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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of UNESCO)

INTERNATIONAL HYDROGRAPHIC ORGANIZATION

Seventeenth Session of the GEBCO Guiding Committee

Covering also

The Sixteenth Meeting of the Sub-Committee on Digital bathymetry

Geological Survey of Canada, Dartmouth, NS, CANADA

23-30 June 1999

SUMMARY REPORT

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SUMMARY REPORT

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SUMMARY REPORT

In addition to recording the business of GEBCO XVII, these minutes also contain a précis of the substantive discussions and decisions which arose during the preceding Sixteenth Meeting of the GEBCO Sub-Committee on Digital Bathymetry (SCDB). For recording purposes, some of the content of the two meetings are woven together.

1. OPENING OF THE MEETINGS

1 The Seventeenth Session of the joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO XVII) and the Sixteenth Meeting of the Sub-Committee on Digital Bathymetry (SCDB XVI) were each held at the Geological Survey of Canada, Dartmouth, NS, Canada, located in the Bedford Institute of Oceanography (BIO) (SCDB XVI 23-25 and GEBCO XVII 28-30 June 1999).

2 The opening address to the SCDB was given by Dr. Jacob Verhoef, Director of the Geological Survey of Canada (Atlantic) and Mr. Richard MacDougall, Director of the Canadian Hydrographic Service (Atlantic). GEBCO participants were given a warm welcome to the BIO and the City of Halifax. Each Director then gave a brief outline of their respective work and expressed their hopes for the continued successful collaboration with GEBCO.

3 In giving his thanks, Dr. Meirion Jones, Chairman, SCDB, said that the GEBCO community was honoured to be invited to meet in the BIO. He added that GEBCO, visiting Canada for a second time, viewed the country as its cultural home, for it was there in the early 1980s that the Fifth Edition GEBCO paper charts were printed and packaged - these charts became the seed for the GEBCO Digital Atlas (GDA).

4 He recalled the revision of Sheet 5.12 in 1994 and the growing impatience of the scientific world who were demanding a reliable updated topographic grid of the ocean floor. The first steps to that goal came in 1994 and 1997 with the First and Second Releases of the GDA. Since then a GEBCO gridding group has driven the project forward with the aim of creating a 2.5 minute Gridded version of the GDA contours for inclusion in the Third Release planned for the year 2000.

5 Dr. Jones then paid tribute to the current efforts of Mr. Ron Macnab and the IOC/IASC/IHO Editorial Board for the International Bathymetric Chart of the Arctic Ocean and in particular to the technological innovations and spirit of co-operation between the nations seeking to update the bathymetry of the Arctic Ocean. He also complimented the Geological Survey of Canada (Atlantic), together with the Canadian Hydrographic Service (Atlantic), for their excellent work in updating the bathymetry of the North Atlantic off the west coast of Canada and looked forward to incorporating these data into the Third Release of the GDA.

6 In greeting participants the Chairman expressed a special welcome for several who were attending a GEBCO session for the first time and for those returning after a break. He added his deep regrets that HDNO (Russian Hydrographic Office) was not represented.

7 A full List of Participants is given in Annex X.

Apologies for absence were received from Dr. Robin Falconer Dr. Andrey Popov and Dr. Hou Wenfeng.

2. CONDUCT OF THE MEETINGS

2.1 Adoption of the Agenda

8 Sir Anthony Laughton, Chairman, GEBCO, said that it had been decided to continue the pattern adopted for the minutes of the 1998 GEBCO meetings in Wellington, New Zealand. Thus the minutes of the 1999 SCDB and the GEBCO Guiding Committee would be consolidated as a single documentation set.
(See Annex I - Agenda). The report of the SCUFN meeting, 22 -25 June, would be issued as a separate document and distributed initially only to members of that Sub-Committee.

2.2 Documentation, Administrative Arrangements, etc.

9 Mr. Brian Harper, Permanent Secretary GEBCO, introduced the documentation (See Annex II).

10 Other papers, maps and diagrams were submitted to the meetings for consideration. These are also listed at Annex II.

3. COMPOSITION OF THE GEBCO GUIDING COMMITTEE AND ITS SUB-COMMITTEES

11 The Chairman, reiterated the rules for representation on the Committee whereby nominations for appointment are selected by the IOC and IHO to fill each of the ten seats (five for each organisation). No more than one nomination from each country is permitted.

