Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans

Eleventh Session

Paris, 28-30 April 1987

Unesco

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IOC-IHO/GEBCO-XI/3
Paris, 22 September 1987
English and French only

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of «El Niño» *(Also printed in Spanish)*
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP (SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Testonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping *(Also printed in French and Spanish)*
12. Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica *(Spanish only)*
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration

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1. OPENING OF THE SESSION

1 The Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO) was held in Unesco House, Paris. Dr. A.S. Laughton, Chairman GEBCO, presided, opening the Session at 10.00 on Tuesday 28 April 1987.

2 A List of Participants is given in Annex VII. Apologies for absence were received from:

- Mr. David Monahan;
- Cdr. D. Francisco Nuche Benito;
- Capt. Francisco J. Penido Salles (represented by Cdr. Marco A.G. Bompet);
- Dr. Gleb B. Udintsev (represented by Dr. Galina V. Agapova);
- Dr. G. Leonard Johnson (Scientific Adviser);
- Mr. William A. Huddy (Scientific Adviser);
- Mr. Gerald N. Ewing (Scientific Adviser);

3 Dr. Mario Ruivo, Secretary IOC, welcomed the participants and in so doing congratulated the Guiding Committee on the success of its activities which had been given strong support by Member States at the recent Fourteenth Session of the IOC Assembly.

2. ADOPTION OF THE AGENDA

4 The Agenda was adopted with the addition of two Items (9.2 and 9.3) - see Annex I.

3. CONDUCT OF THE SESSION AND DOCUMENTATION

5 The Senior Technical Assistant Secretary for Ocean Mapping, Dr. Viktor Sedov, informed the participants of the administrative arrangements for the Session.

6 The Permanent Secretary listed the available documentation - see Annex II.

4. COMPOSITION OF THE GUIDING COMMITTEE AND ITS SUB-COMMITTEES

7 The Chairman welcomed (in their absence) the following new members of the GEBCO Guiding Committee and its Sub-Committees:

- GEBCO Guiding Committee	Mr. David Monahan Cdr. D. Francisco Nuche Benito
- Scientific Advisers	Dr. Georges Balmino Dr. Michael S. Loughridge Mr. Gerald N. Ewing (former Chairman GEBCO)
- Sub-Committee on Digital Bathymetry	M. Denis Toustou Capt. J. Austin Yeager (Chairman, IHO Committee on Exchange of Digital Data - as an observer)

- and IOC Assistant Secretary for Ocean Mapping	Dr. Viktor Sedov (who was present)

8 He then drew attention to the fact that, yet again, very few of the five IHO Members of the Guiding Committee were present - see also the Summary Report of the Tenth Session of the Guiding Committee (Doc. IOC-IHO/GEBCO-X/3), Section 3, sub-paragraph 2. The Permanent Secretary recalled that the dates of the Session had on this occasion been specially chosen to accommodate the IHO-sponsored members of the Guiding Committee planning to attend the International Hydrographic Conference (5-15 May), to allow them to attend the Guiding Committee Session as part of the same travel schedule. Regrettably, it was clear that this had been unsuccessful and indeed it seemed to have had the opposite effect.

9 The Guiding Committee noted that if the present schedules of the two bodies continue, it will be ten years before there is again a juxtaposition between a Guiding Committee Session and the International Hydrographic Conference, so any decision regarding such a situation could be safely postponed. It agreed that the matter ought to be brought to the notice of the XIIIth International Hydrographic Conference.

5. MATTERS ARISING FROM THE DOCUMENTS OF PREVIOUS MEETINGS

5.1 SUMMARY REPORT OF THE TENTH SESSION OF THE JOINT IOC-IHO GUIDING COMMITTEE FOR GEBCO, I.H.B., MONACO, 23-25 APRIL 1985

10 The Chairman took the Committee through the Report (Doc. IOC-IHO/GEBCO-X/3) and showed that all matters requiring action had been dealt with. A number of discussions which took place under this Agenda Item have been summarized in appropriate sections below.

5.2 SHORT SUMMARY RECORD OF DISCUSSION OF THE FIFTH MEETING OF THE GEBCO OFFICERS, SERVICE HYDROGRAPHIQUE ET OCEANOGRAPHIQUE DE LA MARINE (SHOM), PARIS, 19-20 MARCH 1986

11 A number of the matters discussed (Doc. IOC-IHO/GEBCO OFFICERS-V/3) have been taken under appropriate sections below.

12 Item 11 - Interaction with the proposed IUGS Circum-Atlantic Project (CAP)

It was recalled that Dr. Michael Loughridge had agreed to liaise with the CAP on behalf of the GEBCO Guiding Committee. Due to his unavoidable absence he had submitted a written report by Telemail (see Annex IV) which was read out and used as a basis for discussion.

13 Dr. Meirion Jones drew attention to the section on the IUGS Circum-Atlantic Project (CAP) in Section 5 of the Summary Report of the Fourth Session of the Sub-Committee on Digital Bathymetry (Doc. IOC-IHO/GEBCO SCDB-IV/3), and to two chartlets attached to the same Report as Annex V thereof which show a comparison between DBDB5 and GEBCO (5th Edition) contours in a part of the North Atlantic.

14 Although there has been a misunderstanding by the CAP Interim Steering Committee regarding the methodology used in the production of the DBDB5 material, it was clear that the CAP Committee needed bathymetry at an early stage in order to prepare base maps for the compilation of other parameters, and that DBDB5 had been chosen largely because it is already available in digitized form whereas the availability of digitized GEBCO contours of the Atlantic was still very uncertain (see Section 6.6, below).

15 In the view of the Guiding Committee, the best available materials were:

(i) the three GEBCO North Atlantic Sheets 5.01, 5.04 and 5.08, but these could not be offered to the CAP until they had been digitized;

(ii) a new sheet being prepared by the US Naval Research Laboratory (NRL) - Mr. Norman Cherkis - which will cover almost the same area as GEBCO sheet 5.12 on the same scale; and

(iii) GEBCO sheet 5.16 which has already been digitized.

16 The Guiding Committee instructed the Permanent Secretary to respond to Dr. Loughridge's Telemail message asking him to continue his contacts with the CAP Interim Steering Committee, and to tell the Committee that:

(i) they will be informed of the availability (when known) of the GEBCO North Atlantic sheets in digital form; and

(ii) the GEBCO Guiding Committee recognizes that DBDB5 data for some parts of the South Atlantic (i.e., 0°-45° S) may be of better quality than GEBCO sheet 5.12, but draws attention to the new sheet of this area (0°-40° S), being prepared by NRL.

6. INTERSESSIONAL ACTIVITIES

6.1 REPORT OF THE SUB-COMMITTEE ON GEOGRAPHICAL NAMES AND NOMENCLATURE OF OCEAN BOTTOM FEATURES

17 The Sub-Committee had held its seventh meeting a few days previously in the International Hydrographic Bureau, Monaco. The Chairman, Dr. Robert L. Fisher, introduced the Report of the Meeting which had been approved but still needed checking and fair typing (Doc. IOC-IHO/GEBCO SCGN-VII/3).

