular observations should contain hours of these regular observations. The time in use is to be stated, e.g. GMT or zone time. In case of a considerable drift of the vessel, positions at the beginning and at the end of stations are required. Estimates of precision of positions, and navigational methods used, should be reported.

5.2 Instrumental corrections should always be made before the data are submitted.

5.3 Metric units and Celsius scale should generally be used.

5.4 Relevant details of instruments and methods used and estimates of precision are required for all kinds of oceanographic data.

5.5 Specific requirements as to the supplementary information and form of presentation are listed below under sub-divisions corresponding to those given under 4.1 and quoted in parentheses:

5.5.1 (4.1.1) WMO code should be used for reporting wherever practicable. If other codes are used, they should be specified.

5.5.2 (4.1.2) Scale used should be specified.

5.5.3 (4.1.3) The methods used should be specified.

5.5.4 (4.1.4) The following specific information is required:

- (a) The make and type of echo-sounder used;
- (b) Value of the velocity of sound at which the apparatus is calibrated;
- (c) Corrections (i.e. which functions if any) applied;
- (d) All fixes, together with their times and dates;
- (e) Estimated accuracy of fixing methods in use.

5.5.5 (4.1.5) It is preferable that these data be submitted on forms facilitating machine processing or on punched cards (together with the punching code used). Estimates of accuracy and/or precision of measurements should be included if possible. In the case of deep water casts the time of the observation is that of dropping the messenger. Wire angle should be reported in all cases; information on the number of unprotected thermometers and their disposition in depth is desirable. Literature references for chemical methods used are desirable in addition to simple citation of the method. BT records should include a sea-surface reference temperature taken at the same time as the BT observation.

5.5.6 (4.1.6) Additional details of installation and method of reduction of data will be sought as necessary by the Permanent Service for Mean Sea Level.

5.5.7 (4.1.7) Types and sizes of instruments used should be indicated. If codes are used for qualitative description of samples, they should be specified. The address where samples are stored should be reported.

5.5.8 (4.1.8) The following specific information is desirable where appropriate:

- (a) Detailed specification of gear and methods used (with literature references).
- (b) Environmental conditions affecting sampling and observations, such as meteorological and sea conditions. Reference to other associated oceanographic data should be made where appropriate.

- (c) Time, duration and depth of sampling or observation.
- (d) Address at which samples are stored.

5.5.9 (4.1.9) WMO format is to be used.

6. Transmission of information and data

The transmission of information and data to data centres should, as far as possible, conform to the following principles:

6.1 IOC members and other interested countries are encouraged to send advance information on oceanographic programmes to the Secretariat for publication in "International Marine Science". In the case where these are to be considered "declared" national programmes, as defined in Section 3.1, the letter of transmittal should emanate from an appropriate national authority and should include a statement concerning the intention to exchange the resulting data.

6.2 To facilitate prompt dissemination, the information should be submitted in a format similar to that used in "International Marine Science", as described in Appendix II.

6.3 Confirmation that proposed programmes have been carried out, should be reported to the Secretariat at the close of each calendar year. At the same time additional past cruises and activities of international interest could be reported, along with a declaration to exchange appropriate data.

6.4 Observational data from shore and fixed stations should be dispatched without delay, preferably not more than one to two months after the period of observations.

6.5 In respect of cruise data, the first step should be to send within about three months a preliminary report of the cruise, showing station positions, types of observations and a list of scientists concerned. Alternatively, at least a list of station positions with the work done at each may be sent within this interval.

6.6 Cruise data should be forwarded as expeditiously as possible after the completion of the cruise. For temperature and salinity data the interval should not normally exceed nine months. Chemical, biological and geological data may require a slightly longer interval which should not however exceed one year. When biological collections for later systematic studies are made on a cruise, details of the hauls made (the same as in Section 5.5.8) should be submitted along with the temperature and salinity data.

6.7 Except as noted below it is preferable that data be sent to both WDC-A and WDC-B. When data are sent to only one of these centres a copy of the transmittal letter should be forwarded to the other centre. In the case of regional centres such as ICES (2.2.1) established practices should continue, regional centres having further obligation to send the data to the World Data Centres where this has not already been done by the originators.

6.7.1 Mean sea level data (4.1.6) should be sent only to the Permanent Service for Mean Sea Level (2.1.1).

6.7.2 Soundings (4.1.4) either in the form of plotting sheets or in tabulations should be sent to the International Hydrographic Bureau (2.1.2) or to any qualified hydrographic office.

6.7.3 Copies of all meteorological observations including upper air observations, as listed under 4.1.1, 4.1.2 and 4.1.9 should be sent to the National Meteorological Services concerned, with the request that - besides being handled as prescribed for marine meteorological observations in general - they should be sent also to the World Data Centres for Oceanography.

6.7.4 Biological data pertaining to fisheries which would not normally be transmitted to World Data Centres, should be transmitted to the FAO Fishery Data Centre (2.1.3) and/or, according to arrangements existing at the time, to appropriate fisheries commissions or councils.

6.8 For cataloguing non-standard and experimental data (Section 4.2) which are being retained by originating countries, these countries should send to World Data Centres identifying indices (position, time of collection, nature of observation or measurement and location of the data) at the same time as standard data.

7. Collection of publications

National Data Centres or appropriate national agencies are requested to send to each of the World Data Centres one copy of each national scientific publication dealing with the quality and applicability of data held in the centre. World Data Centres, however, should be free to acquire by exchange, subscription or other means, all kinds of scientific literature considered necessary for their operation.

8. Retrieval and dissemination of data and information

8.1 General principles of obtaining data from WDCs as given in the introduction to the CIG "Guide to International Data Exchange through the World Data Centres (for the period 1960 onwards)" are as follows:

- 8.1.1 "In general, to the extent possible each WDC shall give to each contributor a body of data equivalent to that received; to the extent possible, the WDC may, upon request, give an equivalent volume of data from another discipline."
- 8.1.2 "In particular, WDCs are required to supply copies of material in the data centre to any scientific body or investigator in any country (for a cost not to exceed the cost of copying and postage) and, by appropriate arrangement, to enable scientists to work directly with the materials in the WDCs."
- 8.1.3 "Scientific organizations and individual scientists may order materials from the centres directly or through their national organizations responsible for communication with the WDCs. In those cases in which materials are ordered directly, it is desirable for the centres to inform the organization responsible in that country for communication with the WDCs what materials were sent to other organizations in that country. For the purpose of assuring to scientists greater accessibility of materials from the centre, it is recommended that materials received from the centres be concentrated in one or several scientific organizations of the country from which they can be obtained for work by any interested scientist of the country."

8.2 Materials may be ordered from the World Data Centres (Oceanography) directly, through National Oceanographic Data Centres or Designated National Agencies* or through any other national organizations responsible for communication with the WDCs.

- 8.2.1 All data resulting from co-operative expeditions of the IOC should be released free of charge to the participating institutions.
- 8.2.2 Requests for data will be met free of charge on an equivalent basis (see 8.1.1 above), additional requests being satisfied at the cost of reproduction.
- 8.2.3 Members of the IOC may apply through the IOC Secretariat for assistance to international organizations in solving currency exchange difficulties in connexion with ordering data from WDCs.

8.3 Monthly and annual values of mean sea level data are published triennially by the Permanent Service for Mean Sea Level. A free copy of each publication is sent to all data contributors. All mean sea level publications may be purchased by other interested institutions and individuals from the Permanent Service.

Requests for data prior to publication will be met by the Permanent Service at a charge not exceeding the cost of postage.

8.4 Under I.H.B. agreements all sounding data received by the Hydrographic Offices of the I.H.B. Member States are exchanged to facilitate production of the General Bathymetric Chart of the Oceans. Data so received are normally transferred to oceanic plotting sheets after careful quality control. Copies of these plotting sheets may be obtained upon request by any institution either through the I.H.B. or from the relevant Hydrographic Offices. Data in other forms might also be available from the I.H.B. The conditions of data released by I.H.B. are similar to those specified in 8.2.

* Designated National Agency is defined as the official national agency charged with the responsibility of the international exchange of oceanographic data.

8.5 To obtain non-standard and experimental data falling within the general definition given under 4.2 and resulting from "declared" national programmes, interested institutions or individuals may apply to the source of the data in the originating country, either directly or via one of the WDCs. Data in question should generally be released at cost of reproduction or in exchange for equivalent data suggested by the requesting side. Similar data resulting from co-operative investigations should be exchanged in accordance with procedures to be worked out by the international co-ordinating groups involved.

8.6 Each World Data Centre and Regional Data Centre is required to publish at six-monthly intervals catalogues or information sheets based on the cruise reports, station charts and stations lists received under para. 6.5 and the cruise data received under para. 6.6. These catalogues and information sheets should be sent free of charge to the other world and specialized data centres, national oceanographic data centres and/or designated national agencies and to the institutions supplying the data.

RECOMMENDATIONS OF THE IOC WORKING GROUP ON OCEANOGRAPHIC DATA EXCHANGE (as approved by the Commission at its 3rd session, June 1964 and by the IOC Bureau at its Seventh Meeting, January 1967)

WORLD, REGIONAL AND NATIONAL DATA CENTRES

The IOC Working Group on Oceanographic Data Exchange agreed that the primary responsibility of World Data Centres lies in the collection and distribution of data and that the responsibility for processing of oceanographic data should be at the national level.

The Group reaffirmed earlier recommendations concerning the importance of national data centres as focal points for the submission of data to the World Data Centres, and noted that such national centres, working closely with participating national laboratories and institutions, were the appropriate bodies to ensure that data entering the World Data Centre system are of the highest possible accuracy.

The Working Group recognized that responsibility for the quality of data entering the World Data Centre system rests with the originating bodies, not with the World Data Centres. However, the World Data Centres could provide a valuable service to international oceanography by monitoring the quality of incoming data and advising originating governments of any errors so detected. It is recommended that the assistance of SCOR, ACMRR, and other appropriate advisory bodies, should be sought to establish technical specifications for data quality.

If contributors of data require assistance in processing, arrangements may be made through a World Data Centre or appropriate national or regional data centre, the terms being established by mutual agreement. It was recognized that submission of data in forms, facilitating machine processing as recommended in the Provisional Guide, would expedite dissemination of such data.

The need to co-ordinate the data exchange systems of ICES and IOC was recognized by the ICES meeting of the Service Hydrographique in March 1966 at which meeting the following recommendation was adopted:

"Since both ICES and IOC schemes of data exchange pursue one and the same goal of making oceanographic data internationally available, the ICES member countries and their national laboratories should be asked to co-ordinate their participation in the ICES data exchange scheme with their commitments to the IOC within the framework of their "declared" national programmes. This co-ordination should result in rapid transmission of the relevant data both to the Service Hydrographique and to the Exchange System of the IOC (WDC-A and/or B)."

SYNOPTIC OCEANOGRAPHIC SERVICES

In considering the problem of the speedy utilization of oceanographic data, the Working Group recognized that synoptic oceanographic services were already functioning on a national or regional basis in a few cases. Further experience with such restricted programmes is required before an effective international programme can be designed. Consideration of the problem by a working group of the ACMRR is expected to contribute to a better understanding of the problem as well as to that of the desirability or otherwise of including fishery statistics amongst the data to be submitted to the World Data Centres.

BIOLOGICAL DATA

The World Data Centres were originally established for handling geophysical data, under the Comité International de Géophysique. The parent body, the International Council of Scientific Unions, is concerned with all aspects of science. The IOC is similarly concerned with both the biological and non-biological aspects of oceanography.

The present version of the Guide includes certain sections pertaining to biological data (4.1.8, 4.2.8, 5.5.8).

