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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of Unesco)

Report of the Consultative Group on Ocean Mapping (CGOM) to the Sixteenth Session of the IOC Assembly

This report is submitted to the IOC Assembly in accordance with clause 1 of the Terms of Reference of the Consultative Group on Ocean Mapping (CGOM). It covers the period since the last report of the CGOM to the IOC Assembly (doc. IOC/INF-770 dated 16 June 1989).

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The following paper provides a brief summary of the activities of the various component projects making up the Ocean Mapping Programme of the Intergovernmental Oceanographic Commission.

1. GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)

1.1 GENERAL

1 The GEBCO project is jointly sponsored by the IOC and the International Hydrographic Organization (IHO), and the CGOM, as an IOC subsidiary body, wishes to pay tribute to that organization for the excellent close co-operation which characterizes all dealings and discussions held between the two agencies.

2 The GEBCO Officers have met once during the period covered by this report:

GEBCO Officers-VII Alfred-Wegener-Institut
Bremerhaven, F.R. Germany, 30 May - 1 June 1990
(ref.: doc. IOC-IHO/GEBCO Officers-VII/3).

The Sub-Committee on Digital Bathymetry has also met once:

SCDB-VII Alfred-Wegener-Institut
Bremerhaven, F.R. Germany, 28-30 May 1990
(ref.: doc. IOC-IHO/GEBCO SCDB-VII/3).

3 The composition of the GEBCO Guiding Committee and its Sub-Committees, together with a list of Scientific Advisers to the GEBCO, will be found in Annex I.

1.2 BACKGROUND

4 Ever since publication of the GEBCO (5th Edition) in 1982 (by the Canadian Hydrographic Service on behalf of IOC and IHO), the GEBCO Guiding Committee has been studying the way ahead in the light of modern technologies. It was decided at an early date that the 5th Edition contours (and shiptracks) should be digitized and that a supporting structure would be needed to keep this database continually updated, so that there would always be world coverage of up-to-date material in existence from which future editions could be prepared as and when the availability of new data (and the existence of sufficient funding) justified this.

5 The traditional printed paper GEBCO (6th Edition), which will be produced from the above database, has been tentatively scheduled for publication in 1995.

6 The Institut Géographique National (France) and the Bureau Gravimétrique International agreed to undertake the task of digitizing the 5th Edition contours and they have indeed digitized about half of the GEBCO sheets; this material is now on sale to the public on magnetic tape. However, many teething problems were encountered and this programme has taken far longer than originally envisaged. Furthermore, new technologies have outstripped those with which the programme was started.

7 Consequently, parts of the programme are now being carried out by the Japan Oceanographic Data Center, the United Kingdom NERC (Natural Environment Research Council) Unit for Thematic Information Services and the USSR Head Department of Navigation and Oceanography, and it is confidently expected that world coverage (with the possible exception of the South Atlantic for which area a revised sheet no. 5.12 is in preparation) will be available by mid-1991.

1.3 THE "GEBCO DIGITAL ATLAS"

8 As stated in CGOM's report to the Fifteenth Session of the Assembly (document IOC/INF-770), the above digital database has been named the "GEBCO Digital Atlas" and the structure that will be needed for its routine maintenance and marketing is now being established and is expected to be operational by the time of IOC-XVI. Attached as Annex III is a copy of a line diagram in which the main components of the new GEBCO Structure have been identified, together with their relationship to each other and operational links.

9 Besides the bathymetric contour/shiptrack database, the "GEBCO Digital Atlas" will initially include a world coastline - the World Vector Shoreline (WVS) which has been provided by the United States Defense Mapping Agency Hydrographic/Topographic Center - and a listing of Geographical Names of Undersea Features, based on the GEBCO Gazetteer (Gazetteer of Geographical Names of Undersea Features shown (or which might be added) in the GEBCO and on the IHO small-scale International Chart Series) published by the International Hydrographic Bureau in 1988 (publication BP-0008). In due course it is planned to add Digital Terrain Modelling and/or a gridded dataset.

10 In support of this structure, the United Kingdom Government (through its Natural Environment Research Council) has agreed to fund, initially for a period of four years, under the overall supervision of Dr. Meirion T. Jones (Director, British Oceanographic Data Centre), Chairman of the GEBCO Sub-Committee on Digital Bathymetry:

(i) A GEBCO Bathymetric Editor. This post is situated at the Institute of Oceanographic Sciences, Deacon Laboratory, in the United Kingdom.

(ii) A GEBCO Digital Atlas Manager. Situated in the British Oceanographic Data Centre.

(iii) A Research Project at the NERC Unit for Thematic Information Services (NUTIS) in Reading University, to provide advice on the development of the "GEBCO Digital Atlas", in consultation with the Sub-Committee on Digital Bathymetry.

11 A copy of the Terms of Reference for these two posts and a work description "Bathymetric Modelling using Automated Techniques" for NUTIS appears as Annex v to the GEBCO Officers-VII report.

12 The CGOM at its Fourth Session considered it essential that the GEBCO Bathymetric Editor be kept fully informed of all the developments of the various regional Ocean Mapping projects and recommended that he should attend meetings of the Editorial Boards whenever possible.

13 A Network of Reviewers covering the world's oceans is being established as digitization of each region is completed. The task of these reviewers will be to maintain an inventory of all new data in their areas of responsibility and to report to the GEBCO Guiding Committee when sufficient new data are available in any part of their area to justify a block revision to the database.

14 Material from other projects, provided it has been digitized from the same (1:10 M at the equator) or larger scale maps, such as the IOC Regional Ocean Mapping Projects (on a scale of 1:1M at various reference latitudes), will be incorporated into the database to replace blocks of older or smaller scale data. In addition inventories of the existence and availability of other source material, such as GLORIA data and satellite altimetry, which can be used to improve the quality of bathymetric contouring will also be maintained for use by geoscientists undertaking re-contouring of such blocks incorporating new data.

15 It had become increasingly clear over the years that a very large quantity of bathymetric data, indeed most of that collected and archived in digital form, was not being transmitted to the IHB in its capacity as the World Data Centre for Bathymetry, and consequently was not being made available as input, through the IHO's Volunteering Hydrographic Office (VHO) network, for inclusion in nautical charts. In addition digital data collected by Hydrographic Survey Ships (and there is a large amount not subject to military classification) were not reaching the scientific community.

16 A link was clearly needed between the scientific and hydrographic communities to solve this problem, and the GEBCO Guiding Committee as a joint IOC-IHO body was the obvious choice to investigate the problem and recommend a solution. Following a request from the GEBCO Guiding Committee (doc. IOC-IHO/GEBCO-X/3, item 7), the Sub-Committee on Digital Bathymetry prepared in 1986 "A preliminary Report on the possible creation of an IHO Data Centre for Digital Bathymetry", and this has led, after considerable negotiation and consultation with IHO Member States, to an offer from the United States Government which resulted in the establishment of an IHO Data Centre for Digital Bathymetry within the U.S. National Geophysical Data Center at Boulder, Colorado.

17 The investigation showed that many (but not all) of the Volunteering Hydrographic Offices were already handling bathymetric data in digital form and as a result the XIIIth International Hydrographic Conference (IHB, Monaco, May 1987) decided to establish an IHO Working Group on Oceanic Plotting Sheets to investigate the future requirements for these traditional hand-compiled master sounding sheets in the light of new technology, and to submit appropriate recommendations. This group has recently started work and will report to IHC-XIV in May 1992. The terms of reference for the Working Group will be found as Annex IV to the report of GEBCO Officers-VII. Subsequently it is planned to prepare guidelines for the digitization of data that are at present only available on the Oceanic Plotting Sheets. The Catalogue of Oceanic Plotting Sheets (IHB publication BP-0002) is at present under revision.

1.4 REVISION OF SHEET 5.12 (SOUTH ATLANTIC)

18 As mentioned in paragraph 9 above, a new edition of sheet 5.12 (see Annex IV, page 1) covering the South Atlantic (0°-46°40'S.), is at present in preparation and is scheduled for publication during 1991. The greater part of the sheet is being based on a chart which has been compiled by Mr. Norman Cherkis, U.S. Naval Research Laboratory, and published by the Geological Society of America.

19 This work is being extended to GEBCO limits and modified to meet GEBCO standards. The contours and shiptracks will be digitized during compilation and the paper chart will be printed from the digital files. This, a reversal of the traditional method used for the 5th Edition, will not only increase accuracy but will greatly reduce costs.

1.5 CONCLUSION

20 The Chairman GEBCO wrote on 4 September 1990 to all members of the GEBCO Community informing them of the above developments. He concluded his letter with the following remark: "I personally am very pleased with these developments which will, I hope, lead to the GEBCO producing the best available global bathymetry using the developing technology in databases and cartography, and a worthy product for its centenary year of 2002. Meanwhile I wish to thank all members of the GEBCO Community, in whatever form they contribute, for all the work they have put into the project which is, in my opinion, a very valuable and worthwhile contribution to the understanding of our planet".

