Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IOC Consultative Group on Ocean Mapping

Second Session

Paris, 12-13 February 1987

Unesco

IOC/CGOM-II/3
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English only

In this Series

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984, the reports of the following meetings have already been issued:

- Third Meeting of the Central Editorial Board for the Geological/ Geophysical Atlases of the Atlantic and Pacific Oceans
- Fourth Meeting of the Central Editorial Board for the Geological/ Geophysical Atlases of the Atlantic and Pacific Oceans
- Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of «El Niño»
- First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in relation to Living Resources
- First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources
- First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
- First Session of the Joint CCOP (SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
- First Session of the IODE Group of Experts on Marine Information Management
- Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Testonics and Resources
- Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
- First Session of the IOC Consultative Group on Ocean Mapping
- Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
- Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
- Third Session of the Group of Experts on Format Development of the Working Committee on International Oceanographic Data Exchange
- Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
- Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
- Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
- Second Session of the IOC Group of Experts on Effects of Pollutants
- Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica
- Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
- Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources

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1. OPENING OF THE SESSION

The Chairman, Mr. Desmond P.D. Scott, opened the Second Session of the IOC Consultative Group on Ocean Mapping, at Unesco Headquarters, Paris, at 09.30 on Thursday, 12 February 1987.

The Secretary IOC, Dr. Mario Ruivo, welcomed the participants and emphasized the importance of ocean mapping activities in the development of scientific exploration and exploitation of living and non-living resources of the World Ocean.

Apologies were received from Vice-Admiral O.A.A. Affonso, Director IHO.

A List of Participants is given in Annex II.

2. ADOPTION OF THE AGENDA

The Agenda was adopted with some additions (see Annex I).

3. CONDUCT OF THE SESSION, DOCUMENTATION

The Senior Technical Assistant Secretary IOC for Ocean Mapping, Dr. Viktor Sedov, presented the general documentation for the Session and administrative arrangements.

4. INTERSESSIONAL OCEAN MAPPING ACTIVITIES

The reviews given under this item were based on the Report on Ocean Mapping Activities to be submitted to the XIVth Session of the IOC Assembly (doc. IOC/INF-702) - see item 5 below.

Reference should be made to that document for further details.

A list of the Summary Reports of meetings of these groups is given in Annex IV.

4.1 REPORT FROM THE JOINT IOC-IHO GUIDING COMMITTEE FOR THE GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)

The Chairman of the Joint IOC-IHO Guiding Committee for GEBCO, Dr. Anthony S. Laughton FRS, provided information on the intersessional period of activities of the Committee. He reported on changes in the membership of the Committee: Professor E.S.W. Simpson, past Chairman and Vice-Chairman of the Guiding Committee, died on 28 June 1983, and Mr. Henri (Hans) Romleach, died on 9 September 1983.

Mr. Gerald N. Ewing, resigned as Chairman by the end of June 1985 and was replaced by Dr. Anthony S. Laughton. Ing. Gen. André Roubertou was elected as Vice-Chairman of GEBCO. The vacancies were filled by Dr. Robin K.H. Falconer, Commander D. Francisco Nuche Benito and Mr. David Monahan.

Dr. Laughton then made a review of the publications of the Guiding Committee. The final sheet of the 5th Edition - the World's Oceans (in one sheet) was published in April 1984. A very positive review of the GEBCO (5th Edition) had appeared in Scientific American shortly after this time.

English/Russian and English/Spanish versions of the "Standardization of Undersea Feature Names" have been published. English/Japanese, English/German and English/Chinese versions are in preparation.

Dr. Laughton emphasized the importance of the preparation of the publication "International Gazetteer of Undersea Feature Names". This publication will be useful for scientists who often give new names to underwater features which have already been examined and named by others.

4.2 REPORT FROM THE CENTRAL EDITORIAL BOARD FOR THE GEOLOGICAL/GEOPHYSICAL ATLASES OF THE ATLANTIC AND PACIFIC OCEANS (GAPA)

The Deputy Editor GAPA, Mr. Desmond P.D. Scott, provided information on progress with the GAPA Atlases. He gave a detailed review on the state of preparation of the contents of both Atlases. He expressed thanks to the numerous scientists for their contributions without any fees and to the Soviet Government for funding in roubles through the Ministry of Geology of the USSR.