The Working Group considered that a minimum requirement should be to submit along with physical and chemical data, details of what biological sampling was done. This information should include if possible: position, date, time and zone, sounding, and the type of sampling (that is, phytoplankton, zooplankton or benthos sampling, mid-water trawling, long lining, or other forms of fishing, underwater photography, acoustic studies, surface collections, etc.) or measurements (primary production, optical measurements, etc.). Details of the sampling should also be included, incorporating information about the type of gear used, the times of commencement and completion of sampling and, the upper and lower depth of sampling etc. It should also be stated where further information concerning the samples or measurements can be obtained.

Biological results, on the other hand, can be divided into a number of categories which lend themselves in varying degrees to handling by data centres.

The bulk measurements, such as chlorophyll or zooplankton biomass, are conveniently included in the World Data Centres. Although such measurements are less precise than many standard chemical measurements, it was noted that biological concentrations commonly undergo seasonal changes of orders of magnitude which may be usefully described even by the relatively crude measurements now possible.

Some biological data are collected in the course of oceanographic investigations or are closely associated with other characteristics of the environment; disposition of such data should be provided for in the Guide.

Other biological data, such as fishery statistics, including systematic or taxonomic information, descriptions of organisms, publications etc., are less closely associated with oceanographic and environmental studies, and they might be treated in a separate data exchange system co-ordinated by the FAO Fishery Data Centre. It was suggested that FAO might consider the development of a Guide for the exchange of such data.

The Working Group feel, therefore, that the categories of biological results which can usefully be handled by data centres at the present time are the following:*

1. Primary production
2. Plant pigments
3. Micro-nekton biomass
4. Zooplankton biomass

The submission of such data in any form is acceptable providing they are accompanied by precise details of the methods used. It is hoped that after consideration by specialized working groups of SCOR, ACMRR etc., and as a result of the standardization and intercalibration work being conducted by SCOR and other bodies it may eventually be possible to reach agreement on standardized reporting. As methods improve in the future it

will become desirable to include other biological observations, in particular those which may be of importance to fishery oceanography.

The Group therefore recommends that SCOR and ACMRR should continue to give attention to the problems of biological data exchange along the lines proposed by SCOR/ACMRR Working Group 18, and to develop guidelines for the submission and retrieval of biological data, in particular of the types listed in the Revised Manual on International Oceanographic Data Exchange under 4.1.8.

World and Regional Data Centres should be encouraged to store and index data in such a way that retrieval of environmental data associated with biological observations would be facilitated.

The SCOR/ACMRR Working Group on Biological Data has proposed an expansion of biological data exchange, principally through inventories or specialized data centres.

These would include several disciplinary and regional data centres, primarily associated with regional fisheries councils and commissions and concerned with fishery data, in the list of Specialized Data Centres in Part II of the Guide. It was generally felt that such inclusion was premature, it being necessary to study further the interrelationship of these centres with each other and with the FAO Fishery Data Centre before action could be recommended.

ITEMS OF IMPORTANCE

1. The present status of data exchange on "declared" national programmes is still causing concern, with less than half the members having submitted such programmes. As there continues to appear some confusion as to the exact meaning of the term, the Working Group has redefined the existing definition in the present revised Provisional Guide (3.1).

The following brief outline with cross-references to Part II of the Manual is provided to give the user a quick index to all pertinent information relating to the preparation and declaration of a national programme and the step-by-step procedures involved in submitting data, identifying indices or publications to the World Data Centres:

"declared" national programme	
(DNP) redefined	3.1
submitting DNP (forecast)	6.1
format DNP	6.2
submitting DNP (hindcast)	6.3
Subm. standard cruise	
data	6.5/6.6/6.7

* See Summary Report of the 3rd Meeting of the IOC Working Group on International Oceanographic Data Exchange. Doc. AVS/9/89F of 10 May 1966, pp. 2, 3, Annex I p. 3. See also footnote on page 13 of this Manual.

Subm. non-std. cruise

data 6.8/6.7

Subm. publications 7.0/6.7

2. "Declared" national programmes should include those shore and fixed stations reported to the Secretariat for their compilation of the existing network of such stations.

3. Mean sea level observations should be reported back to the time of establishment of the gauge wherever practicable, in view of the great scientific value of long time series records of such observations.

4. World Data Centres A and B should from 1967 onwards, utilize the new revised format for cata-

logues of their holdings. The centres should also study the possibility of compiling and publishing a bibliography of the sources of historical (pre-IGY) oceanographic data.

5. The early submission of provisional data is considered to be impracticable except in the case of co-operative investigations, where special requirements may be established by the International Co-ordinating Group.

6. Synoptic meteorological data from ocean island stations should also be deposited in the appropriate World Data Centres.

PART IV

PROVISIONAL LIST OF NATIONAL OCEANOGRAPHIC DATA CENTRES (NODC) OR DESIGNATED NATIONAL AGENCIES* (DNA) OF IOC MEMBERS

- a - established
- b - about to be established
- c - under consideration
- - does not exist
- ? - no information received

Table 1

Country	NODC	DNA	Country	NODC	DNA
1. Algeria	?	?	29. Malaysia	?	?
2. Argentina	a	-	30. Mauritania	?	?
3. Australia	a	-	31. Mexico	-	-
4. Austria	?	?	32. Monaco	b	-
5. Belgium	?	?	33. Morocco	b	-
6. Brazil	a	-	34. Netherlands	-	a
7. Canada	a	-	35. New Zealand	?	?
8. Chile	a	-	36. Norway	?	?
9. China	-	-	37. Pakistan	-	a
10. Congo (Brazzaville)	?	?	38. Peru	?	?
11. Cuba	-	c	39. Philippines	a	-
12. Denmark	?	?	40. Poland	-	a
13. Dominican Republic	?	?	41. Romania	?	?
14. Ecuador	-	-	42. Singapore	?	?
15. Federal Republic of Germany	a	-	43. Spain	a	-
16. Finland	-	a	44. Sweden	-	a
17. France	-	a	45. Switzerland	-	-
18. Ghana	?	?	46. Thailand	b	-
19. Greece	?	?	47. Tunisia	?	?
20. Iceland	?	?	48. Turkey	-	a
21. India	a	-	49. United Arab Republic	b	-
22. Indonesia	?	?	50. Ukrainian SSR	?	?
23. Israel	?	?	51. United Kingdom	-	a
24. Italy	a	-	52. Uruguay	?	?
25. Ivory Coast	-	a	53. U.S.A.	a	-
26. Japan	a	-	54. USSR	b	-
27. Republic of Korea	c	-	55. Venezuela	-	a
28. Lebanon	?	?	56. Republic of Viet-Nam	-	a

This list is compiled on the basis of information given by delegates at the meetings of the IOC Working Group on Oceanographic Data Exchange and subsequently confirmed by letters to the IOC Secretariat. Addresses of existing National Oceanographic Data Centres and Designated National Agencies as well as information on their mode of operation are given in subsequent pages.

* Designated National Agency is defined on page 16 with reference to Section 8.2.

ADDRESSES OF NATIONAL OCEANOGRAPHIC DATA CENTRES OR
DESIGNATED NATIONAL AGENCIES ALREADY IN EXISTENCE

ARGENTINA	(NODC)	INDIA	(NODC)
Servicio de Hidrografia Naval Avenida Montes de Oca, 2124 Buenos Aires		National Oceanographic Data Centre National Institute of Oceanography Rafi Marg New Delhi - 1	
AUSTRALIA	(NODC)	ITALY	(NODC)
Australian Oceanographic Data Centre Hydrographic Office Garden Island Sydney, N.S.W.		Centro Nazionale Raccolta Dati Oceanografici Consiglio Nazionale della Ricerche 7 Piazzale delle Scienze Rome	
BRAZIL	(NODC)	IVORY COAST	(DNA)
Oceanographic Data Centre Instituto Oceanográfico Caixa Postal 9075 São Paulo 4		Centre de Recherches Océanographiques Boite Postale V18 Abidjan	
CANADA	(NODC)	JAPAN	(NODC)
Canadian Oceanographic Data Centre 615 Booth Street Ottawa		Japanese Oceanographic Data Centre Hydrographic Division Maritime Safety Agency 5- Chome, Tsukiji Chuo-ku, Tokyo	
CHILE	(NODC)	NETHERLANDS	(DNA)
Centro Nacional de Datos Oceanográficos de Chile Instituto Hidrografico de la Armada Casilla 324 Valparaiso		Royal Netherlands Meteorological Institute Utrechtseweg 297 De Bilt	
FEDERAL REPUBLIC OF GERMANY	(NODC)	PAKISTAN	(DNA)
Deutsches Ozeanographisches Datenzentrum Bernhard-Nocht-Strasse 78 2,000 Hamburg 4		Director Meteorological Services Government of Pakistan Karachi	
FINLAND	(DNA)	PHILIPPINES	(NODC)
Institute of Marine Research Merentutkimuslaitos Helsinki 4		The National Data Centre c/o The Library National Institute of Science and Technology Manila	
FRANCE	(DNA)	POLAND	(DNA)
Service Hydrographique 13 rue de l'Université Paris VIIe		Information and Documents Centre of the Polish National SCOR Komitet Badán Morza P.A.N. Prucownia DIN, SOPOT ul. Powstancow Warszawy 2/6	

SPAIN	(DNA)	U.S.A.	(NODC)
Instituto Español de Oceanografía Alcalá 27 Madrid - 14		National Oceanographic Data Center Washington, D.C. 20380	
TURKEY	(DNA)	VENEZUELA	(DNA)
Turkish Navigational and Hydrographic Department Gubuklu Istanbul		Instituto Oceanografico Universidad Oriente Cumana Estado Sucre	
UNITED KINGDOM	(DNA)	REPUBLIC OF VIET-NAM	(DNA)
Hydrographic Department Oxgate Lane, Cricklewood London, N.W.2		Institut Océanographique Canada Nhatrang	

MODE OF OPERATION OF NODCs AND DNAs

ARGENTINA (translated from Spanish)

".....Our Service of Naval Hydrography acts in fact with the equivalent functions as a National Centre of Oceanographic Data, as it compiles, classifies, estimates and preserves the oceanographic data which are obtained in the cruises of its research vessels, including cruises corresponding to declared national programmes and co-operative expeditions as well (Tridente, Equalant, etc.)Aforementioned information is interchanged with the World Data Centres and provided to national or foreign institutions which require them....."

AUSTRALIA

".....Australia has one oceanographic data centre and it is located in the Hydrographic Office. All requests for Australian data should be sent to the Director, Australian Oceanographic Data Centre, Hydrographic Office, Garden Island, Sydney. On request, the Director will send copies of data, of punched cards, or of publications containing data to other data centres, international organizations, laboratories, departments and similar bodies. Some special processing can be done. If any charge is to be made, the Director will advise the requesting body before dispatch. No data catalogues are prepared".

CANADA

(a) Name and address of national data centre

Canadian Oceanographic Data Centre(1)
615 Booth Street,
Ottawa.

(b) Method of operation

The Canadian Oceanographic Data Centre is located under the Marine Sciences Branch of the Department of Energy Mines and Resources. Guidance in establishing policies regarding its scientific and technical operation is being solicited from all member agencies of the Canadian Committee on Oceanography. The chart on page 26 depicts the organizational layout of the Centre.

Methods of operation pertaining specifically to the treatment of physiochemical data have been described in detail in CODC's "Oceanographic Data Processing Manual", a copy of which may be obtained on request. The routine processing described in this manual may be divided into the following well-defined steps:

1. Receipt of Cruise Notification Form.
2. Preparatory steps in anticipation of data submission.
3. Receipt of data and cruise report.
4. Assessment of data entries.
5. Key-punching.
6. Verification.
7. Line-proofing and corrective action.
8. Computation.
9. Return to originator of preliminary computer output (IBM 1401 Automatic Report Generator Program) for verification and quality control.
10. Storage of output punched cards in cruise file.