2. INTERNATIONAL GEOLOGICAL-GEOPHYSICAL ATLASES OF THE ATLANTIC AND PACIFIC OCEANS (GAPA)

2.1 GENERAL

21 The Central Editorial Board for GAPA has met twice during the period covered by this report:

22 GAPA-IX: Institute of Marine Geology and Geophysics of the USSR Academy of Sciences, Far East Branch, Yuzhno-Sakhalinsk, 11-15 September 1989 and

23 GAPA-X: Soviet Geophysical Committee, Moscow, 5-8 June 1990.

24 The composition of the Central Editorial Board for GAPA (CEB/GAPA) will be found in Annex I.

2.2 BACKGROUND AND PROGRESS

25 These atlases have been compiled under the auspices of the IOC from the latest data available. They are truly international atlases, the various sections having been compiled by scientists in the forefront of their field from many countries, Member States of the IOC.

26 They complement the Geological-Geophysical Atlas of the Indian Ocean, published in 1975 to bring together the scientific results of the International Indian Ocean Expedition (IIOE), 1959-1965, (see Annex IV, page 2).

27 The creation of these atlases has been made possible thanks to very generous support from the Government of the Union of Soviet Socialist Republics, and financial assistance from the Ministry of Geology of the USSR in close collaboration with the Academy of Sciences of the USSR. The atlases have been prepared for printing and published by the Main Administration of Geodesy and Cartography under the Council of Ministers of the USSR.

28 The cost of compilation of the various sections has in general been borne by the individual scientists concerned and their institutions.

29 The Dust Cover for the Atlantic Atlas has been printed by the National Oceanic and Atmospheric Administration (NOAA) of the United States of America.

30 An English/Russian version of the General Bathymetric Chart of the Oceans (GEBCO) World Sheet, originally published by the Canadian Hydrographic Service (c Minister of Supply and Services Canada 1984), has been included in both atlases as an Appendix.

31 The Atlantic Atlas has recently been published and the Pacific Atlas is scheduled for publication in 1993. The sale price has been heavily subsidized by the USSR Ministry of Geology in order to make the atlases available to as wide as possible an audience of marine scientists and all those interested in the world's oceans and their resources.

3. INTERNATIONAL BATHYMETRIC CHART OF THE MEDITERRANEAN AND ITS GEOLOGICAL/GEOPHYSICAL SERIES (IBCM)

3.1 GENERAL

32 The Editorial Board for the IBCM has met once during the period covered by this report:

33 EB-IBCM-IV: IOC Headquarters, Paris 11-13 December 1989 (ref. doc. IOC/EB-IBCM-IV/3).

34 An ad hoc meeting of members of the EB-IBCM was held in Perpignan during the XXIIth Congress and Plenary Assembly of ICSEM, 15-20 October 1990 (ref: doc. IOC/INF-835).

35 Captain Sergei V. Val'chuk, who has been Chief Editor IBCM for some years, retired recently and has been replaced in this post by Captain Andrei Popov. The present composition of the Editorial Board for the IBCM will be found in Annex I.

3.2 PROGRESS WITH THE GEOLOGICAL/GEOPHYSICAL SERIES

3.2.1 Bouguer Gravity Anomaly Series

36 This series has been published during the period under review and an explanatory brochure (Chapter 2 of the IBCM Supporting Volume) is in preparation. Additional data have become available for sheets 1.04, 1.05 and 1.09 (see Annex IV, page 3), and these will be revised when opportunity permits.

3.2.2 Seismicity Series

37 The final proofs have been approved and it is expected that the series will be published in time for display at the IOC Assembly session in March 1991. The printed chart will be accompanied by a detailed catalogue with an explanatory text by Dr. Jean Bonnin, and an explanatory brochure (Chapter 3 of the IBCM Supporting Volume); these are in preparation.

3.2.3 Plio-Quaternary/Messinian Sediments Series

38 A black and white proof copy of the 1:5M sheet of this series was tabled by Professor Maurice Gennesseaux at the October 1990 IBCM ad hoc Consultation in Perpignan. It is envisaged that the final proofs of this series will be considered by the Editorial Board at its fifth session in June 1991 with a view to publication in 1992.

3.2.4 Unconsolidated Sea-Bed Surface Sediments Series

39 Professor Pavel Kuprin has compilation of this series well in hand and has plans to submit the first two sheets of the series in proof form to the Editorial Board at its fifth session. Publication is tentatively scheduled for 1993.

3.2.5 Magnetic Anomalies Series

40 Whereas the western sheets of this series prepared by Professor Armand Galdeano are virtually complete, considerable difficulty has been encountered with collection of data and compilation of the eastern sheets. As a result this series will be the last of the five Geological/Geophysical series to be published, most likely not before 1994.

3.3 IBCM (BATHYMETRY) 2nd EDITION

41 The 1:250,000 Bathymetric Plotting Sheets of the area are being updated routinely by a network of Hydrographic Offices, with a view to publication of a second edition of the IBCM when all the Geological/Geophysical Series have been published.

3.4 RECOMMENDATION FOR FUTURE ACTIONS

42 The EB-IBCM at its Fourth Session adopted a "Recommendation for Future Actions" which has been reproduced in Annex II. The CGOM supported this recommendation fully.

43 The Members of the EB-IBCM and Other Experts at their Informal Consultations in Perpignan, 15-20 October 1990, recommended (see doc. IOC/INF-835):

(i) that digital versions of the Bouguer Gravity Anomalies and Seismicity series (and in due course of the other series) be made available on the request of scientists and institutions. The charge could be the same as for the digital IBCM.

(ii) that, so as to ensure that all available bathymetric data were located for incorporation in the 2nd Edition of the IBCM, the IBCM Secretary send a letter to all institutions (other than the Volunteering Hydrographic Offices which would be approached by the IHB) and individual scientists interested in the Mediterranean, who might have new bathymetric data in their possession, because for the First Edition of the IBCM a large amount of bathymetric data had been received directly from such sources.

3.5 OTHER RELEVANT DECISIONS BY THE EB-IBCM

3.5.1 **Digital Terrain Model (DTM)**

44 Professor Jannis Makris and Dr. John Hall have agreed to prepare a gridded Digital Terrain Model of the IBCM bathymetry and land topography.

3.5.2 **Information Centre for Oceanographic Cruises in the Mediterranean, together with data obtained thereon**

45 During the ad hoc Consultations in Perpignan, it was proposed that the IOC/ICSEM Operational Unit for the Mediterranean might operate as an Information Centre for past and planned Oceanographic Cruises in the Mediterranean Region, including maintenance of an inventory of data obtained during each cruise. The Secretary IOC was asked to investigate this possibility further.

4. INTERNATIONAL BATHYMETRIC CHART OF THE CARIBBEAN SEA AND GULF OF MEXICO (IBCCA)

4.1 GENERAL

46 The Editorial Board for the IBCCA has held one session during the period covered by this report:

47 EB-IBCCA-III Dirección de Geografía y Cartografía de las Fuerzas Armadas, Caracas, Venezuela, 16-18 January 1990 (ref: doc. IOC/EB-IBCCA-III/3).

48 The composition of the Editorial Board for the IBCCA will be found in Annex I.

4.2 PROGRESS WITH PRODUCTION OF THE IBCCA

49 Following a decision taken at the first meeting of the IBCCA Officers, Mexico City, 22-24 May 1989, to produce a colour proof of one sheet at an early date in order to arouse more interest in the project and check editing specifications, a colour proof of Sheet 1.09 (see Annex IV, page 3) has now been prepared and was submitted by the Chairman IBCCA, Dr. N stor Duch Gary, to the CGOM at its Fourth Session, Monte Carlo, 22-24 October 1990. The group welcomed this first product from IBCCA and suggested to the Technical Secretary that it be placed on display at the IOC Assembly session (IOC-XVI) in March 1991.

50 The CGOM made a number of constructive criticisms of the sheet, in particular regarding the presentation of sounding control (shiptracks) which is needed to permit the user to assess for himself the contour reliability in any part of the chart. Mr. Peter Hunter, GEBCO Bathymetric Editor, was invited to discuss the various points raised by the Group with Mr. Troy Holcombe, the Scientific Co-ordinator for the sheet.

51 Of the other sheets of the series, compilation of sheets 1.02, 1.03, 1.04 (USA), 1.06 (Mexico) and 1.14 (Venezuela) are well advanced and are expected to be completed very soon.

4.3 AREAS OF RESPONSIBILITY

52 Responsibility for the areas covered by sheets 1-10, 1-16, 1-17 and parts of sheets 1.13 have not as yet been finally assigned. Formal approaches have been made to Panama and Ecuador inviting them to participate in the project and assist with the compilation of sheets 1-13, 1-14 and 1-17.