Both Atlases are well on the way to completion. The Atlantic Atlas is now scheduled for publication in 1988 in time for display at the Joint Oceanographic Assembly (JOA); it is hoped that the Pacific Atlas will be printed no later than two years after the Atlantic Atlas.

Dr. Laughton suggested that a selection of GLORIA mosaics from the United States EEZ surveys might be incorporated in the two atlases. Mr. Scott said this could certainly be done for the Pacific Atlas (see item 7.3 below) but if any such material were to be incorporated in the Atlantic Atlas it would have to be made available very soon. He would certainly investigate the possibility.

4.3 REPORT FROM THE EDITORIAL BOARD FOR THE INTERNATIONAL BATHYMETRIC CHART OF THE MEDITERRANEAN (IBCM)

Prof. Carlo Morelli, Chairman IBCM, provided information on the state of preparation of IBCM geological and geophysical overlay sheets and made a presentation on the revised colour proof copy of the IBCM on a single sheet (scale 1:5 000 000), which had been brought to the Session by Dr. A. Jivago. He emphasized that this map will soon be available for sale and stressed the urgent need to improve the sales arrangements for all IBCM products.

The Chairman CGOM noted that it is unlikely that the IOC Secretariat will be able to undertake the sale of IBCM products but that a more appropriate solution to this problem might be sale by the Operational Unit for the Mediterranean.

Information on the digitization of the IBCM bathymetric contours by Petroconsultants (SA), Geneva, was provided by the Chairman CGOM. After discussion, Mr. John Murray (Petroconsultants UK) agreed to supply a copy of the data tape free of charge for the personal use of members of the IBCM community.

Dr. Jivago reported that Prof. Kuprin is concerned about the lack of response to his earlier requests for data regarding the unconsolidated sea-bed sediments map, and asked for Prof. C. Morelli's help on this matter. He awaits data from the following scientists: Prof. A. Brombati and Prof. M.B. Cita (Italy), MM. F. Fernex and G. Bellaiche (France), Mr. F. Fabricius (Federal Republic of Germany), Prof. E. Izdar (Turkey), Prof. G. Evans (United Kingdom), Prof. D. Stanley (USA), Dr. M. Juracic (Yugoslavia) and Prof. C. Bobier (Tunisia).

The Chairman IBCM agreed to provide the necessary help, indicating that since the legend for the Unconsolidated Sediments map had been approved at the informal IBCM consultations in Palma de Mallorca, a better response can now be expected from marine geologists.

The Chairman CGOM presented a list of Undersea Feature names shown on the IBCM and on the small-scale IHO International Charts prepared by the Operational Unit for the Mediterranean which had been amended following comments made at the Second Session of EB-IBCM. The IBCM Secretary was thanked for this work.

The Secretary IBCM gave an account of the current situation regarding collection of new bathymetric data. He was concerned that many of the 1:250 000 bathymetric plotting sheets used for the compilation of the published bathymetric sheets (comprising soundings, contours and source control) were missing from the set held in the IHB. He was arranging for new copies to be provided where possible.

The Chairman IBCM reported on the schedule of preparation of the Overlay Sheets and on various outstanding problems. He stressed his support for Captain S. Val'chuk's opinion, which was received by the Secretary IBCM by telephone, that yearly sessions of the IBCM Editorial Board are vital in order to ensure that all Overlay Sheets are published by 1991-92. It was suggested that full sessions using IOC funds should be held in 1987 and 1989, and informal consultations in conjunction with the ICSEM Congresses in 1988 and 1990.

4.4 REPORT FROM THE EDITORIAL BOARD FOR THE INTERNATIONAL BATHYMETRIC CHART OF THE CARIBBEAN SEA AND PART OF THE PACIFIC OCEAN OFF CENTRAL AMERICA (IBCCA)

Dr. Néstor Duch Gary, Chairman of the Editorial Board for the IBCCA introduced this item. He recalled that the Commission had approved the establishment of the EB-IBCCA in 1985 by resolution XIII-3.