(1) CODC also acts as the NORWESTLANT DATA CENTRE for the INTERNATIONAL COMMISSION OF THE NORTHWEST ATLANTIC FISHERIES (ICNAF).

- 11. Correction control action on receipt of preliminary computer output from originator.
- 12. Preparation of data for international exchange.
- 13. Preparation of Data Record for publication.
- 14. Transposition of data to magnetic tapes, sorting and merging for up-dating of CODC's geographical magnetic tape data files.

NOTE: Step 13 also includes information on all the other oceanographic disciplines collected, observed or measured during the cruise.

(c) Services and facilities available

The Canadian Oceanographic Data Centre provides its services at no cost to all member agencies of the Canadian Committee on Oceanography. In doing so it will:

receive, compile, process and preserve appropriate oceanographic data provided to it; be responsible for acquiring by exchange, or otherwise, data of scientific value from domestic and foreign sources;

establish procedures and routines to ensure that the accuracy and general quality of the material meets the criteria to be established by a CCO Advisory Council on Data Processing, and undertake analytical studies required for this purpose prior to incorporating the data in its holdings;

prepare and distribute its processed holdings originating from member organizations as data records, print-outs, magnetic tapes, punch cards or in any other form, as required;

on request, prepare summaries of any part of its holdings, prepare statistical summaries of annual and/or seasonal oceanographic conditions in the areas of immediate Canadian interest;

prepare at regular intervals, indices of its holdings for distribution to member agencies;

promote the systematic collection of routine oceanographic data for time series studies;

act as Canada's official agency for the international exchange of oceanographic data.

Facilities

(a) Computers:

CDC 3100 for most routine work.
 IBM-7074 for magnetic tape work.
 IBM-1401 for report generator operations.
 Access to any of a wide variety of other government-owned computers in the Ottawa area for special projects.

(b) Unit record equipment:

Complete tabulating equipment, including sorters, listing devices (on-line and off-line), key punches, verifiers, collators, reproducers, interpreters, etc.

(c) Automatic plotters:

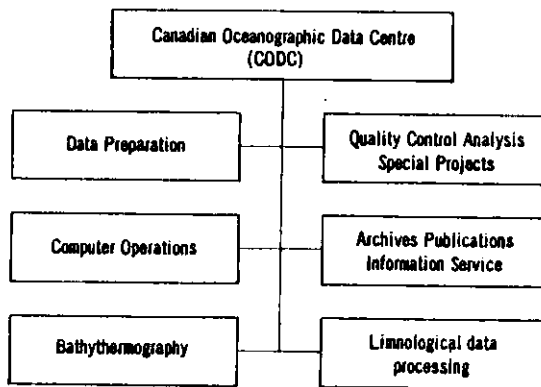
(i) Off-line: IBM-1627
 EAI-3500

(d) Complete microfilm equipment for bathythermograph data processing and record storage and retrieval:

BT Processor (modified 3M "1000").
 BT Processor (modified 3M "2000" - CDC).
 Processor - Camera (3M "2000").
 Card-to-Card Reproducer (3M "086").
 Reader-Printer for roll, fiche, aperture cards (3M "400M").
 Microfiche viewer.
 Densitometer (MacBeth).

(e) TELEX communications facilities.

ORGANIZATION CHART



FEDERAL REPUBLIC OF GERMANY

The Deutsches Ozeanographisches Datenzentrum (DOD) started its work in December 1966. It is run jointly by the Deutsches Hydrographisches Institut and by the Deutsche Forschungsgemeinschaft.

The address of DOD is:
 Deutsches Ozeanographisches Datenzentrum
 2000 Hamburg 4
 Bernhard-Nocht-Str. 78

Deutsches Hydrographisches Institut
 It is the task of the DOD to collect the oceanographic data obtained by the respective institutes in the Federal Republic of Germany and to make them available for the international data exchange. In addition, it acts as mediator for the German

scientists and institutes in procuring foreign oceanographic data.

The DOD presently disposes of machine installations for punching, assorting, and reproducing punched cards. The tabulator and the computer IBM 1620 of the Deutsches Hydrographisches Institut are available for further work.

FINLAND

"....the Institute of Marine Research, Merentutkimuslaitos, Helsinki 4, Finland, is acting as designated national agency for oceanographic data for Finland. All relevant data, collected by the Finnish marine scientists, on hydrography, marine chemistry, air chemistry, sea-level changes and ice observations of the Baltic, and some data on plankton and benthos are stored in the said Institute and can be made available. Main part of the data are already in the international data centres".

FRANCE (translated from French)

"The Hydrographic Service is charged with transmission of all the data received from different sources or the Institute of Oceanography to either the International Council for the Exploration of the Sea or the World Data Centres in Washington and Moscow directly. The Hydrographic Service is located at 13 rue de l'Université, Paris 7e".

INDIA

"....the national data centre for oceanography has been started only recently under the Directorate of the Indian Ocean Expedition (CSIR). The work regarding processing and assembling of data relating to the Indian work in the International Indian Ocean Expedition has also been taken up. This centre will eventually store data pertaining to the Indian Ocean Expedition in regard to all aspects both physico-chemical and biological and will closely collaborate with the World Data Centres A and B with functions of a regional specialized data centre".

ITALY

"NATIONAL OCEANOGRAPHIC DATA CENTRE",
Consiglio Nazionale delle Ricerche
7 Piazzale delle Scienze
ROME (Italy)

In view of the progress made in Italy by studies in the field of oceanography and the further development expected as a result of the encouragement they are to receive during the next five years, availability of the latest data has become a prime

necessity. A knowledge of current and future oceanographic programmes should be readily obtainable by all in order to avoid duplication of work. Co-operation with international organizations is required to collect oceanographic data and in drawing up research programmes of common interest. As a member of Unesco's Intergovernmental Oceanographic Commission, therefore, Italy welcomes the suggestion to set up, as most member countries of IOC have done, a national data centre.

Thus, at a meeting on 13 May 1966, the "Commissione di Studio per la Oceanografia del CNR" (the National Research Council's Study Commission for Oceanography) has approved the establishment of a "Centro Nazionale Raccolta Dati Oceanografici (National Oceanographic Data Collecting Centre), to be headed by Professor Maurizio Giorgi, director of an analogous centre for geophysical data established in 1958 within the Italian Commission of I.G.C.

The aims of the Centre are:

- (1) to collect, select and transmit programmes of work on a national and an international level in conformance with international usage;
- (2) to collect and transmit in Italy and internationally data concerning these programmes and to obtain from the World Data Centre data required by Italian scientists;
- (3) to maintain international relations in the field of data exchange and programmes.

The Centre has started work and intends in particular:

- to inquire into the interests of the various Italian organizations concerned with oceanographic research;
- to assemble all oceanographic data collected during the 1960 cruises and afterwards;
- to issue a booklet on the situation and prospects of oceanographic studies in Italy;
- to compile a bibliography of oceanographic studies since 1960.

For the time being the Centre uses the facilities offered by the Italian Commission of IGC, but it should have its own staff and office equipment in the near future.

JAPANESE OCEANOGRAPHIC DATA CENTRE*

1. On 1 April 1965 the Japanese Oceanographic Data Centre inaugurated its service as a data centre as recommended in the Intergovernmental Oceanographic Commission resolution I-9 of 1961. It is an administrative component of the Japanese Hydrographic Office. The mailing address of JODC is as follows:

The Japanese Oceanographic Data Centre,
Hydrographic Division,
Maritime Safety Agency,
5-chome, Tsukiji, Chuo-ku,
Tokyo, Japan.

* Acting as Kuroshio Data Centre

Principal functions performed by JODC are:

(a) Acquisition of data. The data centre obtains oceanographic data from reports, exchanges, contributions and purchases from various sources, both at home and abroad.

(b) Evaluation of data. The data obtained is evaluated and classified according to its degree of accuracy.

(c) Data processing. The data is processed by coding, punching, accounting and by other methods when required.

(d) Repositing and cataloguing. Processed data is repositied at the data centre in forms such as punch cards, printouts and microfilm. A catalogue of data holdings will be published.

(e) Tabulation and atlases showing oceanographic conditions. Tabulation and atlases showing annual and seasonal oceanographic conditions will be prepared for general use.

(f) Publication of data. Fundamental data of high utility will be collectively issued as a publication.

Data available at JODC includes: water temperature, salinity and chemical properties at surface and various depths of the water; bathythermograph (BT) data; current; and sea level.

Information on other items such as: tidal current; radioactivity, ocean bottom geodesy and structure, geomagnetism; gravity; heat flow, etc., may also be obtained from the data centre.

2. Additional functions as of the Kuroshio Data Centre (KDC) for the Co-operative Study of the Kuroshio and Adjacent Regions (CSK).

At present the Japanese Oceanographic Data Centre is also service as the Kuroshio Data Centre following the decision taken at the 1st Meeting of the International Co-ordinating Group for the CSK held in Manila in February 1965.

The Group decided under Item 6 "Exchange of Data and Information" as follows:

"That exchange of data will be carried out according to the Provisional Guide for Exchange of Oceanographic Data adopted by the IOC at its third session.

That the Japanese Oceanographic Data Centre will serve as the Kuroshio Data Centre.

That primary processing of CSK data will be carried out by collecting countries.

The data centres of the participating countries are requested to send data in the coded form to the Kuroshio Data Centre in the prescribed period, that is, within 3 months of the completion of each survey. The format developed by WDC-A is recommended.

That controlling and monitoring of data will be done by the Kuroshio Data Centre.

That the Kuroshio Data Centre will keep data in punch card and microfilm, when practicable.

That the Kuroshio Data Centre will compute interpolated values, dynamic depths etc., when necessary.

That the Kuroshio Data Centre will submit data to the World Data Centres A and B.

That the Kuroshio Data Centre will supply and distribute data to scientists and institutions in appropriate forms.

That countries participating in the CSK will receive data from the Kuroshio Data Centre free of charge.

That the national committee for CSK of Japan and the Kuroshio Data Centre will compile the CSK newsletter which contains the information concerning the CSK cruises and data etc.

That survey data should be submitted to the Kuroshio Data Centre within three months of the completion of each survey. Data resulting from regular monitoring in selected areas should be submitted within three months following each three months of observations. Parts of these regular observations coinciding in time with synoptic surveys should also be submitted to the KDC together with survey data."

The work carried out by KDC during the year 1965 is as follows:

(a) Publication of CSK newsletters: 5 times.

(b) Collection of serial oceanographic observation data: 763 stations, of which 552 stations are from domestic sources and 211 are from foreign sources.

(c) Evaluation of data: 337 stations.

(d) Computation of data: 183 stations.

In 1966, the Data Centre will issue a CSK Atlas and Catalogue of CSK Data besides publishing CSK newsletters as well as carrying on collection and processing of data including monitoring and computation.