18 The Guiding Committee accepted all the new names and changes proposed by the Sub-Committee, with one exception: 'Valdivia Apron'. It decided that this feature was not an Apron and should be left unlabelled. Some amendments had been proposed by the Sub-Committee to the Terms and Definitions listed in the publication 'Standardization of Undersea Feature Names', for inclusion in the 'International Gazetteer of Undersea Feature Names' which would be initiated very shortly, and subsequently in the comprehensive multi-lingual 'Standardization' volume when published. In regard to the latter, the Guiding Committee agreed that this publication, which will most likely be a sales item, will be useful for institute and ship libraries; however, the existing

small bilingual free publications were more suitable for day-to-day reference by individual scientists and other ocean users, and should continue to be made available even after the comprehensive volume has been published. After a lengthy discussion, the Guiding Committee agreed that RIFT should not be accepted as a primary entry with the same definition as MEDIAN VALLEY, since, although it has this meaning, it also has wider and other uses. It also agreed that VALLEY should be a primary entry followed by SUBMARINE VALLEY and SEA VALLEY.

19 The Guiding Committee also decided that all items should be entered in alphabetical order in English and cross-referenced where necessary. Other language listings as single-line entries in alphabetical order, cross-referenced to the English equivalent, should also be provided. Since all members of the Sub-Committee present agreed to these changes, the Chairman of the Sub-Committee amended his Summary Report accordingly.

20 The Chairman thanked the Chairman and Members of the Sub-Committee for their work, both intersessionally and at their recent meeting.

6.2 STANDARDIZATION OF UNDERSEA FEATURE NAMES

21 Following the decisions taken under Section 6.1 above, the Permanent Secretary tabled the first draft of the English/Japanese version. The main paper was now complete but more examples and references were being obtained. He stated that it would be the next version to be completed and it would be submitted to IHB in camera-ready copy for publication. He also reported that he had spoken to Dr. Werner Bettac, Deutsches Hydrographisches Institut (DHI), Hamburg, at the IOC Consultative Group on Ocean Mapping (CGOM) Session in February and to the Chinese Delegates at the recent IOC Assembly, and had been assured that the German and Chinese versions were in preparation.

22 The Representative of the IHB was asked to publish a further note in the International Hydrographic Bulletin regarding the free availability of this series of publications, in conjunction with Dr. Fisher's article (see paragraph 28, below).

6.3 INTERNATIONAL GAZETTEER OF UNDERSEA FEATURE NAMES

23 The Representative of the IHB reported that preparation of the Gazetteer would be initiated shortly after the XIIIth International Hydrographic Conference. All decisions of the Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features would be incorporated into the volume before publication.

6.4 UNDERSEA FEATURE NAME PROPOSAL FORM - DECISION TAKEN BY IOC-XIV AND PROPOSAL SUBMITTED TO IHC-XIII

24 The Guiding Committee had before it a letter from the Permanent Secretary, dated 10 April 1987, addressed to Members of the Guiding Committee, entitled "PROPOSALS submitted to the XIIIth International Hydrographic Conference". The Permanent Secretary drew attention to the paragraph therein headed PRO 4, in which the wording adopted by the

IOC Assembly had been reproduced, and also to PRO 4 itself which, together with IHO Member States' comments, was attached to the letter.

25 The Guiding Committee approved the action that had been (and was being) taken, though it considered that it was only likely to have limited success. However, it agreed that, if PRO 4 were to be approved at IHC-XIII, as expected, the Permanent Secretary should write to the Editors of major journals, as decided upon at the Tenth Session of the Guiding Committee (Doc. IOC-IHO/GEBCO-X/3, Section 6d), to try to persuade them of the value of what the Guiding Committee is attempting to do and to ask them to help.

26 A small amendment to the proposal form, to improve the recording of, and reduce ambiguity in, the geographical positions of features, was agreed.

27 Dr. Fisher introduced a manuscript entitled 'A Proposal for Modesty' which he had been invited, by the Editor, to write for the periodical Geology, and which would be published very shortly. This short article, which was welcomed by the Guiding Committee, calls on scientists to take a more responsible and scholarly attitude towards the naming of undersea features.

28 During the Session, the Representative of the IHB asked for permission to reprint this article in the I.H. Bulletin; this was agreed upon by Dr. Fisher, subject to clearance with the editor of Geology*. When published in the I.H. Bulletin, it should have a footnote indicating that the author is the Chairman of the GEBCO Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features.

6.5 REPORT OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY

29 The Sub-Committee had met at the US National Geophysical Data Center (NGDC), Boulder, Colorado, 19-20 March 1987. The Chairman of the Sub-Committee, Dr. Meirion T. Jones, introduced the Summary Report of the meeting (Doc. IOC-IHO/GEBCO SCDB-IV/3) which was before the Guiding Committee in draft form, having not yet been checked and approved by the participants.

30 The Chairman of the Sub-Committee drew attention to five main issues:

(i) Digitization of the GEBCO (5th Edition) contours. This was dealt with under Agenda Item 6.6 (see below).

(ii) Review of current activities - see paragraphs 32-37 below.

(iii) Activities of other international groups, in particular the IHO Committee on Exchange of Digital Data (CEDD); the IUGS Circum-Atlantic Project (CAP) - see paragraphs 12-16 above; and the IGU-ICA Joint Working Group on Environmental Atlases and Maps (Project: World Digital Database for Environmental Science (WDDES)) - see Section 9.3 below.

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* This permission from Geology for reprinting the article in the I.H. Bulletin was received shortly after the Session.

(iv) Key issues in the Management of Digital Bathymetric Data at an International Level:

a) Draft article on the Processing and Storage of Digital Data, for inclusion in the revised edition of the GEBCO Regulations - see Section 6.8 below.

b) Creation of an IHO World Data Centre for Digital Bathymetry - also in Section 6.8 below.

c) Report from the US National Geophysical Data Center - see the Summary Report of the Sub-Committee (Doc. IOC-IHO/GEBCO SCDB-IV/3), Section 6.3.

(v) The role of Satellite Altimetry Data Sets in Bathymetric Mapping. M. Denis Toustou (BGI) displayed a contoured version of free-air gravity anomalies in the area of the Gulf of Guinea, with digitized bathymetric contours from GEBCO sheet 5.12 - the Guiding Committee noted their similarity with interest.

31 Lic. Felix Mouzo drew attention to the use of the term 'Southern Ocean' in the draft Summary Report of the Sub-Committee and in other documents. He explained that this had political connotations and should not be used. The correct and acceptable term was 'Southern Oceans' or, in this case, 'Circum-Antarctic Sheets'.*

32 Representatives of four US institutions with bathymetric mapping programmes were present at the Boulder meeting (see paragraph 29, above) and able to give brief explanations of their activities (Doc. IOC-IHO/GEBCO SCDB-IV/3, Section 4). It was noted that the US Naval Oceanographic Office would continue to maintain and support the DBDB5 dataset but that DBDB5 is not intended for use in depths less than 200 metres; in which depths it is basically unreliable.

33 Mr. Norman Cherkis, NRL, has been successfully using magnetic anomaly patterns as indicators for subsequent closer direct examination of undersea features.

34 NRL is preparing for publication in late 1987 a bathymetric chart of the South Atlantic (0°-40° S), in uncorrected metres with a contour interval of 200 metres. This had led to a lengthy discussion in the Sub-Committee on the advisability of incorporating this chart into the GEBCO system as a possible replacement for sheet 5.12, which is considered to be out of date and does not justify the cost and effort of digitization. The Guiding Committee agreed that this possibility should be followed up but foresaw a number of difficulties; however it considered that these could be overcome, in particular since

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* The final approved text of the Summary Report of the GEBCO Sub-Committee on Digital Bathymetry (Doc. IOC-IHO/GEBCO SCDB-IV/3) has been amended accordingly.

Mr. Cherkis has already agreed to investigate the possibility of digitizing the contours of his 1:1 million compilation sheets, and, if he were to do so, it should be possible to overcome the differences in presentation, e.g. change from contours at intervals of 200 uncorrected metres to standard GEBCO corrected depth values, using digital techniques.