Terms of Reference for the Editorial Board are given in an Annex to that Resolution.

To meet the requirements of the Terms of Reference of the IBCCA Project, the First Session of the Editorial Board was held in the city of Aguascalientes, Mexico, from 29 September to 2 October 1986.

The Chairman IBCCA drew attention to three points dealt with during the 1st Session in Aguascalientes, which he considered to be of particular importance:

1. The establishment of mapping specifications for the IBCCA Project. The Editorial Board, following the recommendation of the draft document "Specifications for International Bathymetric Charts produced under Regional Mapping Projects" (see item 6 below), prepared a set of specifications for use by the contributors to the IBCCA. These are appended as Annex IV to document IOC/EB-IBCCA-I/3.

2. Following a recommendation from Cuba, these specifications establish the use of the WGS-72 ellipsoid for the IBCCA. This, in the opinion of the Editorial Board constitutes an important step, as a geodetic reference to the world system.

The Editorial Board made an effort to clarify the specifications and methodological processes which have not been given in detail in the reference documents. The criteria used were extensively discussed and may be considered applicable to other similar regional projects.

3. The Board, in its First Session, also established the area to be covered and the corresponding distribution of the various sheets of the series.

The countries attending the session accepted responsibility for compiling the different sheets, as follows: USA, 1-01, 1-02, 1-03, 1-04 and 1-09; Mexico, 1-05, 1-06 and 1-12; France, 1-10, 1-17[x] and 1-18[x]; Colombia, 1-15 and 1-21; Costa Rica, 1-14; Cuba, 1-07 and 1-08; Venezuela, 1-16, 1-17 and 1-18.

Furthermore, a plotting sheets diagram for bathymetric data compilation on the scale of 1:250 000, following the British Admiralty system, was prepared.

Finally, an investigation was initiated into the possibility of using automated methods for plotting of contours. This research is being conducted in parallel with classical methods and will be used in due time, only if it proves efficient.

4.5 REVIEW OF OTHER PROPOSED IOC REGIONAL MAPPING PROJECTS

4.5.1 International Bathymetric Chart of the Western Indian Ocean (IBCWIO)

Dr. Werner Bettac reported on the state of preparation of the Preparatory Meeting of Experts on the International Bathymetric Chart of the Western Indian Ocean (IBCWIO). He informed the Group about an expert mission he had carried out on behalf of IOC, and plans for a training course on ocean mapping to be held in June/July 1987. A draft Assembly Diagram for IBCWIO has been prepared by Dr. Bettac for consideration at the above Preparatory Meeting. It is expected that IBCWIO will be compiled under the supervision of the Deutsches Hydrographisches Institut, and will be published in the Federal Republic of Germany.

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[x] in collaboration with Venezuela.

4.5.2 International Bathymetric Chart of the Red Sea and Gulf of Aden (IBCRSGA)

Mr. D. Scott provided information on the International Bathymetric Chart of the Red Sea and Gulf of Aden (IBCRSGA) project.

A Draft Project Proposal was prepared in 1983 by the Institute of Oceanographic Sciences (IOS) of the United Kingdom. The preparation of three sets of Overlay Sheets for this Chart is also envisaged. However, unfortunately it has not been possible so far to find the necessary funding for the Project.

4.5.3 International Bathymetric Chart of the Central Eastern Atlantic (IBCEA)

Dr. A. Tolkachev, IOC Senior Technical Secretary, reported on the outcome of the discussion of ocean mapping activities at the First Session of the IOC Programme Group on the Central Eastern Atlantic (IOCEA) held in Praia, Cape Verde, 19-23 January 1987. The Programme Group on IOCEA emphasized the need for preparation of an International Bathymetric Chart of the Central Eastern Atlantic (IBCEA) and recommended that IOC undertake its preparation and convene a consultation of governmental experts from the region, and from other interested Member States of the Commission, to decide on the feasibility of preparing such a chart and to draft Terms of Reference for an Editorial Board for IBCEA. France offered to assist in the publication of the chart in the form of mutual assistance under TEMA. An IOCEA-I recommendation on this matter will be submitted to the 14th Session of the IOC Assembly.