NETHERLANDS

The central mailing address of the Netherlands DNA is

Royal Netherlands Meteorological Institute
Utrechtseweg 297
De Bilt (Netherlands)

The various kinds of observation data will be collected by the following institutes and services, which have been designated as specialized depots or subcentres of the Netherlands DNA; these institutes will also forward the data which have been collected by them, directly to the various international data centres:

Hydrographic Department : bathymetric measurements;
of the Netherland Royal Navy

Directorate for Water Management and Hydraulic Research (Rijkswaterstaat) : measurements of sea level;

- | | | | |
|--|--|--|--|
| Royal Netherlands Meteorological Institute | : other physical-oceanographic observations; | Vening Meinesz Laboratory | : marine geophysical observations (gravity, heatflow, seismics). |
| Netherlands Institute for Sea Research | : chemical observations; | A sub-committee consisting of representatives of the afore-mentioned institutes and services has been established to supervise the functioning of the DNA. | |
| Netherlands Institute for Sea Research | : marine biological observations; | | |
| Geological Survey | : marine geological observations; | | |

Example of a table showing the procedures and other requirements for notification of DNP and NOP and transmission of data

Stage	Item	Addressee	Format	Time or deadline for report or transmission
1.	Declared National Programme and National Oceanographic Programme.	IOC	Not decided	About January every year
2.	Preliminary cruise report	WDCs	Not decided	Within 3 months of completion of cruise
3.	Data:			
	Coastal and fixed stations	WDCs	Not decided	Within 1 month
	Serial oceanographic observation on cruise (except chemical).	WDCs	WDC -A form or	Within 9 months
	Chemical	WDCs	ICES form	Within 12 months
	BT current	WDCs	Not decided	Within 9 months
4.	Publication	WDCs	- - -	- - -

SPAIN

SPANISH OCEANOGRAPHIC DATA CENTRE
(translated from Spanish)

(a) Name and address of the National Data Centre:

Spanish Oceanographic Data Centre (C.E.D.O.)
Spanish Institute of Oceanography,
Alcala 27,
Madrid - 14

(b) Purposes

The C.E.D.O. has been established mainly to provide an efficient instrument of study to the country's oceanographic community, supplying

marine data and also satisfying its information needs.

In the first place it constitutes a central office for the accumulation of national oceanographic data. To this end it receives, compiles, processes and maintains the oceanographic data originating from the various Spanish institutions and laboratories, with a view to locating such data readily.

It will use the criteria and standards which may be internationally established in order to ascertain the precision and general quality of the received data and make a selection.

In the international sphere it will act as the Spanish official agency for the exchange of oceanographic data.

(c) Services

To receive all data from domestic sources. For the time being, though not exclusively so, it will deal with physical oceanographic data, leaving the data of biological and geological nature for the time when international standards of exchange are established.

It will also gather the data provided by the national network of marigraphs.

The data will be prepared for processing by IBM computers.

It will carry out this process of the received data.

It will use the criteria which have already been established and which will be established in the future, for their selection.

It will classify and compile the received data.

The data thus processed will be submitted to the national (domestic) institutions and laboratories which had supplied the data.

It will place at the disposal of the Spanish oceanographic community, upon request, the requested part of the domestic or foreign compiled data at the cost of reproduction.

It will submit to the World Data Centre A Oceanography or to the Regional Centre of ICES, the processed data in the form agreed upon. To the Permanent Service for Mean Sea Level it will submit the related data.

It will request and receive from the International Centres the oceanographic data which may be of interest to Spanish scientists and institutions, under the economic conditions established by said International Centres.

It will assume the duty of advising the Oceanographic Office of Unesco of the list of declared national programmes.

Orientation on scientific and technical media of work will be requested from the main Spanish organizations: The Hydrographic Institute of the Ministry of the Navy; The Spanish Institute of

Oceanography of the Ministry of Commerce; and the Fisheries Research (office) of the Supreme Council of Scientific Research. In general terms the current work is carried out in accordance with the Oceanographic Data Processing Manual of the Canadian Oceanographic Data Centre.

Data catalogues are not prepared.

UNITED KINGDOM

Hydrographic Department, Oxgate Lane, Cricklewood, London, N.W.2 serves as British Designated National Agency for bathythermograph data only.

UNITED STATES OF AMERICA

NATIONAL OCEANOGRAPHIC DATA CENTER

MAILING ADDRESS:

National Oceanographic Data Center
Washington, D.C. 20390

LOCATION:

Building 160, 3rd floor
Washington Navy Yard
Washington, D.C.

ESTABLISHED:

23 December 1960

FUNDING:

Ten sponsoring government agencies

POLICY AND TECHNICAL GUIDANCE:

Interagency Advisory Board composed of sponsors and two non-government representatives.

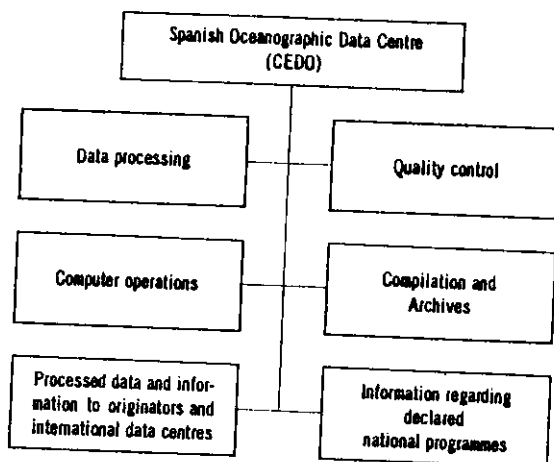
FUNCTIONS:

The functions of the National Oceanographic Data Centre (NODC) are given in specific terms in the NODC Charter (The Interagency Agreement) but can be synthesized into major categories: (1) The Establishment of Data Banks, and (2) Servicing the Needs of the Oceanographic Community. These two functions are obviously interdependent and must be characteristic of data centres.

The establishment of data banks

This function embraces more activities than seem apparent. It is not only necessary to establish the ties that assure a steady inflow of data, but also to establish the many steps in processing the

ORGANIZATION CHART



data for computer use and the development of archive systems that permit rapid retrieval of information ranging from Alkalinity to Zoostera.

Assuring the steady inflow of data may be referred to as acquisition. Three avenues are open to the NODC to accomplish this function: Acquisition of data by (1) Exchange, (2) Gift, and (3) Purchase. For the most part the first two avenues suffice except for those instances in which an organization does have the facilities to reproduce a sizable amount of data. In this case the data centre may be said to purchase the data by the paying of reproduction costs. Of the three avenues the most successful means of acquiring data is by exchange. The NODC explores this avenue to the fullest since the products of the exchange are mutually beneficial. At the present time the NODC exchanges data with 40 nations and such international bodies as IHB, ICES and WDC-A, Oceanography.

Within the United States, the NODC exchanges data with all facilities, both government and non-government, having an interest in oceanography. Most of the data collected by organizations in the United States would eventually be sent to the NODC inasmuch as it is the national data repository, but the process is considerably speeded up under an exchange arrangement. As part of its exchange and acquisition programmes the NODC has established Project ROVER (Routing Oceanographer's Visits for Exchange Response) which has as its goal the establishment of liaison with additional organizations in the general area of visits of the staff to a particular organization.

Probably the most important function of the NODC in its establishment of data banks is the design of archiving systems that will permit rapid retrieval of data in a form suitable for users of the centre. Within the last five years the NODC has established viable systems for archiving and retrieving oceanographic stations, mechanical BT, surface current, and drift bottle data by computer. Systems have been established for biological data using a combination of manual and computer methods. These data include phytoplankton, primary productivity, phytoplankton pigment, zooplankton, and benthic organisms. Current geological systems under development include size analysis, geochemistry and engineering properties of sediments, heat flow, mineral resources, and bottom photography.

The standardization of formats for these systems has been and continues to be a complicated process considering the heterogeneity of recording forms, but the problems involved in this function are always capable of solution. The standardization of units and instrument outputs present other problems which are generally beyond the power of a data centre to control, but the NODC works with the instrument developers and scientists to achieve standardization wherever possible. It is especially important to do so from the standpoint of user's requirements, ease of retrieval and quality control.

With the use of standardized coding forms developed by the NODC, the first phase of the data processing sequence has been considerably simplified. Although contributors of data are not obliged to use the NODC forms they have been accepted fairly well (inasmuch as their design and content are determined from the comments and suggestions of the users). When these forms are used, the coding step is eliminated and the data can be key-punched directly.

After key-punching, the necessary computations and interpolations are performed by the computer. Quality control functions are carried out in practically every step of the processing sequence, but the ultimate quality control, i.e., an evaluation of the scientific plausibility of the data, is performed after the computational phase. This must be performed before the data are accepted into the archives. It is important to note that implausible data are not removed from the archive product. On the contrary, they are retained in the record but so noted as implausible. The user of the data is then free to determine whether or not he wishes to use these data.

Most of the NODC archived data will be on magnetic tape. However, back-up punch card files are available to answer requests for which it would be uneconomical to use tape files.

- The data banks currently available are:
- Analogue BT File - 3 x 5 ozalid cards of temperature depth traces to a maximum of 900 feet.
- Digital BT File - certain portions of Analogue BT File on magnetic tape, geographically sorted.
- Oceanographic Station File - water temperature, salinity, and selected water chemistry (if available), sea water density, and sound velocity at observed depths. Available, in cruise order, on punched cards, or on magnetic tape. Geographically sorted for some areas.
- Surface Current File - current data based on ship reports of set and drift. Available on punched cards or, for certain areas, geographically sorted on magnetic tape. Summaries of direction, speed, and resultant current vectors available for some areas.
- Drift Bottle File - data from drift bottles, drift cards, and similar devices (excluding monitored drifting devices). Available on punched cards or magnetic tape.
- Biological File - punched cards of distribution and abundance of phytoplankton, primary productivity, phytoplankton pigment, distribution, and abundance of zooplankton and benthic organisms.

Servicing the needs of the oceanographic community

This is the most important goal of the NODC and all NODC activities are directed toward its achievement. As directed by its charter, the NODC provides data services at cost. However, any

of the data in the archives may be used on site at the NODC free of charge. The data and information services cover a broad spectrum and may range from an inquiry such as "What is the greatest depth in the oceans?" to an analysis of the sound velocity structure of a major world ocean. Some items are provided as public information, usually in the form of publications which are available at a nominal charge or on an exchange basis. The currently available publications are listed at the end of this article.

Since its establishment the NODC has been concerned about automation both of processing methods and the development of readily usable oceanographic products, without the sacrifice of quality. It is apparent that the historical data and, even more important, the great mass of data which will be collected by emerging instrumentation, will never be assimilated by classical manual techniques. During the past few years the NODC has coped with the problem and has automated some summarizing and display techniques. For example, the NODC has produced cruise tracks and station location charts with an automatic plotter and, more recently, has computer summarized and automatically plotted geographic and historically synoptic displays from oceanographic station data and BT data. The latter provides not only a direct service to the oceanographic community but also an indirect service in helping to strengthen the quality control procedures applied to oceanographic data.

With regard to the automation of data processing methods, the NODC is now attempting to establish the link between automation at the source; namely, electronic instrumentation and shipboard computer back-up and direct accessioning to the data banks. This would provide more rapid response both to the field and shore-based components. This is not an easy task inasmuch as the NODC is already receiving data from such instruments as the STD and the expendable BT which require considerable additional manual or computer manipulation before they can be available to users. So there is a considerable gap between the source and the data bank. The NODC is trying to work with the developers of instruments to close this gap.

The developmental programmes for the design of systems for the establishment of data banks, while serving as a vital link between the establishment of data banks and the providing of services, represent only a few steps towards the goal of providing total service to the oceanographic community.

Recognizing this fact, the NODC has projected its needs for advanced development to 1972 and has outlined programmes which will effectively enhance its services. The five major programmes and examples of the projects which would accomplish these programmes are given below:

I. Development of techniques and procedures which would allow NODC to respond more quickly and economically to the research and operational demands placed upon it.

Projects which would accomplish this aim will consist of implementation of data compression techniques, merging of relatable data files, display of synoptic data (historical and contemporary), and the development of effective communication links.

II. Development of techniques and procedures which would assure an improved quality control of data introduced into the archives.

Using the entire data bank, projects of this type would develop models which would be the basis for automated computer controls and monitoring.

III. Development of techniques and procedures for a more economical and efficient internal handling of data within NODC.

The accomplishment of this goal will require the development of automatic devices or other suitable means which would reduce data backlogs and keep abreast of contemporary data inflow.