53 In regard to sheets 1.10 and 1.16, at the First Session of the EB-IBCCA responsibility for these sheets was accepted by France (Universit de Bordeaux 1 in collaboration with the Bureau de Recherche G ologique et Mini re (BRGM), Orl ans). There is now some doubt whether these institutes will be able to compile these sheets and it was decided at the Third Session of the EB-IBCCA that if this is so, an approach would be made to The Netherlands (Dienst der Hydrografie, Koninklijke Marine) as the area covered by these two sheets falls within that country's area of responsibility for maintenance of the 1:1 million GEBCO Bathymetric Plotting Sheets (ref: IHB publication BP-0002).

4.4 DIGITIZATION OF THE IBCCA

54 Arrangements for digitization of the IBCCA are being investigated with a view to producing in due course a digitized version of the IBCCA, including contours, shiptracks, coastline (WVS - see paragraph 11 above), topography and geographical names. Besides being made available on magnetic tape as a separate item, this material will also be used in this form as an input into the "GEBCO Digital Atlas".

4.5 OTHER RELEVANT DECISIONS BY THE EB-IBCCA

4.5.1 "Standardization of Undersea Feature Names"

55 A 2nd Edition of the English/Spanish version of the publication "Standardization of Undersea Feature Names", the first draft of which has been prepared by Dr. Jorge Rey Salgado, Instituto Español de Oceanografía, is under review by the oceanographic community in Mexico, with a view in particular to inserting against the terms listed examples and references from the Latin American Spanish scientific literature.

4.5.2 IBCCA Geological-Geophysical Series

56 The possibility of compiling Geological/Geophysical series based on the IBCCA is under consideration, starting with a detailed census of information sources and data.

5. INTERNATIONAL BATHYMETRIC CHART OF THE CENTRAL EASTERN ATLANTIC (IBCEA)

5.1 GENERAL

57 The Editorial Board for the IBCEA held its First Session during the period covered by this report:

58 EB-IBCEA-I Nigerian Institute for Oceanography and Marine Research, Lagos, Nigeria, 14-16 February 1990 (ref: doc. IOC/EB-IBCEA-I/3).

59 At this session only the following countries were represented: France, Guinea, Nigeria, Portugal and Togo (out of a total of 25 in the area). Also represented were the IOC and IHO, together with the National Geophysical Data Center (NGDC), USA, and the Institute of Oceanographic Sciences, Deacon Laboratory (IOSDL), United Kingdom.

60 Ing. G n. Andr Roubertou (France) was elected Chairman and Dr. Isabelle Niang (S n gal) as Vice-Chairman. The composition of the Editorial Board for the IBCEA will be found in Annex I.

5.2 DECISIONS REACHED AT EB-IBCEA-I

5.2.1 Adoption of Specifications for the IBCEA

61 These are a slightly modified version of the general specifications established by the CGOM (doc. IOC/CGOM-II/3, Annex IV), in particular: all sheets will be AO size; sheets will be on Mercator projection at a scale of 1:1M (at 20 N.); and all marginal information will be bilingual English/French, or English/Portuguese as appropriate (see paragraph 59 below).

5.2.2 Responsibility for Compilation and Editing of Sheets

62 The Hydrographic Services of France and Portugal will assign Co-Chief Editors for the series. Final responsibility for the compilation and editing of the various sheets will be assigned by bilateral agreement between the two Co-Chief Editors.

5.2.3 **Sheet Assembly Diagram**

63 A provisional Assembly Diagram (consisting of 12 sheets) was adopted subject to final agreement between the editing services. This has since been slightly modified and given final approval (see Annex IV, page 5).

5.2.4 **Possible participation by the Spanish Hydrographic Service**

64 The possibility of participation by the Instituto Hidrogra'fico de la Marina, Spain, (preparation of 1 or 2 sheets) was left open. This service will be approached by SHOM.

5.3 DECISIONS REACHED SINCE EB-IBCEA-I

5.3.1 **Rate of Production of Sheets**

65 French funding for the project should permit a production rate of two sheets a year for several years.

5.3.2 **Compilation procedures**

66 Following preliminary discussion at EB-IBCEA-I, the following schedule has been agreed:

(i) Allocation of responsibility for individual sheets.
(ii) Search for all available data not yet included in the holdings of SHOM.
(iii) Digitization, quality assessment and archiving of new data into the IHO Data Centre for Digital Bathymetry.
(iv) Production of working documents (contouring of sheets) by automatic processing.
(v) Revision and modification by a specialist in marine geomorphology (by contract).
(vi) Assessment and possible modification by other volunteering specialists, and by the Editorial Board.
(vii) Production of the "digital" chart and from this the conventional paper chart.

5.4 INVOLVEMENT OF COUNTRIES FROM THE REGION

67 It is envisaged that active involvement from countries in the region will be needed, especially for stages (ii) and (vi) above and in particular in so far as their coastline and EEZ are concerned.

5.5 RECOMMENDATIONS ADOPTED BY THE EB-IBCEA

68 A "List of Recommendations" adopted by the EB-IBCEA at its first session is attached in Annex II. The CGOM supported Recommendations 1, 2 and 4 fully but had an alternative suggestion regarding Recommendation 3- see paragraph 75 below.

6. INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN INDIAN OCEAN (IBCWIO)

6.1 GENERAL

69 The Editorial Board for the IBCWIO has met once during the period covered by this report:

70 EB-IBCWIO-II hosted by the Minister of Housing, Lands and Environment, Quatre Bornes, Mauritius, 3-5 July 1990 (ref: doc. IOC/EB-IBCWIO-II/3).

71 In addition two small intersessional planning meetings to consider compilation methods have been held at the Deutsches Hydrographisches Institut, Hamburg, 13-14 December 1989 and at the United Kingdom Hydrographic Office, Taunton, on 17 April 1990.

72 The composition of the Editorial Board for the IBCWIO will be found in Annex I.

6.2 PROGRESS WITH COMPILATION OF THE IBCWIO

73 Data and information for the region are being assembled from all known sources and prototype plots have been prepared by the United Kingdom Hydrographic Office, copies of which are being distributed to all members of the EB-IBCWIO. It is hoped that this will enable them to discuss with their colleagues in their home institutes the work entailed in the compilation of bathymetric plotting sheets in areas for which they accept responsibility.

74 Priority will be given to an area north-east of Mauritius for which 14 plotting sheets on a scale of 1:250,000 are at present being compiled, but before work can start training in the selection of depth values, drawing of bathymetric contours and other compilation work will be necessary.

6.3 TRAINING COURSE IN BATHYMETRIC MAPPING

75 The Chairman and Chief Editor IBCWIO has drawn attention (ref: doc. IOC/CGOM-IV/3, Annex VII) to the fact that "Some of the countries of the IBCWIO region possess very efficient land survey services, but no hydrographic services. Other countries have neither. Thus it is not sufficient to ask these countries to construct depth contours, and select the soundings that have to be incorporated into the final product. For this task training will be necessary". A Recommendation on Training Courses in Bathymetric Mapping adopted by EB-IBCWIO-II (see Annex II) was supported fully by the CGOM.

7. INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN PACIFIC (IBCWP)

7.1 GENERAL

76 A meeting of Experts on Ocean Mapping in the WESTPAC Region was held in the offices of the National Marine Data and Information Service, State Oceanic Administration, Tianjin, People's Republic of China, 12-14 June 1990. (ref: doc. IOC/GE-IBCWP-I/3).

7.2 ACTIONS TAKEN AND RECOMMENDED

77 The meeting recommended that the Commission "undertake the preparation of an International Bathymetric Chart of the Western Pacific (IBCWP)", and a draft resolution to this effect will be placed before the IOC Assembly at its sixteenth session. This resolution also contains, as an Annex, draft Terms of Reference for an Editorial Board for the IBCWP.

78 The group also prepared "Specifications for the International Bathymetric Chart of the Western Pacific (IBCWP)", and prepared a number of proposals for consideration by the Editorial Board at its first session, should the Assembly decide to establish such a Board.

8. CONCLUSIONS

79 The CGOM is painfully aware of the shortage of funds available for the IOC's Ocean Mapping Programme, as with other programmes of the Commission, and that this means that it is only possible to convene meetings of the Editorial Boards for the regional projects every two years. It has therefore recommended to the Secretary IOC that instead of holding Editorial Board sessions every year (as proposed by the EB-IBCEA paragraph 65 above) or intersessional meetings of the project officers, consideration should be given to supporting missions by the Chief Editors of each project to their regions, to enable them to hold discussions with local participants on progress with their activities.