Dr. A.S. Laughton informed the Group about some existing bathymetric charts for this region prepared by IOS, UK, which should be taken into account when compiling the IBCEA.

The Group asked for information as to which French institution will take overall responsibility for the preparation and publication of IBCEA.

5. ADOPTION OF THE REPORT ON OCEAN MAPPING ACTIVITIES TO BE SUBMITTED TO THE FOURTEENTH SESSION OF THE IOC ASSEMBLY (IOC-XIV, PARIS, 17 MARCH-2 APRIL 1987)

The Chairman presented a draft of this Report (doc. IOC/INF-702). After a detailed discussion, some editorial corrections and additions were made and the Report was adopted for submission to the IOC Assembly.

6. SPECIFICATIONS FOR INTERNATIONAL BATHYMETRIC CHARTS PRODUCED UNDER REGIONAL MAPPING PROJECTS

The Chairman introduced the document "Specifications for International Bathymetric charts produced under IOC Regional Mapping Projects", which had been prepared at the request of the CGOM by Captain Val'chuk. Comments had been submitted by Dr. Bettac and these were considered along with the content of the document.

After discussion, the specifications were adopted with some amendments (see Annex V).

The EB/IBCCA which had already considered a draft copy of this document (see above) were invited to consider the above amendments at a convenient opportunity.

7. ANY OTHER BUSINESS

7.1 REPORTS FROM GUIDING GROUPS OF EXPERTS ON THE PROGRAMME OF OCEAN SCIENCE IN RELATION TO LIVING RESOURCES (OSLR) AND OCEAN SCIENCE IN RELATION TO NON-LIVING RESOURCES (OSNLR)

The Technical Secretary provided information prepared by Dr. Gunnar Kullenberg on the state of development of various projects on Ocean Science in relation to Living Resources and the request of the Guiding Group of Experts regarding ocean mapping. The regions involved are the Pacific, Caribbean, Southern and Western Atlantic, and the waters round the Iberian Peninsula.

The Guiding Group of Experts had also welcomed the proposals for ocean mapping recently formulated during sessions of the Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE) and the Programme Group on IOCEA.

Dr. K. Kitazawa, IOC Assistant Secretary, reported that the Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources (OSNLR) had been held in Unesco Headquarters, from 26 to 30 January 1987 under the chairmanship of Pfof. Michel Vigneaux. The Guiding Group of Experts identified scientific research programmes for shallow-water areas and the deep-sea.

The shallow-water marine programme includes:

(i) the study of natural and human effects on the coastal zone, including global sea-level rise, regional subsidence, extraction of ground water and hydrocarbons, and river-estuarine-coastal dynamics and interactions;

(ii) the study of the dynamics of the coastal and shelf region (e.g., tidal monitoring, wave climate, storm sturges, etc.).

The deep-sea programme includes:

(i) the study of tectonics and magmatic processes of divergent and convergent plate margins, to provide the geological and geophysical framework for resource exploitation;

(ii) the study of the distribution and composition of cobalt-rich ferro-manganiferous crust and hydrothermal sulphides.

The Guiding Group of Experts had recognized that maps are an important pre-requisite for a better implementation of the above research works. It had identified, besides bathymetric charts, the need for regional maps of distribution and composition of superficial shelf sediments in which the strand-lines of the last low (18,000 years BP) and high (125,000 years BP) still-stands should be delineated world-wide, and maps on which the thickness of sequences of sediments in the marginal basin settings should be shown.

7.2 WORLD DIGITAL DATABASE FOR ENVIRONMENTAL SCIENCE (WDDES)

Mr. David Bickmore provided information about World Digital Database for Environmental Science (WDDES), being developed by a Joint IGU/ICA Working Group on Environmental Atlases and Maps. Details of the project are given in Annex II.

The Group welcomed the project and offered to provide digitized material from the various IOC Ocean Mapping projects as they become available, for incorporation into the WDDES.