IV. Broadening of the scope and improvement of the efficiency of the NODC data acquisition effort.

Projects of this programme aim to determine existing world data backlogs and plan for their acquisition and to maintain close collaboration with national and international bodies to ensure inflow of data.

V. Improvement of data dissemination to researchers in smaller institutions and laboratories which cannot afford large expenditures of funds for data services.

This service would be provided primarily through publication efforts producing such items as atlases of oceanographic data distribution at quasi-isentropic levels, atlases of temperature-salinity-density-depth relationships, etc.

PUBLICATIONS
(December 1966)

GENERAL SERIES

- Pub. No. G-1 Introduction to the National Oceanographic Data Centre
- Pub. No. G-2 Oceanographic Vessels of the World
 - Volume I
 - Volume II

- Pub. No. G-3 EQUALANT I - Data Report, Vols. I and II
- Pub. No. G-4 A Summary of Temperature-Salinity Characteristics of the Persian Gulf
- Pub. No. G-5 EQUALANT II - Data Report
- Pub. No. G-6 Atlas of Bathythermograph Data - Indian Ocean
- Pub. No. G-7 EQUALANT III - Data Report (In press)
- Pub. No. G-8 Guinean Trawling Survey - Data Report (In press)
- Pub. No. G-9 Water Mass-Density Structure for Western Atlantic (In press)
- Pub. No. G-10 Selected IOE Track Charts
- Pub. No. G-11 The Variability of Water Masses in the Indian Ocean
- Pub. No. G-12 Isentropic Atlas of the Indian Ocean (In work)

CATALOGUE SERIES

- Pub. No. C-1 Reference Sources for Oceanographic Station Data, Vols. I and II (set)
- Pub. No. C-2 Inventory of BT Data, World Wide (2nd rev.)
- Pub. No. C-3 Inventory of Archived Data (paper cover) (hard cover)
- Pub. No. C-4 Films on Oceanography (3rd Ed.)

- Pub. No. C-5 Computer Programmes in Oceanography
- Pub. No. C-6 Selective Reading List for Oceanology (In work)

MANUAL SERIES

- Pub. No. M-1 Oceanographic Table for Use by the International Indian Ocean Expedition (Out-of-print)
- Pub. No. M-2 Processing Physical and Chemical Data from Oceanographic Stations Part I, Coding and Key-punching Part IA, Coding and Key-punching Electronically Obtained Serial Data
- Pub. No. M-3 Manual for Processing Bathythermograph Data Part I, Instructions for Manually Digitizing Bathythermograph Data Part II, Procedures for Processing Bathythermograph Data in Analogue Form
- Pub. No. M-4 Manual for Coding and Key-punching Biological Data (Provisional)
- Pub. No. M-5 Instructions for Coding and Key-punching Geological Information Form for Core, Grab and Dredge Samples (Provisional)
- Pub. No. M-6 Manual for Processing Current Data (Provisional)

PART V

PERMANENT SPECIALIZED CENTRES.
INFORMATION CONCERNING THEIR MODE
OF OPERATION

2.1 DISCIPLINARY CENTRES

2.1.1 The Permanent Service for Mean Sea Level

Address: The Observatory
Birkenhead, Cheshire
England

Mode of operation

In addition to data collection and dissemination, and research, the functions of the service are:

1. To ensure a higher standard of accuracy and reliability in observations of sea level.
2. To encourage the permanent installation and maintenance of new sea-level gauges, where present coverage is inadequate.
3. To provide a computational service and to offer advice in the processing of sea-level observations in cases where the data would otherwise remain unused.
4. To modernize methods of data storage and publication, using computers.

Data collection

The data comprise monthly and annual mean heights of sea level above a fixed datum. Additional details of gauge installation and methods of processing gauge observations to produce mean values are sought, as necessary, by the service. (Provisional Guide references 4.1.6 and 5.5.1)

Data are accepted in any unit and format; whenever possible, however, they should be in units of 1 mm and on punched cards in a format available on request from the service.

Ideally, data should be transmitted within a few months of the observations being made. They should be sent only to the Permanent Service for Mean Sea Level, not to WDCs A and B. (Provisional Guide references 6.4 and 6.7.1)

Data dissemination

Monthly and annual values of mean sea level are normally published triennially by the service, and a free copy sent to all data contributors. Publications may also be purchased from the service. (Provisional Guide reference 8.3)

Requests for data prior to publication will be met by the Service at a charge not exceeding the postage. (Provisional Guide reference 8.3)

General information

Periodically the service recommends procedures for processing the basic observations, and standards of accuracy appropriate to mean sea level determinations. It can frequently provide advice on problems of gauge instrumentation, and undertakes to process observations on a regular basis if so required.

2.1.2 The International Hydrographic Bureau

Address: Avenue du Président J.F. Kennedy
Monte Carlo
Pte de Monaco

Mode of operation

The relevant information is contained in the IHB Technical Resolutions K 25 and J 4 which are reproduced below.

K 25. Centralization of oceanic soundings

- I. It is resolved that the IHB shall be entrusted with the collection of information concerning all soundings taken outside the continental shelves.
- II. It is resolved that hydrographic offices receiving reports on oceanic soundings taken outside the continental shelves shall communicate those accepted by them to the IHB, preferably in the form of plotting sheets, or else in the form of lists.
All data for corrections prescribed in item J 4 shall invariably be furnished.
- III. It is resolved that the same procedure shall be followed for the oceanic soundings required by the hydrographic offices responsible for the plotting sheets of the General Bathymetric Chart of the Oceans. For this use, data may also be sent directly to the hydrographic offices concerned, but the IHB should be informed of this fact by letter.
- IV. (a) It is resolved that the IHB shall continue to exercise the functions of a specialized world centre for bathymetric data following the agreements made with the IOC and IGC (International Geophysical Committee). The IHB shall maintain contacts with the IOC in order that its GEBCO co-ordinators may receive all available bathymetric data from oceanographic missions carried out according to the declared national programme or international programmes.
(b) It is recommended that the hydrographic offices aid the national centres as much as possible in sending bathymetric data to the GEBCO co-ordinators with the information required under the rules of procedure in the IHB Reportory of T.R. and the most up-to-date issue of the Guide for the international exchange of oceanographic data.
(c) It is recommended that the IHB, as a specialized world centre, prepare a catalogue summarizing original data recently obtained and listing the plotting sheets with price and means of procuring copies.

R.P. 1929, p.83, 218, 245, 293, 303.

R.P. 1932, p.27, 88, 121, 148, 173, 177, 217, 232, 258, 373, 383, 411, 419.

R.P. 1937, p.26, 139, 153, 345, 412.

Circular letters 17 H, 1954; 18 H, 1955.

R.P. 1962, p.92, 340, 350, 352, 364, 401.

See also J 3 and J 4.

Velocity of sound in sea water. See B 184.

Correction of echo soundings for their insertion on charts. See B 185.

Oceanographic observations. See J 5.

J 4. Oceanic plotting sheets

It is resolved that oceanic soundings, together with the required supplementary information, shall be collected and exchanged on oceanic plotting sheets or lists, or, if possible, and if the receiving hydrographic office is suitably equipped, in the form of media compatible with electronic data processing.

The required supplementary information is specified as follows:

- (i) The name of the vessel.
- (ii) All fixes together with their times and dates.

- (iii) The make and type of echo-sounder used.
- (iv) Details of the speed of sound at which the machine is calibrated.
- (v) Details of any corrections which have been applied to the soundings before plotting (i.e. from H.D. 282 for true depth).
- (vi) Estimated accuracy of fixing methods in use.
 - R.P. 1932, p.88, 217, 232, 258, 383, 411.
 - R.P. 1962, p.88, 335, 352, 364, 399.
 - See also K 25.

2.1.3 FAO Fishery Data Centre

Address: FAO
Via delle Terme di Caracalla
Rome
Italy

Mode of operation

This Permanent Specialized (Disciplinary) Centre is located in the Biological Data Section of the Fishery Resources and Exploitation Division of the Department of Fisheries. This Section also maintains a linked information retrieval system in the field of marine and freshwater sciences and fisheries, including a cumulative and indexed bibliographic reference file, an archive of documents containing pertinent data, and registers of scientists, research institutions and research activities. Copies of documents can be provided on request. The Data Centre is a repository for:

- (a) Fishery data from international co-operative investigations, especially those sponsored by the IOC.
- (b) Data from FAO-executed fishery field projects financed by the United Nations Development Programme (Technical Assistance and Special Fund), the Freedom from Hunger Campaign and other international programmes.
- (c) Such other data of national or international origin as may be deposited as, for example, from bilateral aid programmes, from FAO Trust Fund projects, and from activities of Regional Fisheries Councils and Commissions.

A Guide to the facilities provided by the Biological Data Section, including the Fishery Data Centre, is in preparation. Procedures for deposit and retrieval of data and issue of catalogues of holdings are being worked out in consultation with the WDCs (Oceanography) and will be compatible with the principles laid down in this manual.

In addition to holding defined categories of primary data, it is intended that the Fishery Data Centre will develop an inventory of fishery data of broader scope, and including biological statistics relating to fishery resources. An inventory of catch and fishing effort and fishing power statistics is maintained by the Fishery Statistics and Economic Data Branch of the FAO Department of Fisheries, which publishes global and regional summaries as Yearbook and Statistical Bulletins, in co-operation as necessary with regional and specialized, international fisheries bodies.

2.2 REGIONAL CENTRES

2.2.1 International Council for the Exploration of the Sea

Address: Charlottenlund Slot
Charlottenlund
Denmark

Telegraphic address: Merexploration, Copenhagen

Mode of operation of the ICES Service Hydrographique

The ICES Service Hydrographique is the (physical-chemical) oceanographical data centre of the International Council for the Exploration of the Sea (ICES). It covers the ICES region, i.e. the Atlantic (including the North Sea, the Kattegat and the Baltic) north of the equator, with special emphasis on the area east of 30°W.

Activities

Ever since the start of ICES in 1902 the member countries have sent their oceanographic observations (physical and chemical) in the ICES region to the Service Hydrographique for publishing, storage and, for some areas, combination into diagrams and charts.

An idea about the activities of the Service Hydrographique throughout the years is given in the instructions set up in 1928. According to these the tasks of the Service Hydrographique should be:

1. to prepare the material for the publication of the Bulletin Hydrographique,
2. to undertake the rapid dissemination of hydrographical observations,
3. to combine data in diagrams and charts, for special areas,
4. to undertake the technical sponsorship of hydrographic publications by the Bureau,
5. to further unification of the work and collaboration between the workers in the several participating countries,
6. to draw attention to changes and amplifications which appear to be desirable in the hydrographical programmes,
7. to carry out any other hydrographical work that may be entrusted to it by the Council."

Data collections

In the 1930's a geographically arranged hydrographic card index was started in the ICES Service Hydrographique. It contains temperature and salinity data from oceanographic stations (serial and surface). In the cards are recorded all temperature and salinity data published in the ICES Bulletins for the years 1902-1956; however, also data from other sources have been extracted and included in the index.

For recording the data for the years 1957 onwards punch cards have been introduced. In these are punched temperature, salinity and chemistry data from oceanographic stations (serial and surface) and temperature readings at standard depths from BT traces. A description of the system used is given in the ICES punch card manual ("ICES Oceanographic Punch Cards". 2nd edition, 1966).

Thanks to an exchange arrangement with the National Oceanographic Data Center (NODC), Washington, also the pre-1957 data are now being transferred to punch cards.

The number of pairs of temperature-salinity values at present (1967) stored in the Service Hydrographique is estimated to 2,000,000.