35 The Guiding Committee also recommended that Mr. Cherkis be approached and invited to become a co-ordinator of a revised sheet 5.12, together with Dr. Carl Brenner who could extend Mr. Cherkis' work to join sheet 5.16. They should co-operate with Dr. Gleb Udintsev, whose offer to co-operate was presented by Dr. Agapova.

36 Other problems which would have to be solved are:

(i) the need to obtain the agreement of the Geological Society of America (GSA) to the publication of a GEBCO sheet based on the same material as the NRL sheet which they will publish;

(ii) the need to ensure satisfactory overlaps and continuity with adjoining sheets (5.08 and 5.16);

(iii) the need to find a publisher (preferably free) for the revised sheet when complete * - or the need to raise necessary funds to pay for the map to be published.

37 The Guiding Committee was concerned that one of the matters that had come to light was the apparent deterioration of quality control, particularly with automated systems.

It invited the IHB to keep a close eye on this problem so as to ensure that all unclassified data archived are up to the standard required by the GEBCO Regulations (but see Section 6.8 below). The Representative of the IHB said that the Bureau had no evidence of such deterioration; they were much more concerned at the increasing trend of classifying bathymetric data, though it was understood that some of these data will be released in "sanitized" form. Strong encouragement was given to the Sub-Committee to continue to maintain close contact with people doing digital work; the Guiding Committee is very interested in any advances that are made in this feild.

38 The Chairman congratulated the Chairman and Members of the Sub-Committee for their excellent progress which he hoped would be maintained.

6.6 PROGRESS WITH DIGITIZATION OF THE GEBCO (5TH EDITION) CONTOURS

39 The Chairman welcomed Monsieur Michel Louis, Deputy Director of the Institut Geographique National (IGN), Paris, to the Session, in particular for this item of the agenda, and Mr. David P. Bickmore, Chairman of the Joint IGU-ICA Working Group on Environmental Atlases and Maps.

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* It was learned, subsequent to the Guiding Committee Session, that the Canadian Hydrographic Service would be prepared to publish a revised Sheet 5.12 under the arrangements for publication of the 5th Edition.

40 M. Denis Toustou (BGI, Toulouse) reported that all discrepancies and ambiguities on the five Antarctic sheets (5.13, 5.14, 5.15, 5.16 and 5.18) had now been resolved. The tapes would shortly be finalized and sent to the Chairman of the Sub-Committee on Digital Bathymetry. Procedural checks had been carried out to 1 mm on the GEBCO sheets.

41 M. Toustou presented the Report of the Bureau Gravimetrique International (BGI) to the Eleventh Session of the GEBCO Guiding Committee (see Annex VI).

42 The Guiding Committee considered what procedures and quality control should be followed before approval is given for the tapes to be released. It stressed that this was a technical comparison which should not be confused with the editorial approval needed for the printed sheets. It decided that the Sub-Committee on Digital Bathymetry should draw up a list of such procedures and the Chairman of the Sub-Committee should then carry out the necessary checks on the Antarctic tapes, reporting to the Chairman GEBCO on completion.

43 The Chairman drew attention to the development following on from a decision last September by the Directing Board of BGI to suspend all work on digitization of the GEBCO (5th Edition) for at least one year, since it had been holding up other essential work in the Bureau. As a result, no digitization work on GEBCO contours was being carried out at the present time.

44 As stated in the Report, a possible solution to the problem was being negotiated and there was every expectation that it would be satisfactorily concluded.

45 M. Louis informed the Guiding Committee that IGN would be prepared to second a technician to BGI to complete work on the Atlantic sheets. He would expect that work on the four outstanding Atlantic sheets would be completed by the end of 1987. If BGI is then still in difficulties and not yet in a position to take up the GEBCO bathymetry again, IGN will review the situation.

46 It was pointed out that the Guiding Committee had made certain decisions regarding sheet 5.12 (Atlantic Ocean, 0°-46° 40'S) - see paragraphs 34-36 above. BGI was asked therefore to take in hand work only on the three North Atlantic sheets for the present. By the time these had been completed, the Guiding Committee would be in a position to know its next priorities. The need for BGI to digitize the South Atlantic (0°-45° S) would depend on negotiations with Mr. Norman Cherkis regarding the NRL sheet (para. 34 above).

47 In response to a question from Mr. Bickmore, M. Louis said that preparation of Digital Terrain Models (DTMs) from ocean sheets by IGN was a possibility for the future but no decision had yet been made to do so. If IGN were to be approached with an appropriate request, it would be considered.

48 The Guiding Committee discussed how a Digital Terrain Model of the GEBCO (5th Edition) would differ from DBDB5. It agreed that the model of the GEBCO would at least be of a known quality. In the DBDB5

documentation there is no evidence of the origin of the included data, although much is known to be from the GEBCO. Also, in certain areas the data have been degraded to conceal the source of such soundings. The Guiding Committee took the view that a total lack of accompanying information about sources makes any compilation suspect. It asked Dr. Meirion Jones to write to Mr. Francis Marchant (US Naval Oceanographic Office) to ask for further information on identity of sources.

49 The Guiding Committee decided that ways and means of preparing Digital Terrain Models based on the GEBCO (5th Edition) contours should be pursued. It was suggested that if the actual objective of the Guiding Committee was changed to the provision of DTMs rather than producing a digital 6th Edition, it might simplify continous updating of the series. The Guiding Committee decided therefore to ask the Sub-Committee on Digital Bathymetry to assess how DTMs could be developed as ends in themselves. The Guiding Committee decided to reconsider its present objective in the light of the Sub-Committee's assessment.

50 Now that the first digitized contour tapes were becoming a reality, the Guiding Committee considered it urgent that conditions for their availability should be worked out and agreed at an early date.

51 Dr. Michel Loughridge had offered to act as a distribution centre for the tapes and the Guiding Committee considered that this was a matter for agreement between him and the IGN. The objective would be to make tapes available to the scientific community at cost of reproduction but to charge commercial users, since IGN/BGI would like to recover some of their past expenditure. In the opinion of the Guiding Committee, the way ahead on the sales policy would depend on the outcome of current negotiations between NGDC and the IHB regarding the former acting as an IHO World Data Centre for Digital Bathymetry (WDC DB). If this were to be agreed (as seems likely), it would be logical and convenient for tapes to be sold by NGDC acting in its capacity as the IHO WDC DB. A possible alternative was for the tapes to be sold by IGN.

52 The Chairman thanked M. Denis Toustou, and, through him, Dr. Georges Balmino and the BGI, for all the work they have put into the project and for their continued co-operation. He also thanked M. Michel Louis for attending the Session and for the considerable support afforded by IGN to the GEBCO over the years, and once again on this occasion when the project was again in difficulties.

6.7 REPORT OF THE AD HOC TASK TEAM TO STUDY THE TASK INVOLVED IN THE PREPARATION OF THE GEBCO (6th EDITION)

53 Ing. Gen. Andre Roubertou, Chairman of the ad hoc Task Team to Study the Task Involved in the Preparation of the GEBCO (6th Edition), introduced his Report (Annex V). He noted the main findings of the Report, some of which he had already brought up in his preliminary Report (see Doc. IOC-IHO/GEBCO Officers-V/3, Annex V). He indicated that, in the first part of the Report, an attempt has been made to analyse the need for a 6th Edition and the form in which it should be made available. This was followed by a number of suggestions on the ways and means by which this might be achieved.

54 The archiving and storage of bathymetric data was considered briefly and it was noted that there was a proposal (PRO 10) before the forthcoming International Hydrographic Conference (IHC-XIII) to review the need to maintain the 1:1 million series Plotting Sheets, in view of the fact that most data from the deeper ocean are now collected in digital form.