3.1 GEBCO Guiding Committee

12 The Chairman welcomed Dr. Michael Loughridge, NGDC, and Ingénieur général de l'armement Patrick Souquière from SHOM, as new members of the Guiding Committee.

3.2 Sub-Committee on Digital Bathymetry (SCDB)

13 Dr. Meirion Jones, Chairman, SCDB, reported that the composition of the Sub-Committee had been updated by the addition of five participants who have regularly made significant contributions to the GEBCO project. They were: Dr. Michael Carron, Dr. Andrew Goodwillie, Dr. John Hall, Mr. Peter Hunter, and Mr. Ron Macnab.

14 Additionally, he announced that Mr. Tony Pharaoh, IHB, had taken over the Bureau's representation on the SCDB, a post formerly held by Ing. en chef Michel Huet.

3.3 Sub-Committee on Undersea Feature Names (SCUFN)

15 Dr. Robert Fisher, Chairman, SCUFN, reported that Mr. Desmond Scott had been appointed to the Sub-Committee. Additionally, he added that Mr. Trent Palmer, AUF representative, will be replaced shortly by Mr. Marcus Alsop from the same organisation.

3.4 Scientific Advisers

16 The status of Scientific Adviser (to the GEBCO) was debated. It was acknowledged that the term 'Adviser' did not convey the same degree of permanence suggested by membership of a Sub-Committee. It was noted that some advisers had come and gone as interest or technologies had waned. However, in recognising that the contribution of some advisers had been of extraordinary value it was agreed that GEBCO should be active in augmenting this pool of experts.

17 Mr. Harper, GEBCO Permanent Secretary, said that following instructions at the meeting in Wellington, he wrote to Dr.Garrik Grikurov, Deputy Director, VNIIOKEANGEOLOGIA asking about the intentions of Dr.Yuri Kiselev and his position as a Scientific Adviser. In reply, Dr. Grikurov said that because of poor health Dr. Kiselev was obliged to resign his post. Dr. Grikurov named his chosen replacement nominee as Dr. German Naryshkin.

18 Mr. Harper said he pointed out in his letter to Dr. Grikurov that..... "Consideration of your recommendation of Dr. German Naryshkin as a Scientific Advisor, lies solely with the GEBCO Guiding Committee - the replacement of Dr Kiselev is not an automatic procedure."

19 Dr. Gleb Udinsev said that Dr. Naryshkin had very worthy credentials. He had gained wide experience over many years compiling a range of bathymetric maps in the Arctic and South Atlantic - he strongly recommended this appointment.

20 Concern was raised by a number of participants about the proposed appointment of a marine scientist, who although seemingly qualified, had been nominated by an institute which previously had been conspicuous by its lack of presence and advice.

21 In summing up, the Chairman said that notwithstanding the real concerns about the previous lack of co-operation from a scientist from this institute, the majority was in favour of ratifying the appointment of Dr.Naryshkin and in doing so were expressing their hopes that more Russian bathymetric scientists might become associated with GEBCO. He asked the Permanent Secretary to write to Dr.Garrik Grikurov confirming the appointment, adding that GEBCO would look forward to Dr.Naryshkin's active participation at the next meeting.

22 Apart from the Scientific Advisers re-designated as members of the SCDB, there were no other changes.

3.5 GEBCO Reviewers (See Annex III)

23 Referring to the list of GEBCO Reviewers on Page 5 of the GEBCO Personality List, the Chairman asked if there were any proposed changes.

24 **S E Pacific Ocean:** Mr Harper said that the Director of the Chilean Hydrographic Office, Captain Rafael Mac-Kay, had written (February 1999) to say that Cdr. Patricio CARRASCO Hellwig is once again back in the office and is anxious to resume his duties as a GEBCO Reviewer. Accordingly his name was reinstated in the list.

25 **South Atlantic:** In response to a request for a qualified officer to undertake the post of a GEBCO Reviewer, the Director of the Brazilian Hydrographic Office proposed Mr Marco Antonio de Carvalho OLIVEIRA. The proposed appointment was agreed by the meeting, and welcomed by the Chairman.

26 **S Pacific:** Dr. Hans-Werner Schenke said that owing to the difficulties he was experiencing identifying and gathering new data for this region he proposed the additional support of Dr. Henk Brolsma as an additional reviewer. This proposal gained strong support. The Chairman asked Dr. Schenke to enquire if Dr. Brolsma was willing to undertake these duties and report to the Guiding Committee.