80 The CGOM at its Fourth Session noted that 12 October 1992 will be widely celebrated as the 500th Anniversary of the arrival of Christopher Columbus in the Americas. The Group considered that, with the GEBCO, the IBCEA and the IBCCA, it is in a unique position to prepare overprinted bathymetric charts showing the likely tracks and landings by Columbus and his crews during his four voyages to the "New World". This possibility will be pursued further.

81 The Assembly is invited to give its full support to the IOC's Ocean Mapping Programme which is developing rapidly and, in our opinion, most satisfactorily. It is, we believe, making a worthwhile and responsible contribution to the aims and purposes of the Commission.

ANNEX I

MEMBERSHIP OF ALL GROUPS RESPONSBILE FOR SUPERVISING OCEAN MAPPING PROJECTS SPONSORED (OR CO-SPONSORED) BY THE COMMISSION

A. JOINT IOC-IHO GUIDING COMMITTEE FOR THE GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)

Sir Anthony Laughton (UK) Chairman	representing SCOR
Mr David Monahan (Canada) Vice-Chairman	IHO appointment
Lt. Cdr. Lucas de Campos Costa (Brazil)	IHO appointment
Dr Robin K.H. Falconer (New Zealand)	representing CMG
Dr Robert L. Fisher (USA)	representing IAPSO
Mr Achilleas-Spyridon D. Gazis (Greece)	IHO appointment
Ing. en Chef Jean Laporte (France)	IHO appointment
Lic. Félix H. Mouzo (Argentina)	IOC appointment
Rear Admiral V.K. Singh (India)	IHO appointment
Dr Gleb B. Udintsev (USSR)	IOC appointment

SCIENTIFIC ADVISERS TO THE GEBCO

Dr George Balmino, Bureau Gravimétrique International (BGI)
Dr Carl Brenner, JOIDES/ODP Site Survey Data Bank
Mr Norman Cherkis, U.S. Naval Research Laboratory
Mr Gerald N. Ewing (Canada) Former Chairman GEBCO
Mr. Brian Harper, U.K. Hydrographic Office
Dr G. Leonard Johnson, U.S. Office of Naval Research
Dr Meirion T. Jones, Director, British Oceanographic Data Centre
Dr Michael S. Loughridge, Director, WDC'A', Marine Geology and Geophysics
Mr Carl Nelius, U.S. Defense Mapping Agency
Mr Donald E. Pryor, U.S. National Ocean Service
Dr. Ing. Hans-Werner Schenke, Alfred-Wegener-Institut, FRG
Prof. Roger C. Searle, University of Durham, U.K.

also (ex-officio):
Mr Desmond P.D. Scott, Permanent Secretary GEBCO
Mr Peter Hunter, GEBCO Bathymetric Editor
Ms Pauline Weatherall, GEBCO Digital Atlas Manager
Rear Admiral Alfredo Civetta, Director IHO
Dr Viktor Sedov, Senior Technical Assistant Secretary IOC

GEBCO SUB-COMMITTEE ON DIGITAL BATHYMETRY

Dr Meirion T. Jones — Chairman
Director, British Oceanographic Data Center
Dr Michael S. Loughridge, Director, WDC'A' Marine Geology & Geophysics
Mr Francis Marchant, U.S. Naval Oceanographic Office
Dr Andrey Popov, Head Department of Navigation & Oceanography, USSR
Dr. Ing. Hans-Werner Schenke, Alfred-Wegener-Institut, FRG
Mr Shin Tani, Japan Oceanographic Data Center
Mr. Denis Toustou, Bureau Gravimétrique International
Ing. Pri. Michel Huet, International Hydrographic Bureau
Rear Admiral J. Austin Yeager NOAA, Chairman IHO Committee on Exchange of Digital Data (CEDD) (ex-Officio as an Observer)

GEBCO SUB-COMMITTEE ON GEOGRAPHICAL NAMES AND NOMENCLATURE OF OCEAN BOTTOM FEATURES

Dr Robert L. Fisher — Chairman
Scripps Institution of Oceanography, USA
Dr Galina V. Agapova, Geological Institute of the USSR Academy of Sciences
Rear Admiral Alfredo Civetta, Director
International Hydrographic Organization (IHO)
Ing. en Chef Jean Laporte, Service Hydrographique et Océanographique de la Marine, France
Dr Robin K.H. Falconer, GEORESEARCH Associates, New Zealand
Dr Richard R. Randall, U.S. Board on Geographic Names
M. Michel Huet, International Hydrographic Bureau, Secretary

B. CENTRAL EDITORIAL BOARD FOR THE INTERNATIONAL GEOLOGICAL-GEOPHYSICAL ATLASES OF THE ATLANTIC AND PACIFIC OCEANS (GAPA)

Dr Gleb B. Udintsev, Soviet Geophysical Committee, Chief Editor
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John Dominic Obel, Survey of Kenya
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ANNEX II

RECOMMENDATIONS

1. RECOMMENDATION FOR FUTURE ACTIONS (at EB-IBCM-IV)

The Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series (EB-IBCM).

Having realized the significance of its published compilations, and having **been informed** that the remaining planned series will be published within the next two years,

Strongly recommends that the following actions be undertaken at an early date:

(i) To encourage international co-operation of specialists from various disciplines in defining and addressing problems that may be solved using available data;

(ii) To encourage co-ordinated activities for the optimal use of ships's capacities, thus avoiding duplication of effort, and addressing problems that can only be solved as co-operative ventures;

(iii) To encourage multinational co-operation in raising funds from national and international agencies, in order to undertake further geological/geophysical studies needed to complement the existing data.

Proposes that development of the scientific aims and international co-operation be undertaken by IOC jointly with the International Commission for the Scientific Exploration of the Mediterranean Sea (ICSEM);

Suggests that the Joint IOC/ICSEM Operational Unit for the Mediterranean in Monaco would be the most appropriate body for co-ordinating ship operations and programmes, acting on the advice of the Editorial Board for the IBCM;

Invites Professor J. Makris, President of the Geological/Geophysical Scientific Committee of ICSEM, to contact appropriate scientists and organizations inviting their participation in the scientific programmes and asking them to define their goals.

2. LIST OF RECOMMENDATIONS (at EB-IBCEA-I)

The Editorial Board for the IBCEA, recognizing the importance of the Chart as a key project for the exploration of many other ocean parameters of the Central Eastern Atlantic, recommends to the IOC Secretary:

1. to take the necessary steps to involve the largest number of African countries to participate in the project;

2. to foresee, at an early stage, the organization of training courses in bathymetric mapping for countries of West Africa;

3. to provide the necessary funding for the organization of annual sessions of the Editorial Board;

4. to appoint Mr. J.F. Bonnot and Mr. J. Sobral, representing their Hydrographic offices, as Co-chief Editors of the IBCEA, subject to a formal agreement regarding division of responsibilities for the task.

3. RECOMMENDATION ON TRAINING COURSES IN BATHYMETRIC MAPPING (at EB-IBCWIO-II)

The IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (EB-IBCWIO),

Noting (i) that the IBCWIO has been successfully started and is progressing well in the collection of bathymetric data; and (ii) that the data available need to be processed by the States of the region,

Considering (i) the lack in the region of trained and experienced personnel for the initial compilation of bathymetric and other relevant data; and (ii) the non-existence within the countries of the Region of national training facilities in this speculation,