55 The Guiding Committee has been concerned for some time that a large amount of these data never get entered on the 1:1 million series Plotting Sheets (consequently, they do not get used for the compilation of small-scale nautical charts). It therefore welcomed the Canadian proposal that a review be carried out, but at the same time it noted that a number of the Volunteering Hydrographic Offices (VHOs) have stated that they are unable as yet to handle digital data and that therefore the two systems must co-exist for some years to come.

56 The Task Team had concluded that there was a continuing need for the foreseeable future of a coloured printed paper chart, similar to the GEBCO (5th Edition), but that an electronic chart, by which is meant a digital file from which can be reproduced exactly the content of the printed paper chart (nothing more and nothing less), should also be made available. The technology to do this is available today (but at a price). The Guiding Committee endorsed these conclusions.

57 In 7 to 8 years' time (i.e. by the deadline date the Guiding Committee has set itself for publication of a 6th Edition - 1995), the necessary hardware to print out the electronic chart in colour (at any required projection and scale) should be available at low cost. The Guiding Committee noted, however, that there would be no need to tie the electronic chart to existing sheet limits.

58 There was a significant minority (about 30%) of scientific users who wanted the GEBCO on a larger scale (1:5M or 1:7M). The Guiding Committee considered that this was impractical. If displayed on a wall (and few establishments would have one of sufficient size for a full display), the northern hemisphere would be well above head height and therefore impossible to examine without a ladder or platform of some kind; at a scale of 1:5 million, there would be four times as many sheets, quadrupling the cost not only of production but also of purchase of a complete set of the chart series; however, this would be most unlikely to lead to a quadrupling of sheet sales. It has proved difficult enough to recruit sufficient compilers of high quality to complete the 18 sheets of the GEBCO (5th Edition) over a period of 7 years and it would virtually impossible to recruit the number of such compilers needed to complete 64 Mercator sheets (on 1:5M) plus an unspecified number of polar sheets, in a like time scale.

59 The needs of these scientific users could, however, be met to a certain extent by the electronic chart, particularly in areas where an increase in scale is justified by the density of data.

60 The Guiding Committee did agree, however, that there is a case for the GEBCO (6th Edition) World Sheet to be printed on a larger

scale. The Mercator sheets only (72° N to 72° S) could be printed on a scale of about 1:25 million (as the Heezen and Tharp 'World Ocean Floor' Physiographic Diagram).

61 The first opinion of the Guiding Committee was that the projections used for the 5th Edition should remain unchanged (UTM was considered but quickly rejected), and that sheet limits of the 6th Edition should be identical to those of the 5th Edition, with the exception of the Antarctic sheet which should be on a smaller scale but reach much farther north (to say 40° S).

62 There was a clear tendency for the IOC Regional Mapping Projects to be published on a scale of 1:1 million (with larger compilation scales), which was justified in certain enclosed or semi-enclosed seas and limited coastal areas. The contours therefrom should be incorporated into the digital database for the GEBCO (6th Edition) and the electronic chart, e.g. the digitized contours of the International Bathymetric Chart of the Mediterranean (IBCM) should form the database for the Mediterranean and the Black Seas, rather than the digitized contours of the same area from GEBCO sheet 5.05.

63 The data control (tracks, surveys, etc.) will have to be made available for the electronic chart in a separate subfile which can be displayed on the face of the printout. This is important for scientific users and is also necessary to prevent misuse of the electronic chart by, for instance, increasing the size of limited areas to a scale which the density of data in the area does not justify. Another subfile will be needed for geographical and undersea feature names.

64 As regards updating the present edition, there was divided preference amongst those interviewed between those who would like the whole series of 18 sheets revised over a short period of time and those who preferred sheets to be taken in hand for revision, as and when this was justified by the availability of new data and specific needs for the particular sheet. The Guiding Committee, whilst recognizing the need for the electronic chart which, if possible, should not be compiled from out-of-date material, considered that a prerequisite for taking up a sheet for revision should be that there is a substantial increase in the amount of data in the sheet area over that used to compile the 5th Edition.

65 The Guiding Committee decided that a network of reviewers should be established (initially some of these could be appropriate 5th Edition Scientific Co-ordinators) to keep under review the availability of new data in their areas of responsibility (which will not necessarily be bounded by sheet limits) and to recommend at the appropriate time that specific sheets be taken in hand for revision. These reviewers would be appointed as and when the 5th Edition digital tapes become available. The words 'actively searching' which appear in paragraph 2.2 of the Task Team Report (Annex V) were endorsed by the Guiding Committee as essential, and applicable to the new structure proposed above.

66 The Guiding Committee decided that, besides its primary purpose, the plans for the revision of sheet 5.12 using digital

techniques (paragraphs 34 to 36, above) should be considered to be a first trial for the proposed new continous updating procedures above.

67 The Guiding Committee considered at length the long-standing proposal for the establishment of a GEBCO Geoscience Unit (or Ocean Mapping Unit) - see Terms of Reference of the GEBCO Guiding Committee, Item 2. The Task Team had raised the matter once again and had questioned whether such a concept is still acceptable or necessary, and whether the present time is propitious for the setting up of such a unit. The Guiding Committee concluded that it was not appropriate to establish a Geoscience Unit. After discussion it agreed that what was needed was an individual (and later possibly two persons) of demonstrated scientific and technical expertise and energetic character, to keep informed of ongoing or planned field programmes and to maintain a supervisory role over the flow of data relevant to GEBCO. This person should be well acquainted with, and maintain contact with, those academic and agency geoscientists and hydrographic services demonstrably interested in and actively researching the geomorphology of the world's oceans, as well as with technical groups engaged in forefront processing and manipulation of such data. His task would be to search out new data sources and ensure that - within the limits of propriety for publication by originating investigators - all available data are deposited in data banks in timely fashion, and to provide copies of such data to appropriate compilers.

68 The person should be located in a research institute but would need to have close links with the IHO World Data Centre for Digital Bathymetry. He would need a generous communications and travel budget.

69 The Guiding Committee asked the Chairman and the Secretary to carry out an intersessional study, corresponding as necessary with members of the Guiding Committee and others, in particular with Dr. Michael Loughridge, on: (i) the role of such a person - a preliminary Job Description could be prepared; (ii) optimum location; (iii) costs; and (iv) possible source(s) of funds. The matter would then be considered further by the GEBCO Officers at their next meeting.

70 The Chairman expressed the grateful thanks of the Guiding Committee to Ing. Gen. Andre Roubertou and the members of his Task Team, for the work achieved and the excellent and most useful concluding Report they had submitted (Annex V). Their work having been completed, the Guiding Committee decided to disband the Task Team.

6.8 PREPARATION OF THE GEBCO REGULATIONS (REVISED EDITION)

71 The Guiding Committee took the view that revision of the GEBCO Regulations, last published in 1970 by the IHB prior to the 5th Edition, was long overdue and recommended therefore that they be taken in hand at the earliest opportunity by IHB, with the advice and guidance of the Guiding Committee.

72 The Representative of the IHB said that a first draft of the revised edition would be prepared after IHC-XIII and sent out to all members of the Guiding Committee (with a copy of the 1970 issue) for their comments.

73 The Guiding Committee asked the Chairman of the Sub-Committee on Digital Bathymetry to prepare a final text of the article 'Processing and Storing Digital Data' - the second draft of this article will be found as Annex II to the Report of the Fifth Meeting of the GEBCO Officers (Doc. IOC-IHO/GEBCO Officers-V/3) and as Annex V to the Chairman GEBCO's Report to IHO-XIII (IHO Doc.: CONF.13/0/01) - taking into account the comments of IHO Member States which were sent to him recently, and to transmit this to the IHB, through the Chairman GEBCO, at an early opportunity.