7.3 PRESENTATION ON GLORIA

Dr. A. Laughton provided information on the GLORIA long-range side-scan sonar system and displayed a series of slides showing mosaics compiled using the GLORIA system.

He then presented a copy of the "Atlas of the Exclusive Economic Zone, Western Conterminous United States", prepared using GLORIA material for deposit in the OCE/IOC Marine Information Centre. The gift was highly appreciated.

8. DATE AND PLACE OF THE NEXT SESSION

The Group recommended that its Third Session be held in late-1988 (in good time before IOC-XV) at a convenient location to be decided later, possibly in conjunction with another meeting if this was considered appropriate by the Secretary.

9. ADOPTION OF THE SUMMARY REPORT

The Summary Report was adopted unanimously.

10. CLOSURE OF THE SESSION

The Chairman closed the session at 16.30 on Friday 13 February and in so doing thanked the participants for their attendance and contributions.

ANNEX I

AGENDA

1. OPENING OF THE SESSION

2. ADOPTION OF THE AGENDA

3. CONDUCT OF THE SESSION, DOCUMENTATION

4. INTERSESSIONAL IOC OCEAN MAPPING ACTIVITIES

   4.1 Report from the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO)

   4.2 Report from the Central Editorial Board for the Geological/ Geophysical Atlases of the Atlantic and Pacific Oceans (GAPA)

   4.3 Report from the Editorial Board for the International Bathymetric Chart of the Mediterranean (IBCM)

   4.4 Report from the Editorial Board for the International Bathymetric Chart of the Caribbean Sea and part of the Pacific Ocean off Central America (IBCCA)

   4.5 Review of other proposed IOC Regional Mapping Projects

      4.5.1 International Bathymetric Chart of the Western Indian Ocean (IBCWIO)

      4.5.2 International Bathymetric Chart of the Red Sea and Gulf of Aden (IBCRSGA)

      4.5.3 International Bathymetric Chart of the Central Eastern Atlantic (IBCEA)

5. ADOPTION OF THE REPORT ON OCEAN MAPPING ACTIVITIES TO BE SUBMITTED TO THE FOURTEENTH SESSION OF THE IOC ASSEMBLY (IOC-XIV, PARIS, 17 MARCH-2 APRIL 1987)

6. SPECIFICIATIONS FOR INTERNATIONAL BATHYMETRIC CHARTS PRODUCED UNDER REGIONAL MAPPING PROJECTS

7. OTHER BUSINESS

   7.1 Reports from Guiding Groups of Experts on the Ocean Science in relation to Living Resources (OSLR) and Ocean Science in relation to Non-Living Resources (OSNLR)

   7.2 World Digital Database for Environmental Science (WDDES)

   7.3 Presentation on GLORIA

8. DATE AND PLACE OF THE NEXT SESSION

9. ADOPTION OF THE SUMMARY REPORT

10. CLOSURE OF THE SESSION

ANNEX II

LIST OF PARTICIPANTS

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ANNEX III

LIST OF REPORTS OF IOC OCEAN MAPPING BODIES

IOC-IHO/GEBCO-X/3	Summary Report of the Tenth Session of the Joint IOC-IHO Guiding Committee for General Bathymetric Chart of the Oceans (GEBCO)
IOC-IHO/GEBCO Officers-V/3	Fifth Meeting of the GEBCO Officers
IOC-IHO/GEBCO-SCAB-IV/3	Third Meeting of the GEBCO Sub-Committee on Digital Bathymetry
IOC/INF-702	Report of the Consultative Group on Ocean Mapping (CGOM) to the Fourteenth Session of the IOC Assembly
IOC/EB-IBCCA-I/3	Informe resumido de la Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica (IBCCA)
IOC/EB-IBCCA-I/3S	Executive Summary (English) of the above-mentioned Report
IOC/EB-IBCM-II/3	Summary Report of the Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
IOC/INF-696	Report of the ad hoc informal consultations between members of the Editorial Board for IBCM and other experts during meetings of the ICSEM Marine Geology and Geophysics Committee at the XXXth ICSEM Congress

ANNEX IV

SPECIFICATIONS FOR INTERNATIONAL BATHYMETRIC CHARTS PRODUCED UNDER REGIONAL MAPPING PROJECTS

SECTION 100 - GENERAL

101 - Introduction

A. International Bathymetric Charts produced under Regional Mapping Projects are a continuation and further development of the General Bathymetric Chart of the Oceans (GEBCO), under the general guidance of the IOC Consultative Group on Ocean Mapping. These charts are prepared and published with the co-operation of volunteer hydrographic Offices and/or groups of scientists from appropriate institutions.