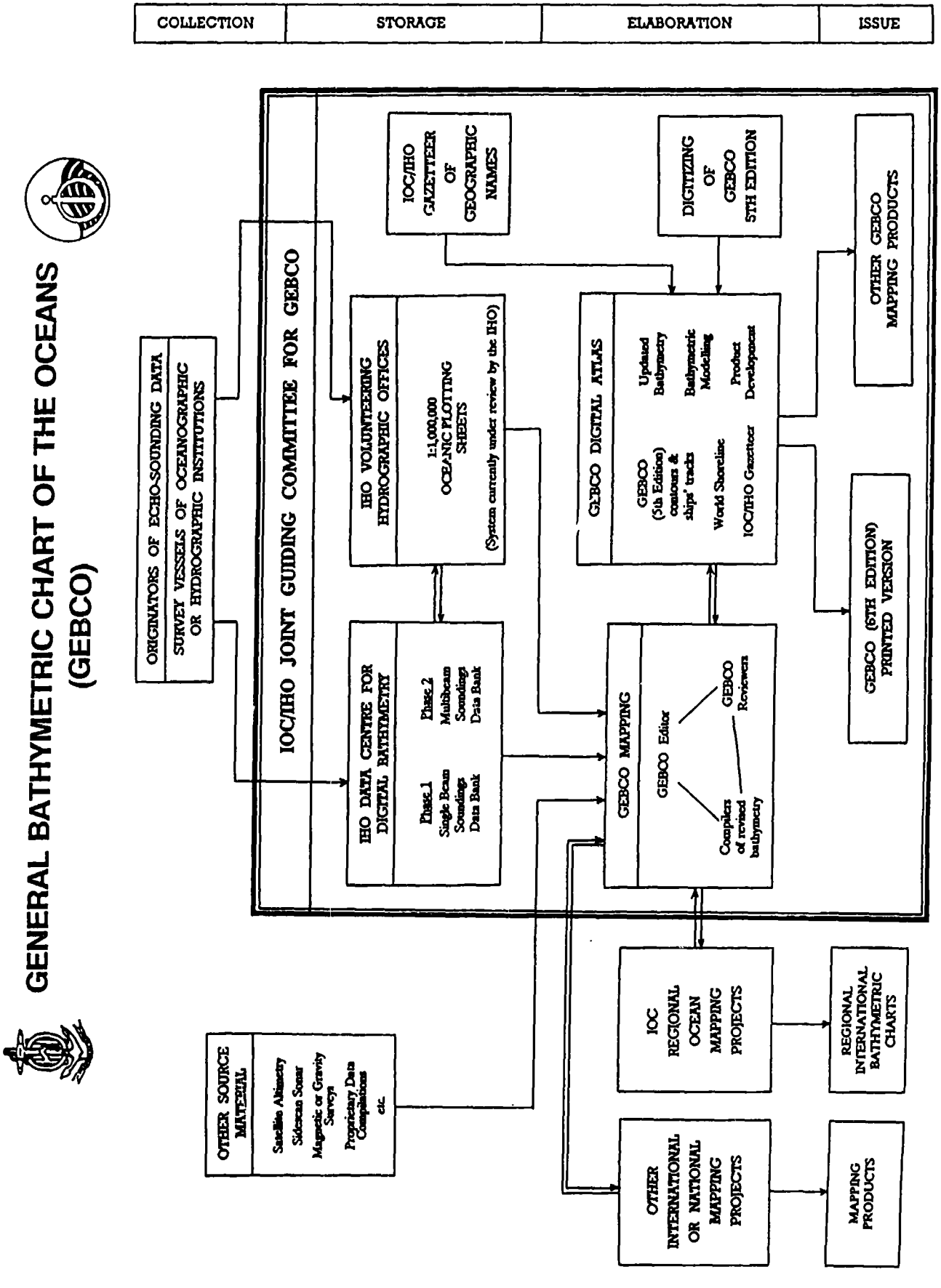
Being aware of the need that the participating countries of the region be directly involved in the compilation work of the IBCWIO in order to improve their knowledge of the sea area under their jurisdiction for a better use of it,

Recognizing the existence in the area of the Nairobi Regional Centre for Services in Surveying, Mapping and Remote Sensing (RCSS MRS) which is already performing training for the Eastern and Southern African countries in other areas of cartography,

Recommends that (i) IOC organize a two to three weeks course in bathymetric mapping at the RCSS MRS for the training of one or two specialists from each of the participating Member States; and the IOC Secretariat seek extra budgetary funding for such a training course to be held at the beginning of 1992.