Publications

For the years 1902-1956 the data from oceanographic stations have been published, mainly in the series Bulletin Hydrographique and its predecessors. This series was replaced by ICES Oceanographic Data Lists which will cover the corresponding data for the years 1957-1962. For the years after 1962 data from joint expeditions only will be published.

Data exchange

As data centre for the ICES region the Service Hydrographique channels to the World Data Centres all data received. This has hitherto mainly been effected by means of the ICES Oceanographic Data Lists. However, in order that the data might be available to the oceanographic community also before publishing, the data furnished by the Service Hydrographique to the NODC, Washington, as part of the exchange arrangement mentioned above at the same time were included in the collections of World Data Centre A. For post-1962 data copies will be furnished to WDCs on punched cards or on magnetic tape.

Services

Up to 1966 copies of data available in the Service Hydrographique have been furnished on request, as far as possible free of charge. New rules have, however, been established in an ICES resolution according to which the Service Hydrographique furnishes free of charge copies of data on punched cards or on lists, on request to national and international institutions and services. Individual scientists of the member countries who have been authorized by the delegates of each member country to forward such requests will have the same rights. In each case the cost of such a delivery should not exceed D. kr. 100. Greater deliveries will be made at cost.

IGY World Data Centres

The International exchange of data through World Data Centres was first organized during the IGY. This new form of international co-operation - exchange of data through WDCs - was found to be very effective. Instead of having to address themselves to many national organizations, scientists could receive data necessary for scientific work directly from the WDCs. Thanks to the collection and exchange of data through WDCs, it became possible to investigate phenomena on a planetary scale and to study the interdisciplinary relationships among various phenomena.

Experience has shown that the existing system of two universal centres, together with certain discipline centres, satisfies the demands of international exchange of geophysical data, creates optimum conditions for countries, and permits them to fulfil their obligations of exchange of geophysical data with minimum effort.

CIG Guide for 1960 onwards

At the end of IGY, the responsibility for the exchange of data through the WDCs was assigned by the International Council of Scientific Unions (ICSU) to the CIG. In response to the resolutions of various international scientific organizations (e.g. IUGG, URSI, IAU, COSPAR, SCAR, SCOR and IOC), the Comité International de Géophysique (CIG) has issued a revised "Guide to World Data Centres" based in large measure on the "Guide to IGY World Data Centres" adopted by CSAGI. In approving the "Guide", the CIG took into account the effective work of the CIG reporters and their working groups over a period of several years, and also the comments of the Geophysical Committees of participating countries and of international scientific organizations including COSPAR, SCAR, SCOR, the Intergovernmental Oceanographic Commission, and the

Consultative Meeting of Representatives under the Antarctic Treaty and others.

The main principles governing the responsibilities of the WDCs and the nature of data interchange are founded on the IGY "Guide" and the experience gained during the IGY. Both the general principles and the specific details of data exchange through the WDCs have been the subject of discussions and reports in many international scientific meetings, especially at the several meetings of CIG, and the CIG-IQSY Committee.

The revised "Guide" is based on two essential resolutions of CIG:

1. That the WDCs continue to collect, interchange and make available to the scientific community data from the various geophysical disciplines on a permanent basis. The precise agreements on data to be exchanged should be reviewed periodically to ensure that these agreements continue to be meaningful in the light of rapidly changing scientific interests and findings.
2. The operation of the WDCs should be in accordance with the basic principles laid down by CSAGI, especially:

(a) Each WDC must collect data according to the revised WDC Guide to be adopted by CIG on the basis of recommendations of the discipline specialists gathered by the reporters.

(b) Each WDC must agree to exchange data according to the conditions outlined in the Guide. In particular, the WDCs shall interchange among themselves by discipline in accordance with the Guide and at no charge.

(c) Each WDC is required to supply data (at a cost not to exceed the cost of reproduction) on request of scientists or scientific institutions.

(d) Each WDC must be freely open to visitors and guest workers from any nation participating in the CIG programmes, and all data in the centres shall be accessible to such visitors and workers.

Types of centres

International exchange of geophysical data is effected through the World Data Centres, as in the IGY, and by means of the activities of certain specialized organizations:

(a) World Data Centres for collection and distribution of data. For each discipline, there are two or three such centres which operate according to the principles set forth in the Guide to WDCs.

(i) World Data Centre A, which consists of eleven subject-matter divisions and includes all disciplines.

(ii) World Data Centre B, which consists of two subject-matter divisions and includes all disciplines.

(iii) World Data Centre C, which consists of several discipline centres in several nations.

(b) Centres for certain kinds of analysis and synthesis resulting in issuance of indices, certain bulletins of summary information etc. There are two groups of such centres and provision is made for others as needed.

(i) Permanent Services. Certain of these have long operated and were also a part of the IGY World Data Centres. This is expected to continue as in the past; no change in relationships or procedures is involved. Moreover, data sent to the Permanent Services, where they are made available to all, unless specifically stated to the contrary, need not be sent in their primary form to the WDCs. The Permanent Services will send their bulletins, etc. to the WDCs; CIG, CIG national committees and all countries participating in IQSY; as appropriate to unions, associations and ICSU committees as well as their special committees corresponding to IQSY or other programmes for which data are exchanged through WDCs. In addition, WDCs shall provide the Permanent Services with their data as needed for the functions of the Permanent Services.

CIG notes: that in each discipline the CIG Guide to WDCs must differentiate clearly between data flowing to WDCs and data flowing to Permanent Services;

that WDCs A and B may have data needed by the Permanent Services; such data shall be provided to the Permanent Services by the WDCs free of charge;

that in a few instances certain data collected by the Permanent Services are of interest to WDCs; and therefore requests that the institutions providing such data to the Permanent Services also provide copies of such data to the WDCs. When Centres A, B or C do not receive such material from the original institution, Centres A, B or C may request such material from the Permanent Service free of charge.

(ii) Special world geophysical centres. During IGY, some of the WDCs compiled and

published certain syntheses of scientific value. CIG encourages the furtherance of such activities in connexion with the WDCs. In addition it may be desirable to establish additional centres of synthesis in connexion with new or existing Permanent Services, the WDCs or other appropriate organizations.

The World Data Centres are maintained at the expense of the countries which organize them. Special centres are maintained at the expense of the countries which establish them or, if they are located in a Permanent Service, at the expense of the Permanent Services. The countries which organize World Data Centres guarantee the condition for collection, storage, reproduction, distribution and safekeeping of materials, and also provide investigators the possibility to work personally with the material stored in the WDCs. The direct administration of WDCs is the responsibility of the appropriate national committee and scientific organization under which the WDC is established.

Every three years, each special world geophysical centre must present a report to the appropriate international scientific unions, associations, and committees about its work for the triennium, together with the proposed plan of work for the succeeding triennium. The unions, committees, and associations, having reviewed the reports and proposals of the centres, make their recommendations regarding the continuation, expansion, reduction, or termination of activities of the centres. These recommendations become effective after their approval by the CIG.

CIG responsibilities

Overall co-ordination of the activity of the WDCs and special world geophysical centres is the responsibility of the CIG. Committees and commissions established for carrying out international programmes (Committee for the International Years of the Quiet Sun and others) make recommendations to the CIG on questions of collection and exchange of data essential for accomplishing these programmes.

The data exchange arrangements through the WDCs should be reviewed and revised periodically to reflect the changing scientific problems being undertaken as part of international co-operative programmes. The decisions regarding changes in the list of materials collected in the WDCs, as well as initiation and termination of activities in the special world geophysical centres and changes in the programme of their work, are made by the CIG upon recommendation of international scientific unions and international scientific organizations after consultation with the corresponding national organizations. The international scientific unions, committees, and associations which assist the CIG in the organization of international exchange of data are indicated in the appropriate sections of the "Guide". The Guide to WDCs should be

reviewed (and revised as necessary in accordance with the recommendations of the afore-mentioned groups) every two or three years.

Functions and responsibilities of WDCs

The objects of establishing several IGY World Data Centres for collecting IGY observational data were: (1) to ensure against catastrophic destruction of a single centre, (2) to meet the geographical convenience of, and provide easy communication for, workers in different parts of the world.

WDCs conduct their operation at no expense to ICSU or the ICSU family of unions and committees.

Each WDC is responsible for: (1) endeavouring to collect a complete set of data in the field or discipline for which it is responsible, (2) the safekeeping of the incoming data, (3) correct copying and reproduction of data, maintaining adequate standards of clarity and durability, (4) supplying copies to other WDCs of data not received direct, (5) preparation of catalogues of all data in its charge, (6) making data in the WDCs available to the scientific community. In particular, WDCs are required to supply copies of material in the data centre to any scientific body or investigator in any country (for a cost not to exceed the cost of copying and postage) and, by appropriate arrangement, to enable scientists to work directly with the materials in the WDCs.

In addition the World Data Centres are called upon as follows:

.....

(b) To prepare and issue semi-annual catalogues of data.

(c) In general, to the extent possible, each WDC shall give to each contributor a body of data equivalent to that received; to the extent possible, the WDC may, upon request, give an equivalent volume of data from another discipline.

Participation in data exchange through WDCs

The international exchange of geophysical data through WDCs may be participated in by all countries of the world, both members of international scientific unions and other international organizations and non-members as well.

A country wishing to participate in the international exchange of data through the WDCs can so advise either a WDC or the CIG. In so doing, the country reports: the kind of data that will be sent to one or another of the WDCs; the organization that will be responsible for communication with the centres; and from which centre it wishes to receive requests for transmittal of data in the event of special events. This information is then distributed either by the WDCs or the CIG to all interested centres and national committees.

Scientific organizations and individual scientists may order materials from the centres directly or through their national organizations responsible for

communication with the WDCs. In those cases in which materials are ordered directly, it is desirable for the centres to inform the organization responsible in that country for communication with the WDCs what materials were sent to other organizations in that country. For the purpose of assuring to scientists greater accessibility of materials from the centre, it is recommended that materials received from the centres be concentrated in one or in several scientific organizations of the country from which they can be obtained for work by any interested scientist of the country.

The organizations which are responsible for communication with the WDCs verify whether all data sent by them are included in the WDC catalogues and, in the event of discovery of some sort of omission in the material sent by them, they so inform the appropriate centres and take measures to search for and complete the collection of the missing materials.

The national organization responsible for communication with the WDCs as well as any scientific organizations and individual scientists may borrow from the WDCs any publication for which duplicates are available in the centre for temporary use for a period not to exceed one month, not including time of transmittal. If it is desired, a microfilm copy of the publication can be made for a cost not to exceed the cost of copying and transmittal.

The transmittal of data and publications to the WDCs and analytical centres is made within the period of time and according to formats indicated in the appropriate sections of the "Guide".

General data exchange agreements

Transmittal to WDCs

(a) The basic recommendation is that one copy of data shall be sent to each relevant WDC, if practicable.

(b) Alternatively, enough copies may be sent to one WDC for forwarding to all other WDC;

(c) or, lastly, one copy may be sent to one WDC which will then make copies for the other WDCs.

The selection of the WDCs to which to send data is the responsibility of the station or of the Participating Committee.

The data specified for exchange are, in general, closely related to international scientific programmes. In addition to the data specified in the Guide, scientists, institutions or participating committees are asked to send to the WDCs special publications related to these programmes, i.e. articles not available in the widely circulated geophysical journals, maps, atlases, reports, etc. Three copies should be sent to each WDC or six copies to one WDC for forwarding to the other WDCs.

In the event that a country sends data to one of the WDCs only, the country should notify the other WDC (for example, by means of sending a copy of the transmittal letter).

Quality of data. WDCs are not generally responsible for accuracy of data in their possession. In some disciplines (for example, solar activity), the WDCs may be requested by the CIG reporter to monitor data.