74 Two other linked matters (which should be kept separate if possible), both of which will be considered by IHC-XIII, will effect the content of the revised GEBCO Regulations:

(i) A suggestion that an IHO World Data Centre for Digital Bathymetry be created, and operate in conjunction with the national data centre of an IHO Member State. A proposal has already been made by the US National Geophysical Data Center (NGDC) at Boulder, Colorado, that it operate as the World Data Centre for Digital Bathymetry on behalf of the International Hydrographic Organization (IHO) - 'A Preliminary Report on the Possible Creation of an IHO World Data Centre for Digital Bathymetry', dated 18 March 1986, prepared by the Sub-Committee on Digital Bathymetry, was submitted to the IHB the same month during the Fifth Meeting of the GEBCO Officers (Doc. IOC-IHO/GEBCO Officers-V/3, Section 6b).

(ii) The proposal that a Review be undertaken of the need to maintain the 1:1,000,000 Plotting Sheets (PRO 10 - Proposal submitted by Canada to IHC-XIII).

75 The Guiding Committee took the view that an international mechanism for handling digital bathymetric data is urgently needed, and the proposal to create an IHO World Data Centre for Digital Bathymetry at NGDC, Boulder, would appear to be by far the best solution to the problem.

76 If this proposal is accepted and when it is operational, a progressive start could be made to phase out the 1:1 million series Plotting Sheets, starting with those at present maintained by countries having the necessary facilities to handle digital data. It would appear, however, that it will be some years before all VHOs will be in this position and therefore the two systems will have to co-exist until this situation has been achieved. In the meantine, the pragmatic solution will have to be that all users should be encouraged always to interrogate both sources when requiring data from a specific area.

7. REPORTS TO GOVERNING BODIES

7.1 CHAIRMAN'S REPORT TO IHC-XIII

77 The Chairman's Report to IHC-XIII (IHO Doc.: CONF.13/0/01) had been circulated to all persons appearing in the GEBCO Personality List, in October 1986. No suggested amendments had been received (though, in paragraph 6.8, the reference to WDC'A'MGG should be replaced by NGDC). A number of further developments (all of which are reported on

in this document) have taken place since the Chairman's Report was written. The Permanent Secretary (in the unavoidable absence of the Chairman) was authorized to present the Report to IHC-XIII, and to inform the Conference of any subsequent developments, in particular those mentioned in Sections 6.6, 6.7 and 6.8, above.

7.2 REPORT OF THE CONSULTATIVE GROUP ON OCEAN MAPPING (CGOM) TO IOC-XIV

78 The Permanent Secretary stated that this Report (Doc. IOC/INF-702), which contains details of the International Geological/Geophysical Atlases of the Atlantic and Pacific Oceans (GAPA) and the IOC Regional Bathymetric Mapping Projects, as well as the GEBCO, was well received by the IOC Assembly.

8. SALES AND PUBLICITY

79 The Chairman noted that over 44,000 copies of the GEBCO (5th Edition) sheets and some 600 Boxed Sets (see Annex III for a breakdown of sales) had now been sold. Further publicity would be made to stimulate sales, particularly in fields such as the political (Law of the Sea) and educational which had hardly been touched.

9. OTHER MATTERS

9.1 REPORT OF THE SECOND SESSION OF THE IOC CONSULTATIVE GROUP ON OCEAN MAPPING (CGOM-II)

80 The Second Session of the CGOM was held in Paris, 12-13 February 1987, to approve the 'Report of the CGOM to IOC-XIV' (Doc. IOC/INF-702), and to consider the progress and activities of other IOC Ocean Mapping activities. The Chairman GEBCO had attended ex-officio and had reported on the GEBCO project. He had also given a short presentation on GLORIA, the long-range side-scan sonar system.

9.2 PROPOSALS SUBMITTED TO THE XIIIth INTERNATIONAL HYDROGRAPHIC CONFERENCE

81 The Permanent Secretary introduced a letter, dated 10 April 1987, in which he had drawn the attention of the members of the Guiding Committee to three 'PROPOSALS submitted to the XIIIth International Hydrographic Conference'.

These were: PRO 4 Naming of Undersea Features - dealt with in Section 6.4 above;

PRO 10 Review of GEBCO 1,000,000 Plotting Sheets - dealt with in paragraphs 74 and 76 above;

PRO 11 Revision of IHO Resolution A 1.5: Velocity of Sound in Sea Water - this Proposal was noted as an internal IHO matter.

9.3 WORLD DIGITAL DATABASE FOR ENVIRONMENTAL SCIENCE (WDDES)

82 Mr. David Bickmore, Chairman of the Joint IGU-ICA Working Group on Environmental Atlases and Maps, introduced the World Digital Database for Environmental Science (WDDES). For the land area, the database will be derived by digitizing the Operational Navigation Charts (ONCs) on a scale of 1:1 million. These cover the world, apart from the Antarctic, with 256 large sheets, of which about 90 have less than 10% land on them.

83 Digitization of contours is being carried out by the firm Petroconsultants (CES) Ltd. (Cambridge, UK, and Geneva) which is already working on elements of the ONC, including: Coastline; Main Rivers; International Boundaries; and Main Towns. This database is expected to have applications for many organizations in various disciplines. It will be used as a digital base map on which organizations such as ICSU (for the International Geosphere-Biosphere Programme (IGBP)) can plot their own overlay/overprint material.

84 The Working Group wishes to use the GEBCO digitized contours for the oceans - the fact that these will be at a lower resolution than that for the land is recognized.

85 It was agreed that the Guiding Committee should work closely with Mr. Bickmore and his Working Group, and that, when the first finalized GEBCO digitized tape of any sheet is ready for release (see para. 40 above), a copy could be passed to Mr. Bickmore for a trial and to ascertain the feasibility of incorporation of all the GEBCO tapes into the WDDES. If this trial proves satisfactory, and both parties are willing, a formal agreement of some kind will have to be concluded between GEBCO and WDDES (or their sponsoring bodies).

86 The Chairman thanked Mr. Bickmore for attending and presenting the Guiding Committee with an explanation of the WDDES, and details of his Working Group's plans for its development.

10. DATES AND PLACES OF THE SIXTH MEETING OF THE GEBCO OFFICERS AND THE TWELFTH SESSION OF THE GUIDING COMMITTEE

87 It was proposed that the Sixth Session of the GEBCO Officers be held at the Institute of Oceanographic Sciences, Wormley, UK, on Thursday 14th and Friday 15th April 1988; it was suggested that it might be convenient to have a meeting of the Sub-Committee on Digital Bathymetry on the Monday and Tuesday of the same week, 11-12 April 1988.

88 Following confirmation of the invitation made previously by the Argentine government, the Guiding Committee recommended that its Twelfth Session, which is scheduled for March/April 1989, be held in Buenos Aires, Argentina.

11. ADOPTION OF THE SUMMARY REPORT OF THE SESSION

89 Sections 1 to 6.5 were adopted during the Session. The remainder of the Report was adopted subsequently by correspondence.

12. CLOSURE OF THE SESSION

90 The Chairman closed the Session at 16.00 on Thursday 30 April and, in so doing, he thanked the Secretary IOC and his Secretariat for their support.