B. For each bathymetric chart series, an Editorial Board will be established by the IOC Assembly or Executive Council, for the purpose of technical direction of its compilation and publication.

SECTION 200 - BASIC SPECIFICATIONS

201 - Projection

A. Sheets between latitudes 72°N and 72°S shall be shown on Mercator Projection using an agreed International Ellipsoid.

B. Polar sheets shall be prepared using the Polar Stereographic Projection.

202 - Scale

A. A scale of 1:1 000 000 at a reference parallel to be defined by the Editorial Board shall normally be used.

203 - Graticule

A. A scaled border of each sheet shall be shown subdivided into 1 minute increments of latitude and longitude.

B. Meridians and parallels shall be drawn every 2°.

C. Labelling of the graticule shall be every 1°.

D. The tropics of Capricorn and Cancer and the Polar Circles shall be shown.

204 - Size

The neat line size of each sheet shall not generally exceed 740 x 900 mm.

205 - Numbering

A. For each chart a consecutive sheet number shall be used as shown in an Assembly Diagram.

B. Sheet numbers shall be printed in 8 mm Arabic figures in the lower right-hand and top left-hand corner of each sheet.

206 - Dating

The date of the chart publication to be shown on each sheet shall be the date of going to press.

207 - Units of measurement

Depths and topographic heights shall be shown in metres. Depths should be corrected from the third edition of the Echo-Sounding Correction Tables, published by the United Kingdom Hydrographic Department, and this should be stated on the face of the chart.

208 - Marginal information

A. All marginal information shall be in English (or bilingual if appropriate).

B. This shall include:

1. The general title of the chart.
2. Sheet number.
3. Projection, ellipsoid and scale (see 201, 202).
4. Unit of measurement used for depths and heights.
5. Code of colours used to portray hypsometry.
6. Code of colours used to portray bathymetry.
7. An index of areas and names of countries whose Hydrographic Offices or groups of scientists prepared plotting sheets for the sheet.
8. The names of scientific co-ordinators of the chart series and of scientists responsible for the scientific content of the sheet.
9. The logo of the Intergovernmental Oceanographic Commission (IOC) of Unesco.
10. Edition number and date of publication (see 206) followed by the statement:
"Published by the..... (name of printer)
under the authority of the IOC (of Unesco)"
11. List of the sources of the data used (for the chart series).

SECTION 300 - TOPOGRAPHY

301 - For the land part, topographic maps shall be used.

302 - The best available agreed upon coastline shall be used. The coastline shall be shown as a firm line in black.

303 - A. Contours on land shall be at 200 m intervals.

B. The thicker lines shall be at 200, 1,000, 2,000, 3,000, etc., m. intervals.

C. Additional contours which may be required by the data must be shown.

D. A colour change for hypsometry shall be used at the following intervals: 0-200, 200-1000, 1000-2000, 2000-3000, etc., m.

E. Glaciers shall be shown by contours or by symbols. The significant heights shall be shown.

304 - Hydrology of the land

. On the chart shall be shown:

- rivers and channels;
- lakes;
- lagoons.

(at the discretion of the Editorial Board, but these should be compatible with the contour information on land and the scale of the Chart).

305 - Major cities and towns, priority being given to those on the coast.

SECTION 400 - BATHYMETRY

401 - The 1:250 000 plotting sheets prepared by the participants in the Project, according to their zones of responsibility, shall form the basic bathymetric data to be used for the compilation of the chart.

The plotting sheets shall be prepared according to the Annex to these Specifications.

402 - Soundings

A. A sparse pattern of numerical soundings shall be shown to indicate maximum and minimum (and other significant) depths, where known, over major undersea features in such a way as not to detract from the paramount objective of indicating sea floor relief by means of contours.