Exchange among WDCs. Each WDC will provide within two months of receipt, and on a free-exchange basis, copies of all incoming data to any other WDCs (for the discipline) which have not received those data.

Catalogues. Catalogues of data received by the WDCs will be issued at six-monthly intervals. Catalogues are sent free to other WDCs, special world geophysical centres, organizations responsible for communication with the WDC and to addresses supplied by the geophysical committees of the countries participating in the exchange.

Catalogues of newly received publications, data, and materials are prepared in accordance with established formats for each discipline. The names of publications are given in the language of the original and, if necessary, in translation into one of the widely known European languages. Information about the data received by the WDC is given in the catalogue by discipline, country and station. For each station the following is given:

station name, kind of data, and period for which data were received.

Use of data in WDCs. All WDCs shall satisfy promptly, in any case within three months, the demands of scientific bodies or investigators in any country for copies of material, or extracts thereof. The fee charged should not exceed the cost of copying plus postage. (Exceptions to the time schedule may be made when the WDC must give priority to requirements of CIG and Participating Committees)

Each WDC shall be freely open to visitors and guest workers from any country participating in the CIG programmes, and all data in the centres shall be accessible to such visitors and workers.

Acknowledgement. When data are supplied by a WDC in response to a request, the WDC shall transmit them with a letter stating the location of the observations and the name and address of the investigator responsible for securing the data. The letter shall contain a request to the person receiving the data to respect the usual rights of the investigator.

For all disciplines the recipient of data shall be requested to make appropriate acknowledgement to the original investigator, and the WDC in any subsequent publication involving the data.

APPENDIX 2

(1) National Oceanographic Programme
Format Sample Page (employed in International Marine Science)

Ship	Area in IHB code and/or Marsden Squares	Date	Pro-gramme	Expe-dition	Operating Agency	Comments
3-c021**	Sweden 1964 Skagerak	Baltic	Jan.	Do, Fr	Fishery Board	Hydrography, Trawling. DNP
3-c022	Skagerak	Kattegatt-Skagerak	Feb.	Do, Fr	Fishery Board	Hydrography, Nephrops
3-c023	Skagerak	Kattegatt-Skagerak	Mar.	Fr	Sw. Inst. Food Pres. Res.	Fish Freezing exp.
3-c024	Skagerak	Kattegatt-Skagerak	Apr.	Fr	Fishery Board	Nephrops, shrimps
3-c025	Skagerak	Baltic	Apr.	Do	Fishery Board	Hydrography
3-c026	Skagerak	Oresund	Apr.	Do	Oresund Com-mittee	Water pollu-tion
3-c027	Skagerak	Kattegatt-Skagerak	June	Fr	Fishery Board	Nephrops, shrimps
3-c028	Skagerak	Kattegatt-Skagerak	June	Cm	Nat. Research Council.	Demonstr. of new Instrum.
3-c029	Skagerak	Kattegatt-Skagerak	June	Do, Cm	Oceanogr. In-stitute	Together with Thetis. DNP
3-c030	Skagerak	Baltic	Aug.	Do, Cm	Fishery Board	International Programme DNP
3-c031	Skagerak	Oresund	Aug.	Do	Oresund Com-mittee	Water pollu-tion research
3-c032	Skagerak	Kattegatt-Skagerak	Aug.	Fr	Fishery Board	Nephrops, shrimps
3-c033	Skagerak	Kattegatt-Skagerak	Sept.	Fr	Sw. Inst. Food Pres. Res.	Fish freezing exp.
3-c034	Skagerak	Kattegatt-Skagerak	Oct.	Do	Fishery Board	Hydrography DNP
3-c035	Skagerak	Kattegatt-Skagerak	Oct.	Cm	Oceanogr. Inst.	Current measurements
3-c036	Skagerak	Baltic	Nov.	Do	Fishery Board	Hydrography DNP
3-c037	Skagerak	Kattegatt-Skagerak	Nov. to Dec.	Fr	Fishery Board	Nephrops, shrimps
3-c038	Skagerak	Kattegatt-Skagerak	Dec.	Do	Fishery Board	Hydrography DNP
3-c039	Thetis	North Sea	Jan.	Fr	Fishery Board	Trawling
3-c040	Thetis	Baltic at Blekinge	Jan. to Feb.	Fr	Fishery Board	Trawling
3-c041	Thetis	Kattegatt-Skagerak	Feb. to Mar.	Fr	Fishery Board	Sprat Investi-gation

** Reference index numbers are assigned by the IOC Secretariat.

(2) Abbreviations in IMS

(a) Classification of scientific programmes

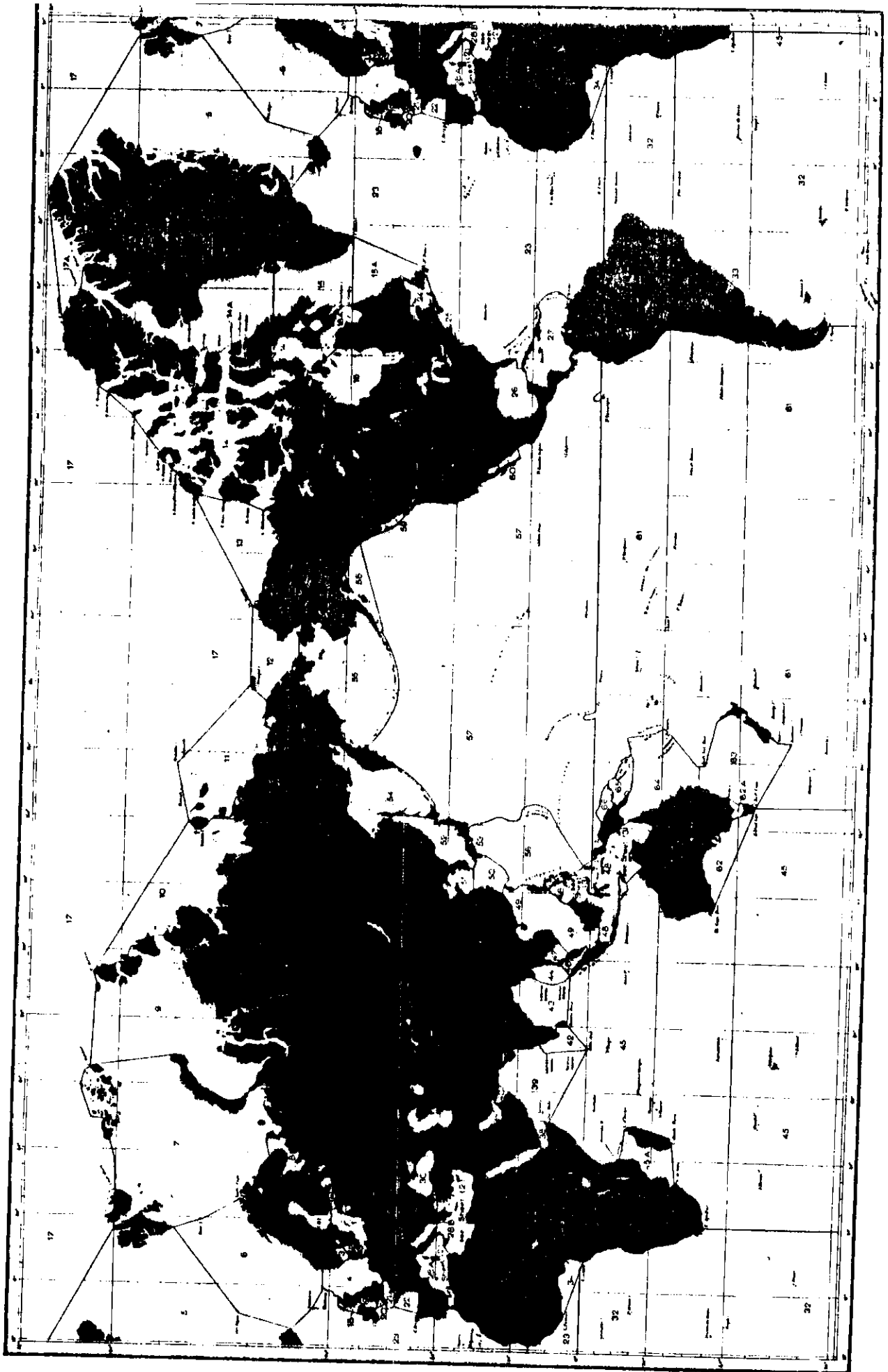
D _o	Descriptive oceanography (measurement of temperature, salinity and other dissolved substances required for computation of geostrophic currents and description of water properties)
C _m	Current measurements (by direct methods, such as GEK, current meters, drogues, swallow floats, etc.)
Fr	Fisheries research (exploratory fishing, bionomics, sampling, selectivity, gear experiments, tagging, etc.)
Ps	Planktonic studies (phyto- and zooplankton research, including fish eggs and larvae, standing crop and primary production, associated measurements or observations mainly in the biological euphotic zone)
Ab	Biological aphotic zone studies (biological studies in waters deeper than several hundred metres)
Gg	Geology and geophysics (coring, dredging, seismic studies, heat flow, gravimetric, magnetic measurements, etc.)
Mt	Meteorology (upper air observations, meteorological research - surface weather observations included under "Do").

DNP	Declared National Programmes
DOR	Division of Oceanographic Research
DOT	Department of Transport
DRB	Defense Research Board
DWK	Deutsche Wissenschaftliche Kommission für Merresforschung, (Bonn)
FAO	Food and Agriculture Organization of United Nations
FA	(Japanese) Fisheries Agency
FRB	Fisheries Research Board of Canada
GTS	Guinean Trawling Survey
HBRI	Hydrobiological Research Institute
HD, MSA	Hydrographic Division, Maritime Safety Agency
HMO, JMA	Hakodate Marine Observatory, Japanese Meteorological Agency
HRFRL	Hokkaido Regional Fisheries Research Laboratory
HU	(Faculty of Fisheries) Hokkaido University
ICES	International Council for the Exploration of the Sea
ICITA	International Co-operative Investigation of the Tropical Atlantic
ICNAF	International Commission for Northwest Atlantic Fisheries
IFM	Institut für Meereskunde der Universität (Kiel)
IHB	International Hydrographic Bureau
IIOE	International Indian Ocean Expedition
IMS	Institute of Marine Sciences
IO ESSA	Institute for Oceanography, Environmental Science Services Administration
IOC	Intergovernmental Oceanographic Commission
IODU	Institute of Oceanography, Dalhousie University
IOUBC	Institute of Oceanography, University of British Columbia
IPMM	Institut des Pêches Maritimes du Maroc
JEDS	Japanese Expedition of Deep Sea
JMA	Japanese Meteorological Agency
KMO	Kobe Marine Observatory
KNMI	Koninklijk Nederlands Meteorologisch Instituut
LGO	Lamont Geological Observatory
MBA	Marine Biological Association (Plymouth)
MD	Marine Division
MIR	Morski Instytut Rybacki
MMO	Maizuru Marine Observatory
MOD	Ministry of Defence
NASA	National Aeronautic and Space Administration
NAVOC	U.S. Naval Oceanographic Office
NIO	National Institute of Oceanography
NIOZ	Netherlands Institute for Marine Research
NMO	Nagasaki Marine Observatory

(b) Organizations, Institutions and Expeditions

AOG	Atlantic Oceanographic Group
BAH	Biologische Anstalt Helgoland
BCF	Bureau of Commercial Fisheries
BHMW	Biuro Hydrograficzne Marynarki Wojennej
BUFOFI	Bundesforschungsanstalt für Fischerei, (Hamburg)
CFRS	Central Fisheries Research Station
CHS	Canadian Hydrographic Service
CIG	Comité International de Geophysique
CNRS	Centre National de la Recherche Scientifique
CNEXO	Comité National d'Exploitation des Océans
COFI	Committee on Fisheries, FAO
CSIR	Council of Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organization
CSK	Co-operative Study of the Kuroshio
DAFS	Department of Agriculture and Fisheries for Scotland
DFG	Deutsche Forschungsgemeinschaft
DHI	Deutsches Hydrographisches Institut, (Hamburg)
DMSHQ	District Maritime Safety Headquarters
DMTS	Department of Mines and Technical Surveys