ANNEX I

AGENDA

1. OPENING OF THE SESSION

2. ADOPTION OF THE AGENDA

3. CONDUCT OF THE SESSION AND DOCUMENTATION

4. COMPOSITION OF THE GUIDING COMMITTEE AND ITS SUB-COMMITTEES

5. MATTERS ARISING FROM THE DOCUMENTS OF PREVIOUS MEETINGS

   5.1 SUMMARY REPORT OF THE TENTH SESSION OF THE JOINT IOC-IHO GUIDING COMMITTEE FOR GEBCO

   5.2 SHORT SUMMARY RECORD OF DISCUSSION OF THE FIFTH MEETING OF THE GEBCO OFFICERS

6. INTERSESSIONAL ACTIVITIES

   6.1 REPORT OF THE SUB-COMMITTEE ON GEOGRAPHICAL NAMES AND NOMENCLATURE OF OCEAN BOTTOM FEATURES

   6.2 STANDARDIZATION OF UNDERSEA FEATURE NAMES

   6.3 INTERNATIONAL GAZETTEER OF UNDERSEA FEATURE NAMES

   6.4 UNDERSEA FEATURE NAME PROPOSAL FORM - DECISION TAKEN BY IOC-XIV AND PROPOSAL SUBMITTED TO IHC-XIII

   6.5 REPORT OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY

   6.6 PROGRESS WITH DIGITIZATION OF THE GEBCO (5th EDITION) CONTOURS

   6.7 REPORT OF THE AD HOC TASK TEAM TO STUDY THE TASK INVOLVED IN THE PREPARATION OF THE GEBCO (6th EDITION)

   6.8 PREPARATION OF THE GEBCO REGULATIONS (REVISED EDITION)

7. REPORTS TO GOVERNING BODIES

   7.1 CHAIRMAN'S REPORT TO IHC-XIII

   7.2 REPORT OF CGOM TO IOC-XIV

8. SALES AND PUBLICITY

9. OTHER MATTERS

   9.1 REPORT OF THE SECOND SESSION OF THE IOC CONSULTATIVE GROUP ON OCEAN MAPPING (CGOM-II)

9.2 PROPOSALS SUBMITTED TO THE XIIIth INTERNATIONAL HYDROGRAPHIC CONFERENCE

9.3 WORLD DIGITAL DATABASE FOR ENVIRONMENTAL SCIENCE (WDDES)

10. DATES AND PLACES OF THE SIXTH MEETING OF THE GEBCO OFFICERS AND THE TWELFTH SESSION OF THE GUIDING COMMITTEE

11. ADOPTION OF THE SUMMARY REPORT OF THE SESSION

12. CLOSURE OF THE SESSION

ANNEX II

LIST OF DOCUMENTS

Working Documents

IOC-IHO/GEBCO-XI/1 prov.	Provisional Agenda
IOC-IHO/GEBCO-XI/2	Annotated Provisional Agenda
IOC-IHO/GEBCO-XI/3	Draft Summary Report
IOC-IHO/GEBCO-XI/4	List of Documents
IOC-IHO/GEBCO-XI/5	List of Participants
IOC-IHO/GEBCO-XI/6	Report of the ad hoc Task Team to Study the Task Involved in the Preparation of the GEBCO (6th Edition)
IOC-IHO/GEBCO-XI/7	Report of the Bureau Gravimetrique International on Digitization of the GEBCO (5th Edition) Contours

Other Documents

IOC-IHO/GEBCO-X/3	Summary Report of the Tenth Session of the IOC-IHO/GEBCO Guiding Committee.
IOC-IHO/GEBCO SCDB-IV/3 (draft)	Report of the Fourth Meeting of the Sub-Committee on Digital Bathymetry.
IOC-IHO/GEBCO Officers-V/3	Short Summary Record of the Discussions of the Fifth Meeting of GEBCO Officers.
IOC/INF-702	Report of the Consultative Group on Ocean Mapping to the Fouteenth Session of the IOC Assembly.
IHO CONF.13/0/01	Chairman GEBCO's Report to the Thirteenth International Hydrographic Conference.
IOC-IHO/GEBCO SCGA-VII/3	Report of the Seventh Meeting of the Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features.

Permanent Secretary GEBCO's letter dated 10 April 1987, addressed to Members of the GEBCO Guiding Committee, to which are attached: 'Proposals submitted to the XIIIth International Hydrographic Conference'.

Invited paper "A Proposal for Modesty" submitted by Dr. R.L. Fisher to the periodical Geology, for publication.

N.B. THIS LIST IS FOR REFERENCE ONLY. NO STOCKS OF THESE DOCUMENTS ARE MAINTAINED.

ANNEX III

TOTAL SALES OF GEBCO SHEETS
to end April 1987

5.00	1530
5.01	2199
5.02	2343
5.03	2154
5.04	2230
5.05	2260
5.06	2921
5.07	2420
5.08	2615
5.09	2405
5.10	3121
5.11	2580
5.12	2975
5.13	1679
5.14	1901
5.15	1661
5.16	1932
5.17	2442
5.18	2983
GRAND TOTAL	44,351

BOXED SETS	616

TOTAL SALES ALL SHEETS IN 1986 :	3,147

ANNEX IV

IUGS CIRCUM-ATLANTIC PROJECT (CAP)

Following is a brief summary of my interactions with the Circum-Atlantic Project (CAP) as the GEBCO representative to CAP.

Most interactions have been with/through Dr. Terry Edgar, US Geological Survey, and US members of the Interim Steering Committee for the Circum-Atlantic Project:

- Furnished small area contour plots from gridded data base ETOPO5 (DBDB5 in oceans) at same scale/projection as GEBCO for comparison with GEBCO contours.

- Advised Interim Steering Committee as to progress on digitization of GEBCO contours from Southern Ocean sheets and provided best guess of schedule for Atlantic sheets.

- Explained origin of ETOPO5/DBDB5 values and methodology for calculation of gridded values; misunderstood as averages of depths rather than multi-dimensional cubic spline calculation based on contours.

- Furnished copy of Report by CAP Interim Steering Committee "Evaluation and Recommendations for the Initiation of the Circum-Atlantic Project", February 1987, for discussion by the GEBCO Sub-Committee on Digital Bathymetry. Chairman of this Sub-Committee has copy for transmittal to GEBCO Guiding Committee.

Report referred to indicates decision to use ETOPO5 contours for CAP instead of GEBCO. Primary reason is likely delay of GEBCO contours.

Respectfully submitted,

Michael S. Loughridge

ANNEX V

REPORT BY THE TASK TEAM TO STUDY THE TASK INVOLVED IN THE PREPARATION OF THE GEBCO (6th EDITION)

1.1 The enquiry conducted in France in 1985 was continued sporadically by contacting new personalities. Interesting answers despite their reduced number obtained from the IHB to Circular Letter 7/1986 were taken into account at the same time. The results from the initial enquiry are generally confirmed, and the final conclusions are as follows:

1.1.1 A large majority of users express the need for the usual paper chart accompanied by the corresponding electronic chart.

1.1.2 The paper chart is widely accepted as presented in the 5th Edition. Some users suggest a few modifications or minor additions to increase the legibility of the document (deletion of sounding lines and of comprehensive survey zone boundaries, addition of spot-depth values on peaks and troughs and where the sea-bed is flat, etc.). Some improvements should certainly be taken into account, especially to solve the ambiguities noticed during the digitization by BGI. For example, a suggestion for a good compromise on the portrayal of sounding lines is to delete them from the chart but print them on the back of the sheet, which allows them to be seen with the use of a light table.