B. The exact position of all numerical soundings shown shall be indicated by a dot. The depth shall be written as cartographically convenient against the dot using 1.5 mm sans-serif figures. Where space does not permit the juxtaposition of the figures they may be offset and linked by a fine line to the dot placed in the exact position.

C. In order to indicate contour reliability, all soundings used shall be shown as dots representing discrete soundings or lines representing continuously sounded traverses. Areas of detailed surveys, where soundings are denser than can be conveniently shown, shall be indicated by numbered boxes referenced in the margin.

403 - Depth contours and colours

A. Basic contours shall be at 200 m intervals.

B. The 200 m contour line and all contours at 1000 m intervals shall be drawn using thick lines.

C. 20, 50 and 100 m contours, if necessary, shall be drawn using thin lines.

D. A colour change for the bathymetry shall be used at the following intervals: 0-200, 200-1000, 1000-2000, 2000-3000, etc., m.

SECTION 500 - NOMENCLATURE AND GEOGRAPHICAL NAMES

501 - A. A proposed list of names for inclusion on each sheet shall be forwarded to the GEBCO Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features, with a request for guidance on any that might be controversial. In preparing this list account should be taken of the guidelines contained in the GEBCO publication "Standardization of Undersea Feature Names".

B. As a general policy, local names (cities, towns, mountain ranges, rivers, etc.) shall be in exact agreement with the form prescribed by the most authoritative national source. However, in those cases where the national names differ substantially from the normal English usage, the English version shall be shown alongside in parenthesis.

C. The nomenclature for undersea features shall be shown in the English language.

APPENDIX TO ANNEX IV

RECOMMENDATIONS FOR PREPARATION OF PLOTTING SHEETS FOR INTERNATIONAL BATHYMETRIC CHARTS PRODUCED UNDER REGIONAL MAPPING PROJECTS

1. For plotting and contouring purposes the British Admiralty's plotting sheets for oceanic soundings should be utilized.

2. Soundings should be in metres corrected using the third edition of the "Echo Sounding Correction Tables".

3. The position of the sounding should be the central point of the group of figures representing it. But the position may also be indicated by a dot with the sounding figure alongside, and if necessary, by a thin line drawn to connect the two.

4. The soundings figures should be inscribed across the track; the figures should be easily readable, the recommended average size being 1.5-2 mm in height.

5. The largest possible number of soundings should be shown on the plotting sheets so long as their clarity is not impaired. When soundings are very dense, the number may be reduced if care is taken not to eliminate the more important soundings: maxima and/or minima.

6. The margin of each plotting sheet should contain the following legend:

   "Compiled by .....
   "Last brought up to date on .....
   "Prepared under ..... (name of the appropriate Regional Mapping Project).

7. Each plotting sheet should be accompanied by two overlays:

   a) overlay contour lines with contouring made through each 100 metres, additional contours may be drawn through 50 and 10 metres, where warranted (on the shelf and abyssal plains);

   b) Overlay source materials on which should be shown the following:
      - areas of soundings and position of isolated soundings with the appropriate legends required to indicate the source and the date of such soundings;
      - information on the method of navigation and its precision;
      - information on the type of the echosounder and its precision.

8. On each plotting sheet and overlay the date of completion of compilation should be indicated.

ANNEX V

WORLD DIGITAL DATABASE FOR ENVIRONMENTAL SCIENCE (WDDES)
(by David Bickmore, Chairman of the IGO/ICA Joint Working Group on Environmental Atlases and Maps)

1. Background

A Joint International Geographical Union and International Cartographic Association (IGU/ICA) Working Group was set up in 1984 under David Bickmore to explore the feasibility of developing a standard global base map in digital form. No serious digital base map of the world showing relief exists. The object is to produce tapes (and discs) - rather than printed maps; and the purpose is to enable correlation, analysis, and modelling of new and existing data sets for the environmental sciences. This has been seen both as a timely international development, e.g. by CODATA[1], and as practical device in such programmes as IGBP, SOTER and GRID[2].