ANNEX III

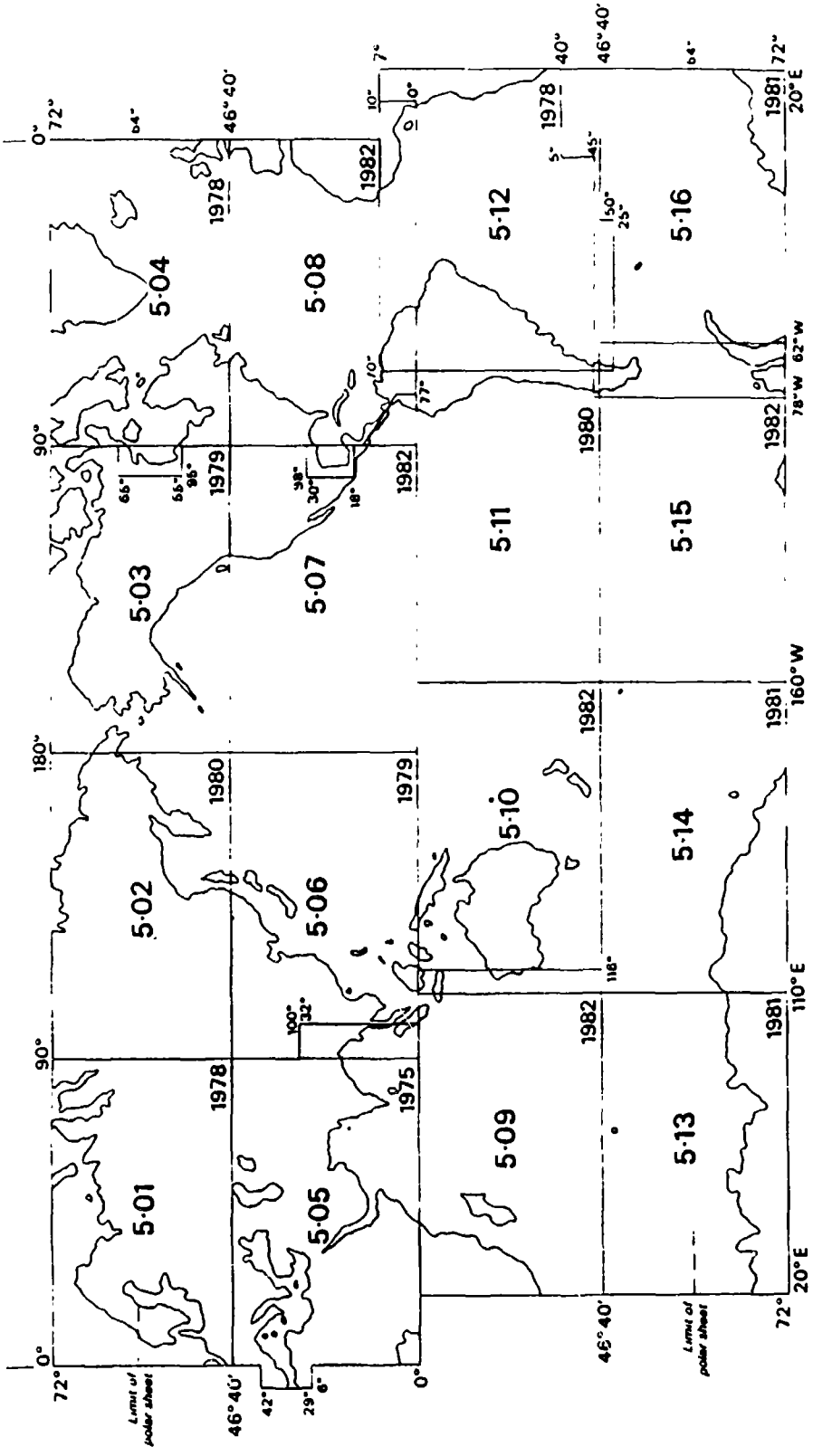
GEBCO STRUCTURAL DIAGRAM

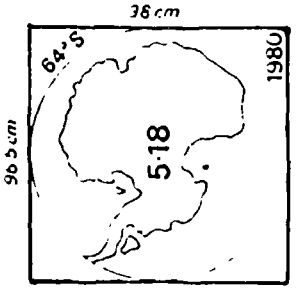


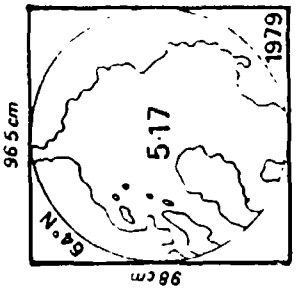
ANNEX IV

ASSEMBLY DIAGRAMS FOR ALL IOC OCEAN MAPPING PROJECTS

GENERAL BATHYMETRIC CHART OF THE OCEANS
scale 1:1 million at 0





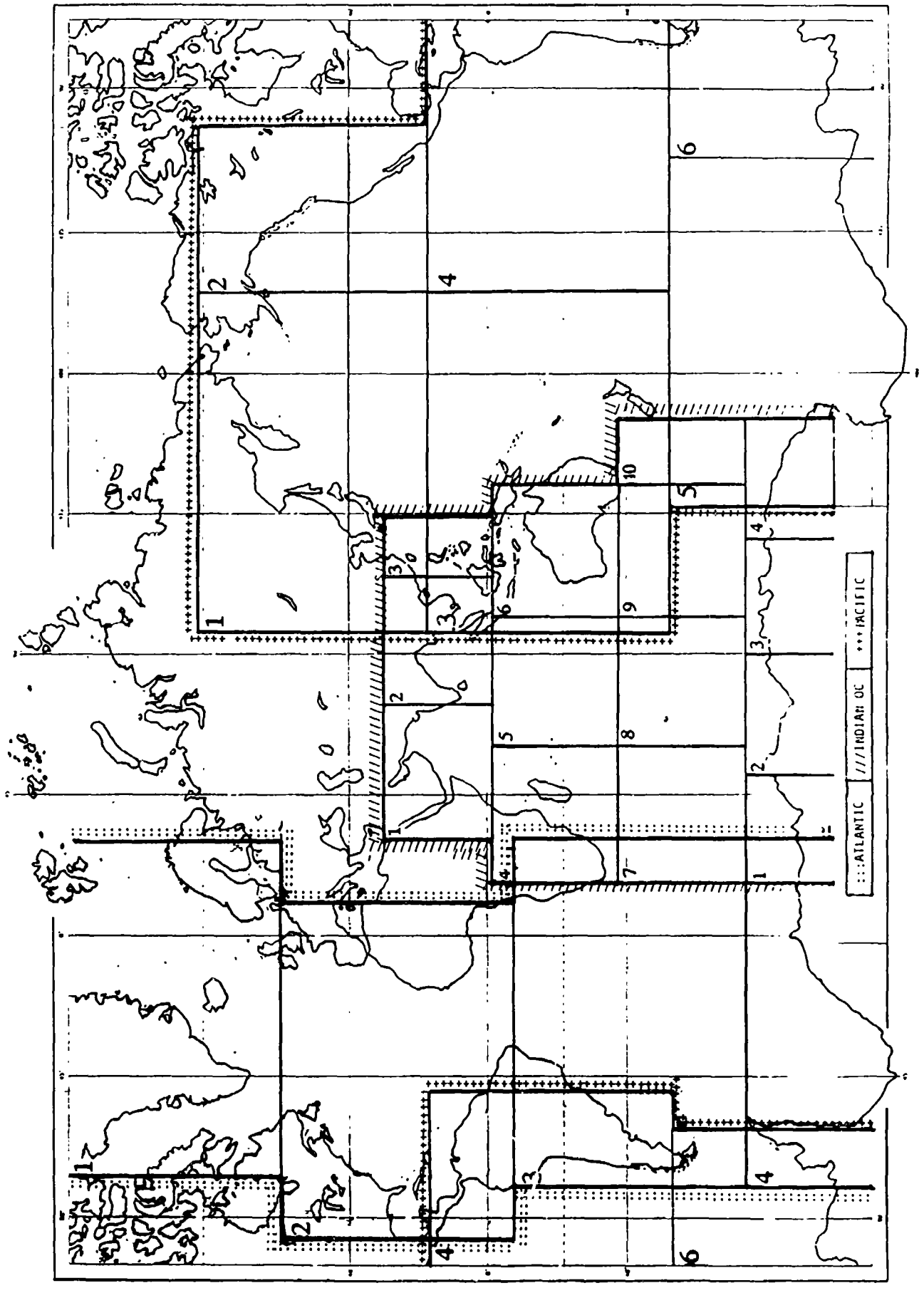


WORLD MAP

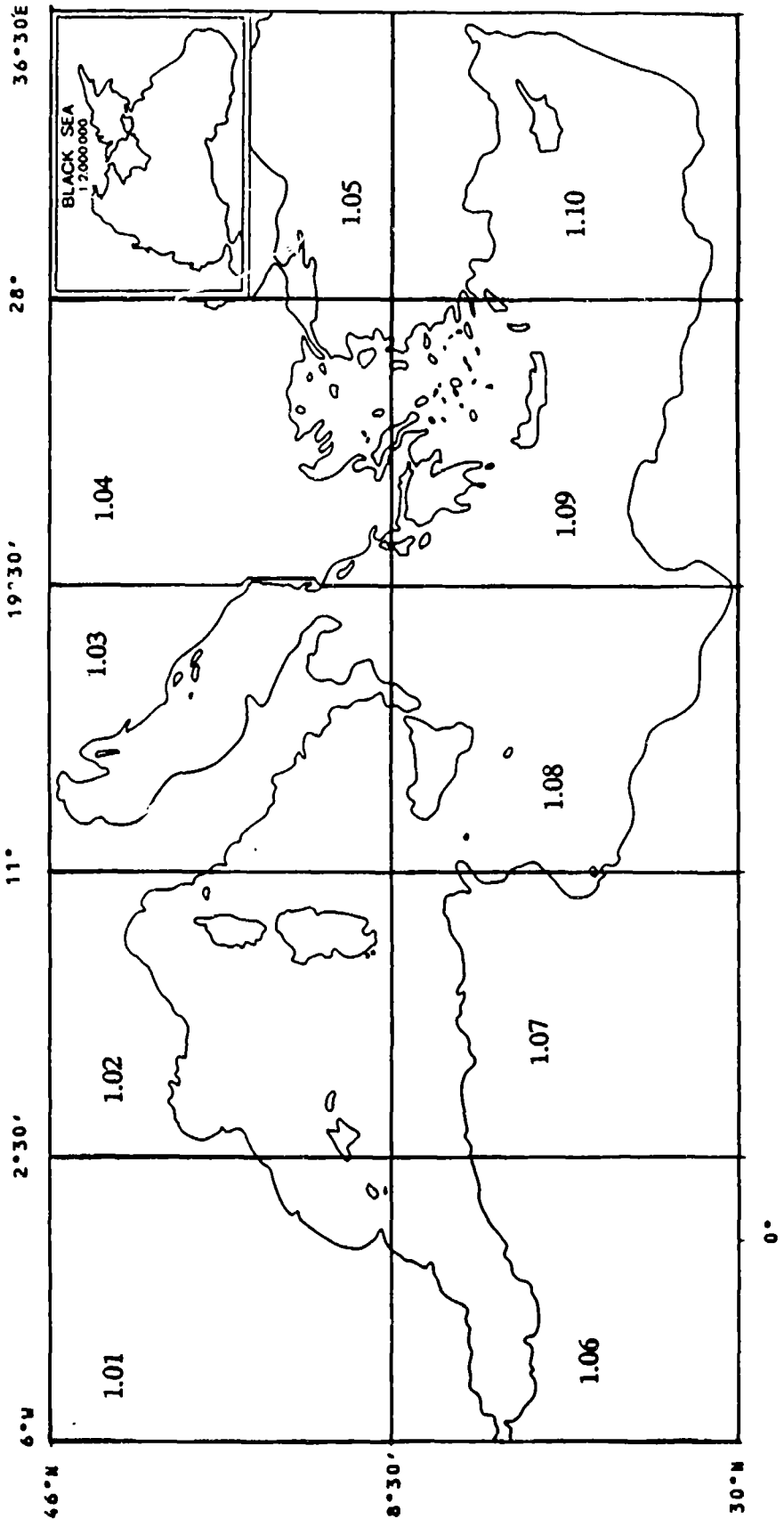
The 5th edition of GEBCO has been assembled into a single map of the world at a scale of 1:35 000 000 with the polar regions at 1:25 000 000

This world map is identified as GEBCO 5·00

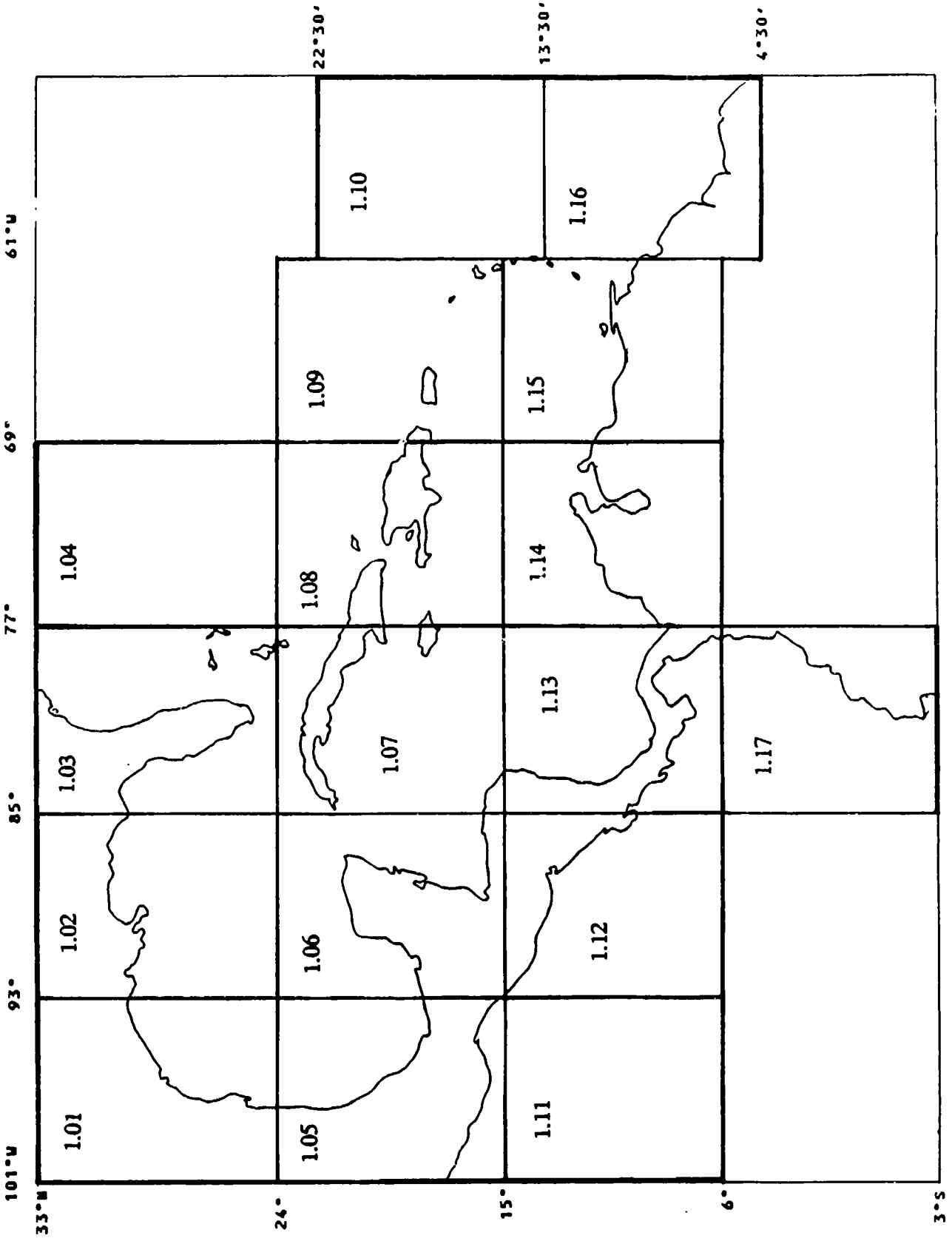
INTERNATIONAL GEOLOGICAL/GEOPHYSICAL ATLASES
scale 1:5 million at 45 for Indian Ocean Atlas and
1:10 million at 45 for Atlantic and Pacific Ocean Atlases