1.1.3 During the enquiry in France, the corresponding "electronic chart" was clearly defined as a digital data file (of a format to be determined) reproducing exactly the content of the paper chart, nothing less and nothing more. Therefore, such a file would be composed of a series of sub-files describing the coastline, terrestrial hypsometric lines (if necessary, the land topography may be considered uninteresting), bathymetric contours, the indentification of sounding lines, the toponomy, etc... A simple software system, as flexible as possible, should be associated with this file, providing the basic treatment facilities : selection of data, visual display (windowing, scale adjustment, change of projection) and basic computations (surfaces, volumes). It was clearly indicated that other digital products should and could exist, up-stream and down-stream of the chart, but that these products (gross data files, gridded data, digital relief models, etc.) were not part of GEBCO.

Inquiries conducted out of France, especially answers to Circular Letter 7/1986, did not necessarily take that detailed definition into account. Therefore, the clear preference of the majority towards a digital data file associated with the paper chart must be understood in a broader sense, without referring to such a narrow definition of this data file.

1.2 A certain number of answers, representing a significant minority, expressed a need for a chart at a larger scale. Values quoted are 1/7,500,000 or 1/5,000,000 (at the equator).

1.2.1 The reasons given to support this request are often mere adaptation to use : a larger scale chart, with a thicker drawline would be more convenient for some uses (training, data display, etc...). There is of course a compromise to reach between these advantages and the corresponding drawbacks (sheets awkward to handle, for representation of large areas). These users consider that the best compromise would be more towards 1/5,000,000 rather than the present 1/10,000,000.

Notwithstanding the fact that 1/10,000,000 remains well adapted to certain areas, especially in the southern hemisphere, other users put forward that the data in most areas are now so comprehensive as to make their presentation at 1/10,000,000 unable to give an image, even global both clear and sufficiently detailed.

1.2.2 It must be underlined that this is quite distinct from the need expressed by the "regional" specialists, which cannot be covered by GEBCO. This latter need is locally very variable, but implies in some areas much higher scales (ratio of 5 to 10 instead of 1.5 to 2). This need is partially fulfilled by GEBCO plotting sheets at 1/1,000,000, and in certain areas by existing (Mediterranean Sea) or future (Caribbean Sea, eastern Central Atlantic, etc...) "REBCOs" (Regional Bathymetric Charts of the Oceans).

1.2.3 Obviously, the Task Team cannot conclude on this point but it seems to me that it should be studied carefully. The question could be formulated as follows : in addition to (or instead of ?) the present chart, would it not be reasonable to envisage the new edition of some of the 18 existing sheets at a doubled scale (therefore in 4 sheets)?

1.3 As far as updating of GEBCO is concerned, a quasi-unanimity of users gave its support to a new updated edition sheet by sheet, accounting for available data, rather than to a 6th complete edition proper. Therefore it seems that the matter is settled and that it must be decided accordingly. In fact, things are not that simple and strong arguments advocate for the opposite.

1.3.1 The first argument is that a continous updating requires stability in every respect of the GEBCO concept, for a long period of time, indefinite in principle. Obviously, it forbids any change to the chart specifications, apart from very minor ones, that might endanger the overall homogeneity that is an essential feature in the interest and originality of GEBCO. Moreover, it supposed that this continuous updating is realized with rather limited means and at a rather slow pace (or else it will not be different in practice from the production of a 6th edition proper in a short period of time). In fact, it is questionable whether the evolution in techniques (examined further below) will permit a very long life for the "conventional" GEBCO. The very concept of a 6th edition, to be produced within a period of time as short as possible, depends itself upon an optimistic answer to that question of lifetime.

1.3.2 Continuous updating implies a permanent working unit (geoscience unit or GSU) relatively light, but over a long time, unlimited in principle. If such a GSU can be established, then this is probably the best solution. Nevertheless, one may think it could be easier to obtain financial support for a rather larger unit, but existing for a fixed and rather short period of time, supporting a unique, well-defined operation, resulting in a well-defined product, without having to make any hypothesis on the long term (finance people may prefer capital rather than a revenue expenditure). Therefore, in this latter case, it would be preferable to choose the 6th complete edition formula.

1.3.3 There again the Task Team cannot support a definite choice. It concludes that this choice will be one of the important elements to be taken into account when defining the structure and financing of the future GSU. It observes that a quick continuous updating is similar in practice to a 6th edition proper, and therefore that the real distinction rather lies between a fast pace and a slow pace, i.e., between a powerful GSU and a modest GSU.

2. Nowadays, modern digital techniques are widely spread and used by numerous cartographic services and various institutes more or less interested in bathymetry. Nevertheless, many of them, often among the important ones, remain largely dependent on traditional methods, and this leads to an extreme variety in working processes and presentation of results.

On the other hand, the operation of these modern techniques, even restricted to the conversion of conventional documents to a more digital form, sometimes raises extreme difficulties, as demonstrated by the digitization of GEBCO 5th edition by the BGI.

Finally, some technical deficiencies still remain for an unpredictable period of time and these have consequences which must be studied carefully.

2.1 Obviously it would be unreasonable not to use all the facilities provided by modern technology when preparing a 6th edition. Consequently, the task of the GSU (or whatever other structure) which will be responsible for the preparation of this edition, may become unmanageable if the data to be compiled are available in too numerous and different forms :

- Plotting sheets at 1/1,000,000 (under graphical and/or digital form), established by VHOs (Volunteering Hydrographic Offices), which have not brought the same care in the compilation of such documents, only few VHOs probably being able to provide them in digital form.

- Various documents coming from other sources are (unfortunately) numerous and probably very different in form. A rapid survey of sheet 5.11 (East Pacific, co-ordinators Hammerickx and Smith) indicated that a large proportion of data used by the compilers never reached SHOM, responsible for the plotting sheets at 1/1,000,000 and therefore have not to date (1987) been included in the SHOM data holdings.

Conversely numerous data collected after compilation have of course been taken into account, the sheets being carefully updated.

2.2 This situation is not satisfactory, for a process of updating GEBCO, as it should, by definition, be able to take into account all new and existing data, including the most recent ones. The Task Team concludes that the present system should be replaced by a system that is :

- more centralized, to guarantee the availability to the GSU of a unique and homogeneous data base in the form best adapted to its needs, i.e. through the preparation of documents worked out on demand (choice of depths, tentative bathymetric contours, relevant scales and geographical windowing, etc.).

- more direct, by suppressing in due course the VHO stage which is a source of delays and differences in processing, without providing a complete collection of data, as the VHOs are not commissioned to search for soundings but only to accept and process those reaching them.

The creation of an IHO World Data Centre for Digital Bathymetry, as proposed in the draft report prepared by the GEBCO Sub-Committee on Digital Bathymetry, dated 18 March 1986, would help to solve the problem. It should be studied carefully with a view to substituting it for the present VHO system. A detailed and firm agreement between NGDC and IHO should be enough to get rid of any reticence and convince all Member States that this is the best solution.

Concomitantly, it would be necessary to convince Member States to entrust their Hydrographic Office (or any other national authority responsible for bathymetry) with the task of actively searching for all available data in their area of responsibility, and/or obtained or retained by their various public or private national organizations. No one ignores the difficulties usually encountered in every country to obtain certain data, against normal retention reflexes of economic, scientific or other origin (let alone the obvious military confidentiality!). However, this is no reason to give up promoting an effort on which the quality of the future GEBCO is strongly dependent, whatever its form.

2.3 The technical evolution of computer graphics has been very fast in recent years and is now able to provide an irreplacable help in the different stages of bathymetric chart production, as already mentioned elsewhere in this report. Nevertheless, important consequences still exist and must be studied carefully, as it is difficult to predict when and how these limitations will disappear.