2. Scale and features

As a result of three international workshops[3], consensus has emerged that the base map should be at 1/1M scale (c. 1 km resolution); also that the following elements should be portrayed:

(a) Coastlines
(b) Drainage networks
(c) Land relief (contours at c. 300m interval; spot heights)
(d) Bathymetry (contours at 1000m intervals; depth values)
(e) Statistical (e.g. provincial) boundaries
(f) Built up areas
(g) Place names of the above

The estimated size of such a database is about 1 gigabyte: professional management is called for ab initio.

3. Sources

For the land areas the database will be derived by digitizing the Operational Navigation Charts (ONC) which appear to be the best current world series at this scale: they are maintained by the military on a continuing basis[4]. Additional information can be assimilated from other sources (e.g. 5' elevation data from World Data Center, Boulder; statistical boundaries from FAO; eventually also from results of remote sensing). Lower resolution data will have to be used for the oceans, e.g. GEBCO, and for the Antarctic.

Unavoidable variations in the positional reliability of these data can be categorized (subjectively at least) and flagged on each line segment. The intention is first to provide global cover as above, then to improve it.

4. Feasibility

The geotechnical feasibility (digitizing and data structures) of the project has been tested by examining digitized data for two pilot areas (N. Kenya and N.W. Sumatra) at some ten international laboratories[5]. Expert help in the pilot exercises was provided by IH (river structuring), Nottingham University (digital terrain modelling), Cambridge University Computer Laboratory (data structuring and management), and by the R.G.S. (map analysis). Notable assistance in this pilot work was provided by the firm Petroconsultants (Cambridge - whose Mundocart is an outline version of our project but with c.30% of the data).

5. Funding

A project of this kind also needs to be seen within the context of its possible funding. We envisage two elements - first a production team for digitizing and structuring the data and for distributing it; and second, an editorial team to assemble source materials, issue specification, check results and generally provide quality assurance. Costs of $1.5M for the first and of $0.5M for the second are envisaged - over two years.

6. Production

We have a specification for production work and some discussions about this and about its funding are currently taking place. The assumption is that the data and its derivatives would be sold as widely as possible to recoup digitizing etc. costs.

7. Editorial

It would seem appropriate for the second team to be partly funded by ICSU, and in particular by IGBP. The British Natural Environment Research Council is well placed to provide the kind of editorial authority that this team requires and they may anyhow wish to take an active lead in this project on some kind of contract basis. This is also under active discussion.

8. Interdisciplinary interests

It is of the essence of this WDDES project that it should be relevant to a number of other disciplines and organizations, for example to the International Geosphere Biosphere Programme (IGBP), to the International Society of Soil Scientists (ISSS), to the Commission for the Geological Map (CGOM), as well as to the Natural Environment Research Council (NERC). Other organizations might wish to use WDDES as a digital base map and develop their own overlays etc. in the context of the IGBP. It is believed that linkages from WDDES to global thematic mapping require anticipating and arrangements to do this could with benefit now be made.

9. Workshop IV

In order for the WDDES database to be a reality for 1989, it is necessary that the work be underway by April 1987.

Footnotes

1. CODATA's Workshop on Environmental Data (May 1986) emphasized the urgency to "harmonize" location data globally and to avoid a plethora of different base maps.
2. ICSU - International Geosphere Biosphere Programme; International Society of Soil Sciences - Soil and Terrain Database 1/1M; UNEP - Global Resources Information Database.
3. At ICSU, Paris, January 1985; at World Data Center, Boulder, November 1985; at WMO, Geneva, July 1986. Workshop IV is planned in Oxford for April 1987.
4. Links with General Thompson have been helpful - e.g. loan of film separations of this series is now assumed. Military Survey might become one of the customers.
5. At USGS; World Bank; Goddard; Survey of Canada; Zurich University; Institute of Image Analysis, Graz; Landestopographie Berne; IGN, Paris; Nottingham University; Birkbeck College; Institute of Hydrology.
6. Discussion October 1986 (Baker/Rosswall/Bickmore) confirms the need for such a database for IGBP by 1988/9 and the intention to appeal generally to foundations etc. in March 1987.