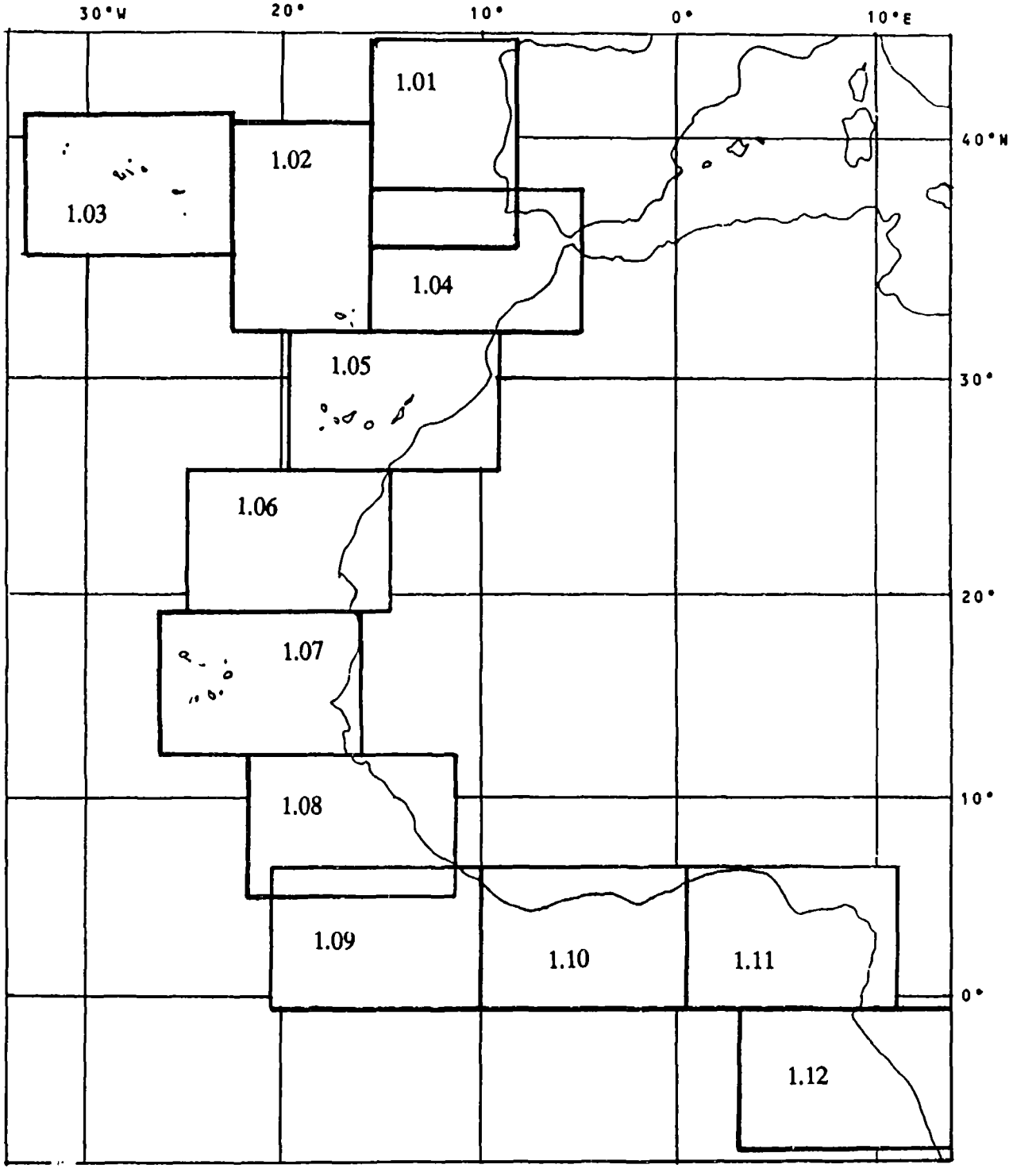
INTERNATIONAL BATHYMETRIC CHART OF THE MEDITERRANEAN
scale 1:1 million at 38 N



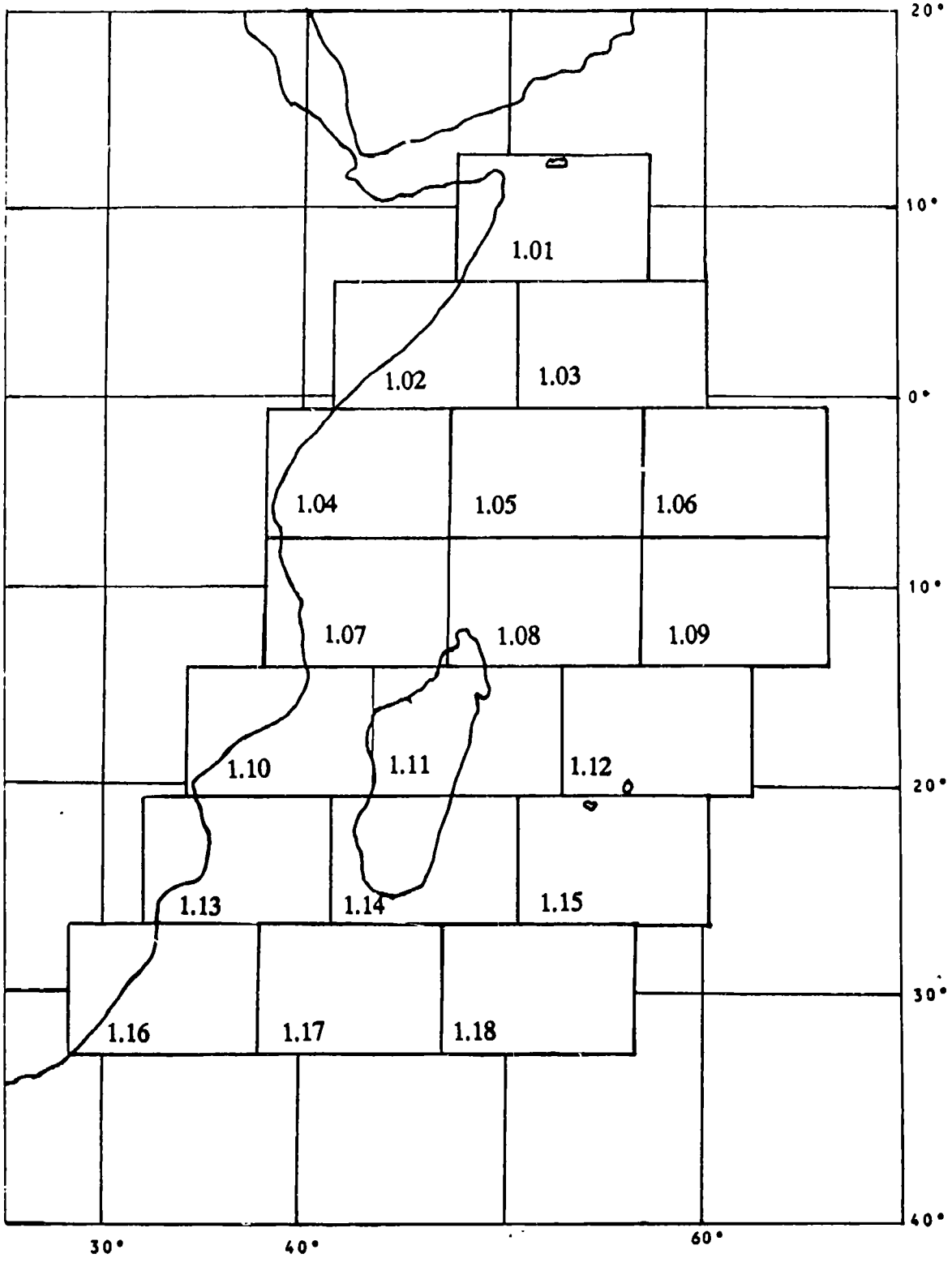
INTERNATIONAL BATHYMETRIC CHART OF THE CARIBBEAN SEA AND THE GULF OF MEXICO
scale 1:1 million at 15° N