NML	Narragansett Marine Laboratory University of Rhode Island	RCN	Royal Canadian Navy
NRC	National Research Council	RIVO	Rijksinstituut voor Visserij - onderzoek
NRFRL	Nankai Regional Fisheries Research Laboratory	SCOR	Scientific Committee on Oceanic Research
NSF	National Science Foundation	SCH	Service Central Hydrographique
NTU	National Taiwan University	SHN	Servicio Hidrográfico Naval
NU	Nagasaki University	SIO	Scripps Institution of Oceanography
NYU	New York University	SRFRL	Seikai Regional Fisheries Research Laboratory
ONR	Office of Naval Research	TRFRL	Tokai Regional Fisheries Research Laboratory
ORSTOM	Office de la recherche scientifique et technique d'Outre-Mer	TUF	Tokyo University of Fisheries
OSU	Oregon State University	UNESCO	United Nations Educational, Scientific and Cultural Organization
PBS	Pacific Biological Station	USC	University of Southern California
PHS	Public Health Service	USCG	United States Coast Guard
PIHM	Panstwowy Instytut Hydrologiczno-Meteorologiczny	USCGS	United States Coast and Geodetic Survey
PINRO	Polar Institute of Fisheries and Oceanography	USNOO	United States Naval Oceanographic Office
PNL	Pacific Naval Laboratory	USWB	United States Weather Bureau
POG	Pacific Oceanographic Group	UT	University of Tokyo
PSMSL	Permanent Service for Mean Sea Level	WHOI	Woods Hole Oceanographic Institution



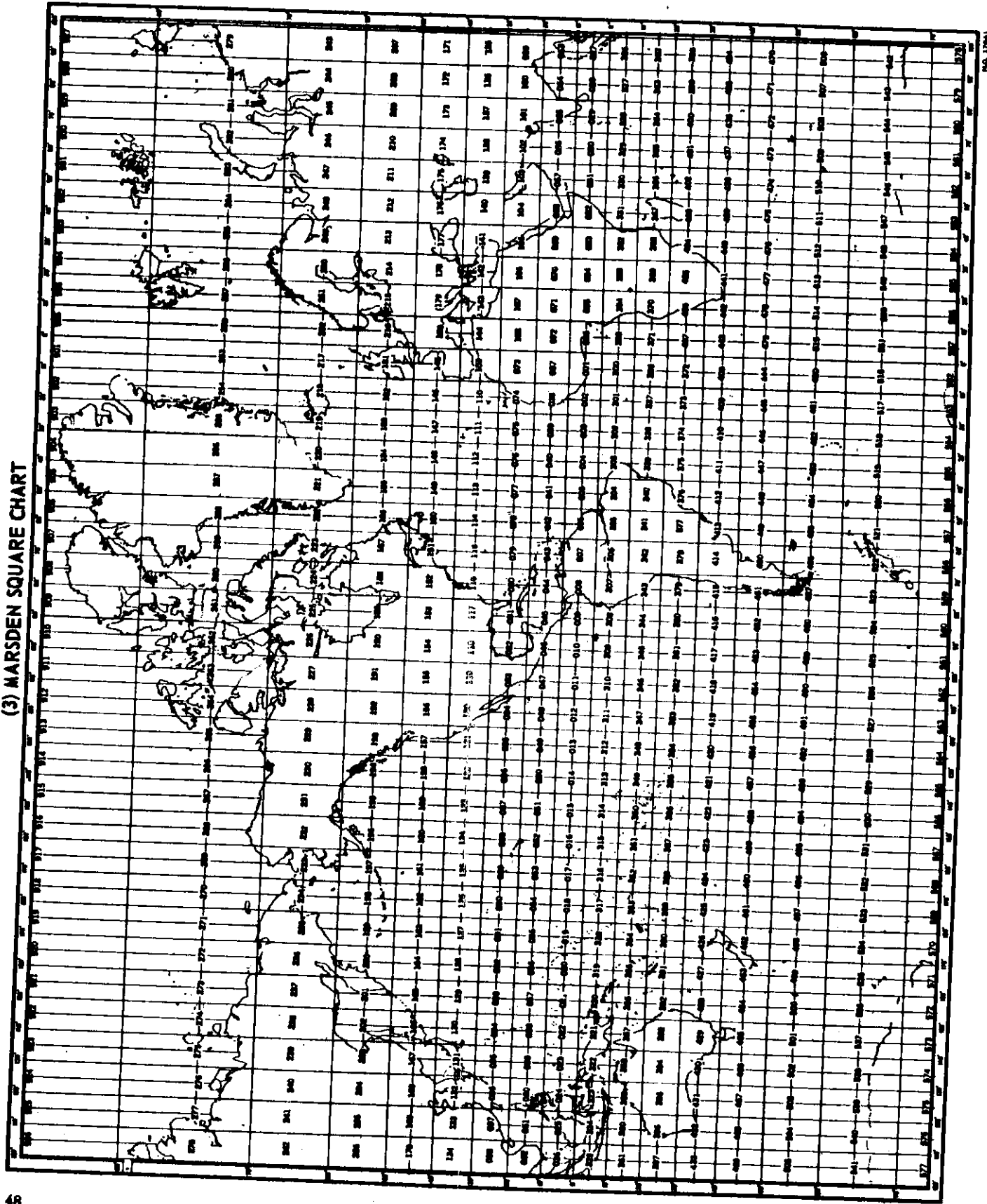
APPENDIX 3

Legend of the IHB Chart of Limits of Oceans and Seas

- | | | | |
|-------|--|-------|--|
| 1. | Baltic Sea. | 30. | Black Sea. |
| | Sub-Divisions of Baltic: | 31. | Sea of Azov. |
| | (a) Gulf of Bothnia. | 32. | South Atlantic Ocean. |
| | (b) Gulf of Finland. | 33. | Rio de La Plata. |
| | (c) Gulf of Riga. | 34. | Gulf of Guinea. |
| 2. | Kattegat, Sound and Belts. | 35. | Gulf of Suez. |
| 3. | Skagerak. | 36. | Gulf of Aqaba. |
| 4. | North Sea. | 37. | Red Sea. |
| 5. | Greenland Sea. | 38. | Gulf of Aden. |
| 6. | Norwegian Sea. | 39. | Arabian Sea. |
| 7. | Barentsz Sea. | 40. | Gulf of Oman. |
| 8. | White Sea. | 41. | Gulf of Iran (Persian Gulf) |
| 9. | Kara Sea. | 42. | Laccadive Sea. |
| 10. | Laptev (or Nordenskjold) Sea. | 43. | Bay of Bengal. |
| 11. | East Siberian Sea. | 44. | Andaman or Burma Sea. |
| 12. | Chuckchi Sea. | 45. | Indian Ocean. |
| 13. | Beaufort Sea. | 45-A. | Mozambique Channel. |
| 14. | The North Western Passages. | 46. | Malacca and Singapore Straits. |
| 14-A. | Baffin Bay. | 47. | Gulf of Thailand (Siam) |
| 15. | Davis Strait. | 48. | East Indian Archipelago (Indonesia). |
| 15-A. | Labrador Sea. | 49. | South China Sea (Nan Hai). |
| 16. | Hudson Bay. | 50. | Eastern China Sea (Tung Hai). |
| 16-A. | Hudson Strait. | 51. | Yellow Sea (Hwang Hai). |
| 17. | Arctic Ocean. | 52. | Japan Sea. |
| 17-A. | Lincoln Sea. | 53. | Seto Naikai or Inland Sea. |
| 18. | Inner Seas off the West Coast of Scotland. | 54. | Sea of Okhotsk. |
| 19. | Irish Sea and St. George's Channel. | 55. | Bering Sea. |
| 20. | Bristol Channel. | 56. | Philippine Sea. |
| 21. | English Channel. | 57. | North Pacific Ocean. |
| 22. | Bay of Biscay. | 58. | Gulf of Alaska. |
| 23. | North Atlantic Ocean. | 59. | The Coastal Waters of South East Alaska
and British Columbia. |
| 24. | Gulf of St. Lawrence. | 60. | Gulf of California. |
| 25. | Bay of Fundy. | 61. | South Pacific Ocean. |
| 26. | Gulf of Mexico. | 62. | Great Australian Bight. |
| 27. | Caribbean Sea. | 62-A. | Bass Strait. |
| 28. | Mediterranean Sea. | 63. | Tasman Sea. |
| | A. Western Basin. | 64. | Coral Sea. |
| | B. Eastern Basin. | 65. | Solomon Sea. |
| 29. | Sea of Marmara. | 66. | Bismarck Sea. |

APPENDIX 3

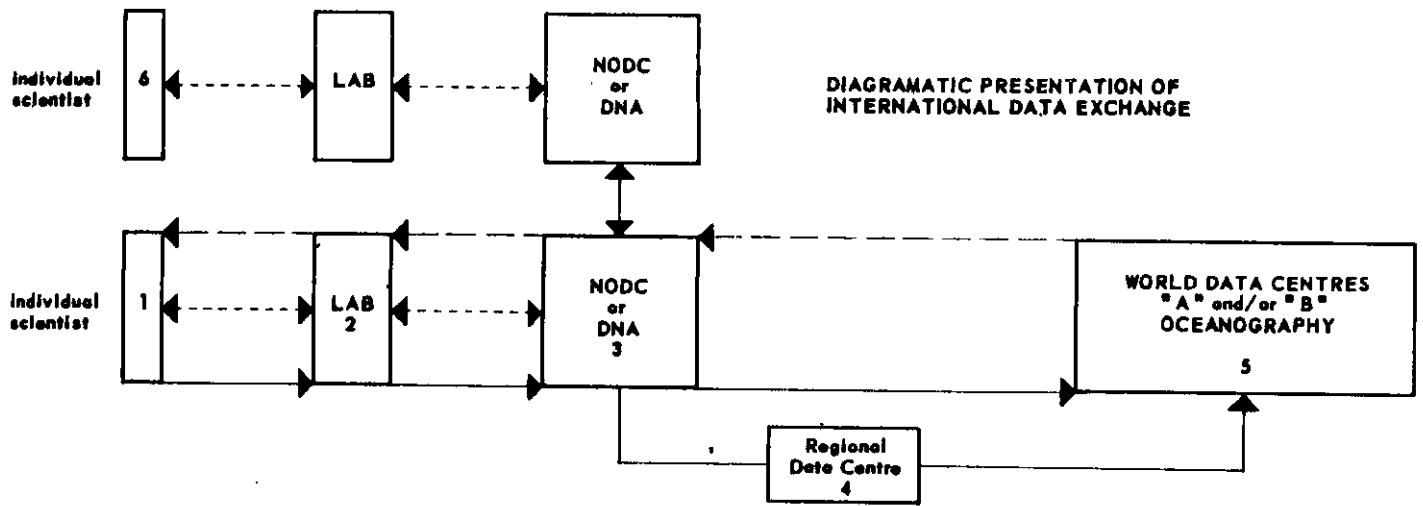
(3) MARDEN SQUARE CHART



NO. 17041

APPENDIX 4

DIAGRAMATIC PRESENTATION OF INTERNATIONAL DATA EXCHANGE



← Submission of standard data (reports and summaries)
 ← Retrieval
 ← Request for non-standard data

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