2.3.1 One of these limitations will probably remain for a long time : it is the fact that the relief interpretation phase, actually expressed by the drawing of detailed contour lines, requires the expertise of a specialist. It must be done by hand, outside limited areas where the density of data is such that there is at GEBCO scale no place left for interpretation.

Presently all known automatic algorithms can only provide working documents able to facilitate the task of the experts, but not to replace them. Therefore, "scientific co-ordinators" or those who will replace them in a new system, must remain. It is difficult to imagine in the foreseeable future that an "expert system" may be substituted for them to work out an automatic updating from newly collected data, partly because this expertise itself changes and improves with the flow of new data and their processing.

2.3.2 Another limitation comes in at the chart user level. The traditional paper chart will probably survive, so long as a display system, of small weight and size, convenient even with large format, precise and usable with compact portable computers, is not available, the whole at a low cost. Present and short term foreseeable technologies do not provide such systems. Nevertheless, it seems obvious that a "technological breakthrough" remains possible and that such an equipment could become available during the nineties, in conditions strictly unpredictable nowadays. If so, the traditional paper chart would come to its end, maybe very suddenly.

Before then, the available real time display techniques will remain awkward, costly, and of limited performance (resolution and size of image). Only well-equipped organizations will be able to use the electronic chart, and the conventional document remains necessary. Nevertheless, it can be predicted that on-line systems of graphic printing for computers are liable to drastic improvements in the near future. Such equipment will become easily available and have high performance (large size, colour, high graphic resolution), even though they will remain, possibly for a long time, rather expensive and reserved to well equipped centres. But if a chart user can easily resort to such a centre and get from the electronic chart a paper document exactly adapted to his need, quickly and for a moderate cost, then the conventional printed chart will be obsolete.

As a conclusion, the Task Team is of the opinion :

- that the evolution of computer graphics techniques must be monitored with extreme care, and that the GEBCO Guiding Committee must be ready to take appropriate action without delay.

- that anyway the 6th edition (certainly the last one under conventional form) should be completed as soon as possible, if it is to live a reasonable time. "As soon as possible" must of course be understood as accounting for every kind of constraint involved in such decision and in particular the obvious one : availability of a significant amount of new data.

- that the accompanying electronic chart should be "published" at the same time as the paper chart itself (if not a bit earlier).

3. The setting up of a GSU in charge of the preparation of a 6th edition, whatever its form, is recommended for two reasons, scientific and financial. If impossible, the renewal of the system which succeeded in realizing the 5th edition could be envisaged, hoping that it would be possible, and trying to implement some improvements.

3.1 Scientific factors relate to the homogeneity of the processing and presentation. Some deficiencies of the 5th edition are well known and must be amended (e.g. sheet 5.12 to be recompiled in a similar style to the other sheets; improvements in the edge-matching of the sheets or overlapping zones). This requires that the whole work be placed under the direct responsibility of a unique cartographer and the work be done by a unique team. Moreover, this formula is the only one allowing a good management of priorities in accordance with the user's needs and the actual flow of available data, under the supervision of the GEBCO Guiding Committee.

The cartographer responsible for this team should of course be provided with the support of a certain number of specialists of various "backgrounds" (geologists, geomorphologists, geophysicists, biologists) so as to constitute a group of "scientific co-ordination" which would be the "author" of the 6th edition and guarantee the fulfillment of the various categories of users' needs. Undoubtedly, this group would be extremely difficult to constitute and bring together harmoniously in day to day life and work, without hurting individualisms.

3.2 Financial reasons relate essentially to the contents of the proposals to be presented to the international organization(s) from which financial support is expected. It seems that a grant destined to a well-defined organization, wholly and uniquely devoted to the supporting task, thus able to provide a clear and detailed report of its management, stands a reasonable chance of being accepted. It stands better chances anyway and seems easier to advocate than an application for financing a less neatly defined project, to be spread amongst several teams around the world, belonging to pre-existing national organizations.

3.3 Staff requirements of the GSU will be quite easy to define and assess as soon as the desired realization pace is chosen and the load of new data and the scope of the changes are assessed. Equipment requirements that should be made available to this unit is a delicate problem. These requirements will be considerable, as it is necessary to make use of all the resources of modern technology and in particular of automatic processing. It is probably unreasonable to try to provide the unit with its own equipment (and the expertise going with it). A more logical and cheaper solution would be to conclude an agreement with some existing organization already possessing such equipment, and agreeing to accommodate the GSU and provide it with material assistance.

It would probably be simpler that this organization be the centre that will host and maintain the data base, but that is not an absolute necessity, and may not even be the ideal solution.

3.4 If the constitution of the GSU is not possible, there is no other possibility but to try to renew the 5th edition formula and try to obtain financial support to be shared out amongst the scientific co-ordinators.

The difficulties arising in the funding of presently planned REBCOs is not very encouraging. Nevertheless, if this formula was to work out, it would be useful to improve on the situation of the 5th edition by reducing the number of co-ordinators. Every co-ordination group could then accept responsibility for one oceanic zone of large extent, and look for a better homogeneity of treatment of adjacent zones, with better chances of success.

3.5 Of course, all the foregoing admits the continuation of the editing and publication of the chart of one unique existing service as is the case at present. There would be a lot of advantages in keeping the Canadian Hydrographic Service (CHS) as that service.

Andre Roubertou

Chairman, Ad hoc Task Team to Study the Task Involved in the Preparation of the GEBCO (6th Edition)

Vice-Chairman GEBCO

ANNEX VI

REPORT OF THE BUREAU GRAVIMETRIQUE INTERNATIONAL TO THE ELEVENTH SESSION OF THE JOINT IOC-IHO GUIDING COMMITTEE FOR GEBCO

The Bureau Gravimetrique International, (BGI-Toulouse, France) has continued the digitization and correction of the GEBCO charts, a task which was started in 1985.

Significant progress was made : a new strategy was analysed and a sophisticated inter-active graphic software, ALCION, was developed by D. Toustou; this software was made operational on a Tektronix 4115 terminal; 5 charts were completed : the 4 Circum-Antarctic sheets 5.13, 5.14, 5.15 and 5.16 plus the Antarctic sheet 5.18 (which is on polar projection).

The merging of the corresponding files was performed and the precise junction between adjacent maps was recently carried out. Some corrections have also been applied (e.g., the destruction of the Orcades Seamounts), and some others (on 5.18), are awaiting the final help of Dr. J.R. Vanney (Institut de Physique du Globe, Paris).

This activity, which was presented last month at the Boulder meeting by D. Toustou, is presently stopped due to other priorities and manpower problems. Some help was proposed by Dr. M. Loughridge during discussion at this meeting, and Dr. G. Balmino then wrote to him to enquire about partial financial support from this organization, the rest of the support being provided by the Institut Geographique National - which is already deeply involved in the whole work.

If this scenario works fine, the schedule could then be the following :

- restart of the production work : mid-1987;
- completion of Atlantic sheets 5.04, 5,08 and 5.01 : end of 1987 (it was understood that sheet 5.12 must be recompiled and re-drawn, and therefore that it will be processed by BGI at a later date).

On the other hand, BGI undertook the determination of free-air gravity anomalies over the oceans from Geos 3 and Seasat satellite altimetry derived geoid heights for the purpose of :

(i) Correlating anomalies with bathymetric variations;

(ii) detecting artefacts.

The computation was achieved in 1986 and results appeared in EOS (January 1987). The file is at the disposal of the GEBCO Guiding Committee for inspection, and, eventually, overlays with the bathymetry maps for future geophysical interpretations will become available.

G. Balmino
(April 27, 1987)

ANNEX VII

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