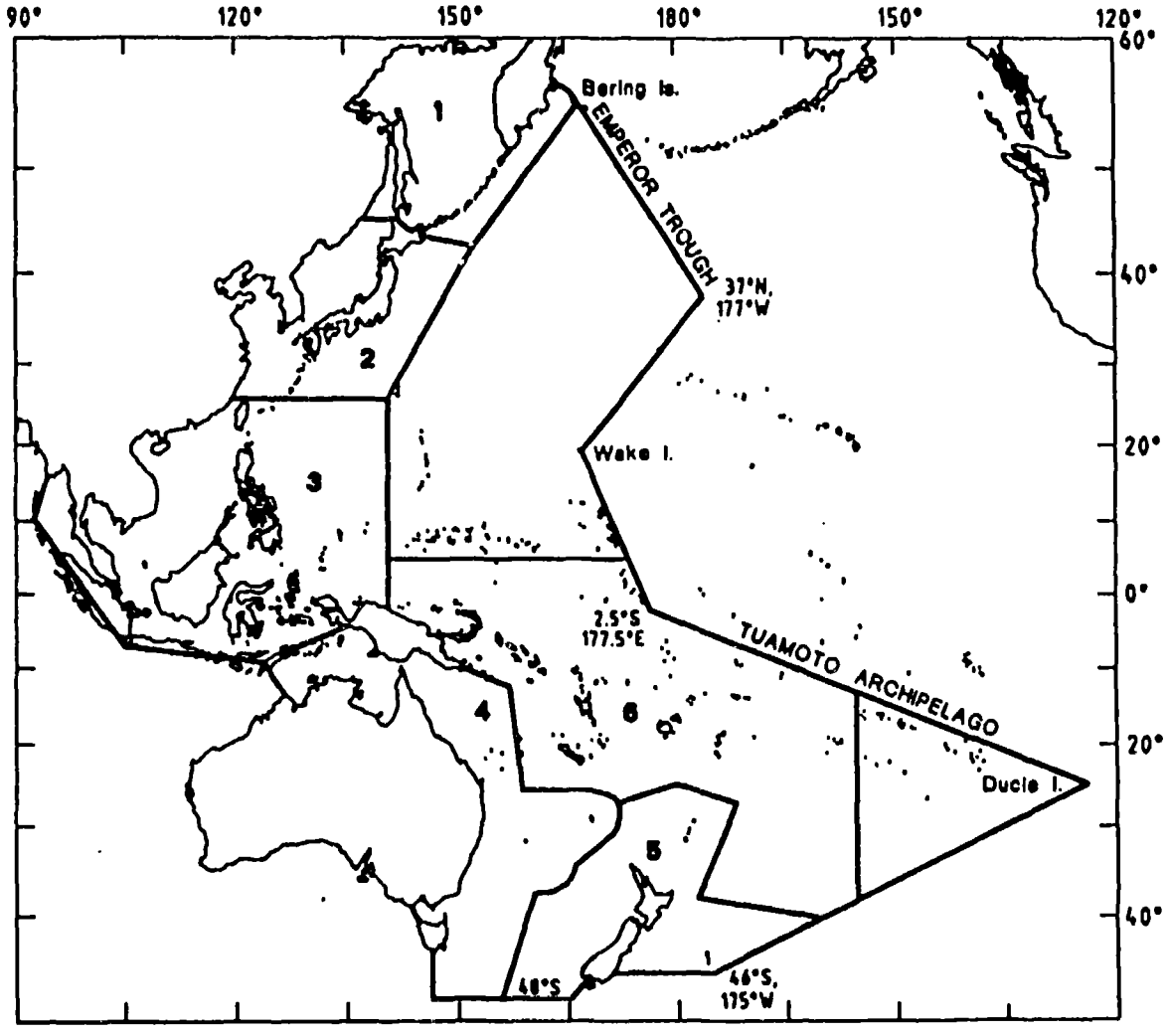
INTERNATIONAL BATHYMETRIC CHART OF THE CENTRAL EASTERN ATLANTIC
scale 1:1 million at 20 N



INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN INDIAN OCEAN
scale 1:1 million at 0



APPROXIMATE LIMITS OF PROPOSED SUBREGIONS
COVERING THE WESTERN PART OF THE WESTPAC AREA



Subregions

1 - Sea of Okhotsk and S.E.Kamchatka
2 - Japan Sea and waters surrounding Japan
3 - The Central Western Pacific
4 - The Australian northern and eastern margin
5 - Waters surrounding New Zealand
6 - SOPAC area

ANNEX V

LIST OF IOC OCEAN MAPPING PRODUCTS

1. THE GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)
(see Assembly Diagram, Annex IV, page 1)

Flat sheets:

- 16 sheets 72°N to 72°S, Mercator projection
Scale 1:10M at the equator;

- 2 polar sheets to 65° lat. Polar Stereographic projection
Scale 1:6M at 75° latitude;

- 1 world sheet, 72°N to 72°S, Mercator projection
Scale 1:35M at the equator and 2 polar insets
(as above) Scale 1:25M at 75° latitude;

- revised Sheet 5.12 (South Atlantic) - in compilation;

- Supporting Volume.

Boxed Set containing all above 19 sheets (folded) Supporting Volume and legend.

Digitized contours on magnetic tape in GF-3 international format, with necessary documentation for the following regions:
(i) North Atlantic and Arctic;
(ii) Antarctic;
(iii) Indian Ocean (in preparation);
(iv) Pacific Ocean (in preparation);
(v) South Atlantic (in preparation).

Gazetteer of Geographical Names of Undersea Features shown (or which might be added) on the GEBCO and on the IHO small-scale International Chart series (1:2,250,000 and smaller) - IHB publication BP-0008

Standardization of Undersea Feature Names*
- IHB publication BP-0006
Versions: English/French (2nd Edition published)
English/Russian) (1st Editions published)
English/Spanish) 2nd Editions in preparation)
English/Chinese (in preparation)
English/German (in preparation)
English/Japanese (in preparation)
English/Portuguese (in preparation)

2. THE INTERNATIONAL GEOLOGICAL-GEOPHYSICAL ATLASES

- The Geological-Geophysical Atlas of the Indian Ocean (published 1975)

*These publications are provided on request free of charge

- The International Geological-Geophysical Atlas of the Atlantic Ocean (published 1990)

- The International Geological-Geophysical Atlas of the Pacific Ocean (in preparation).

3. THE INTERNATIONAL BATHYMETRIC CHART OF THE MEDITERRANEAN AND ITS GEOLOGICAL/GEOPHYSICAL SERIES

Flat sheets

Bathymetric Chart in 10 sheets Mercator projection
Scale 1:1M (at 38°N.) Black Sea 1:2M.

Bathymetric Chart in 1 sheet Mercator projection
Scale 1:5M (at 38°N.) Black Sea 1:10M.

Digitized contours of the bathymetric chart on magnetic tape in GF-3 international format, with necessary documentation.

Bouguer 2.67 Gravity Anomalies of the Mediterranean Region (same scales and sheet limits as the bathymetric chart)

Seismicity of the Mediterranean Region (same scales and sheet limits as the bathymetric chart).

List of Geographical Names of Undersea Features shown (or which might be added) on the International Bathymetric Chart of the Mediterranean (IBCM) and on the IHO small-scale international chart series for the Mediterranean (IHB publication BP-0008 Supplement No. 1 (IBCM))

In preparation (same scales and sheet limits as the bathymetric chart):

Plio-Quaternary/Messinian Sediments of the Mediterranean Region

Unconsolidated Sea-bed Surface Sediments of the Mediterranean and Black Seas

Magnetic Anomalies of the Mediterranean Region

IBCM Supporting Volume (being issued chapter by chapter as each of the above chart series is published).