27 **S W Pacific Ocean:** Mr. Peter Hunter said he had a proposal for Dr. Russell Howorth, Programme Manager SOPAC. The Secretary said he would make enquiries from Mr. Alfred Simpson about this officer and his willingness to participate as a reviewer.

28 **Caribbean Sea & Gulf of Mexico:** Dr. Mike Loughridge reported that Dr. Troy Holcombe had retired from NGDC and it was not clear if he was able to continue as a reviewer. The Secretary agreed to make enquiries.

3.6 General Review of the GEBCO Personality List

29 Details of the IOC/IASC/IHO Editorial Board for the International Bathymetric Chart of the Arctic Ocean were added to the list of 'Ocean Mapping Projects'.

30 In pointing out the difference between the GEBCO Personality List and a List of Participants for any particular meeting, the Chairman accepted a proposal to add Dr. Gallo Carrera to the Personality List.

4 MATTERS ARISING FROM REPORTS OF PREVIOUS MEETING

4.1 Summary Report of the Sixteenth Session of the Joint IOC-IHO Guiding Committee for the GEBCO (doc. IOC-IHO/GEBCO-XVI/3)

31 The Chairman said that although it was not the practice to sign the minutes of GEBCO meetings, there remained the matter of 'Generic names' which had not been resolved at Southampton in 1997. This topic is covered at Item 6.

4.2 Summary Report of the Eleventh Meeting of the Joint IOC-IHO GEBCO Officers (doc IOC-IHO/GEBCO Officers-XI/3)

32 All matters arising from this report are covered by agenda items.

5. REPORT BY THE CHAIRMAN OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY (SIXTEENTH MEETING, GEOLOGICAL SURVEY OF CANADA, DARTMOUTH, 23-25 JUNE 1999)

5.1. GEBCO Activities

33 Dr. Jones reported that once again the Sub-Committee had attracted a high attendance with 28 participants from 12 countries with an excellent geographic representation. He remarked that, more importantly, the assembled group around the table probably embodied the world's experts on wide area bathymetric mapping. Thirty four papers were tabled.

34 He made special reference to the work of two new participants: Mr. Dick Martino, NIMA, for his link with WVS and Mr. George B. Newton, US Arctic Science Commission, who was instrumental in developing and sustaining the SCICEX programme for capture and release of Arctic under-ice data collected by US submarines.

35 He added that one of the successes of the meeting had been the co-session with members of the IBCAO. This innovation had proved of great interest to the SCDB when new players to the group demonstrated their new approaches and insights to bathymetric mapping - perhaps showing the way GEBCO may evolve in the future. A separate report of this co-session is available from Mr Ron Macnab (see List of Participants at Annex X).

36 Dr. Jones explained that the main theme of the meeting had been the development of ideas and

plans for the Third Release of the GDA, originally planned for 1999, but now postponed to 2000 for the following reasons:

a) need for a substantive update on the contours, and

b) need for a acceptable Gridded data set.

37 a) Very few contours ready for 1999 - marginal improvement only. However, by 2000, major data sets will be available including those for the Indian and Arctic Ocean, and for large segments of the NE and NW Atlantic together with the Ross Sea and, hopefully, the bathymetry around New Zealand.

38 b) Time frame too cramped for Dr. Carron's Grid Working Group to synchronise with contours and meet 1999 target - see 5.1.4

39 Two possible further additions to the GDA were identified as the Data Base of IHO Gazetteer of Undersea Feature Names and the soon expected New Edition of IHO publication S 23 'Limits of Oceans and Seas'. Asked about name placements for the Third Release, Dr. Jones replied that nothing new was planned, however he was aware that a number of GIS users wanted the Gazetteer in data base form..

40 He reported that the accuracy of Carter's Tables was discussed. He said that the present tables are of dubious relevance to the Arctic region where only a sparsity of data was available to David Carter at the time of constructing his tables. A far more comprehensive database of temperature and salinity data for the world's oceans had since been compiled by Syd Levitus at WDC-A (Oceanography) and this could be used for updating Carter's Tables. John Hall commented that, in his experience working in the Arctic, Carter's Tables had proved entirely acceptable.

41 Two questions were raised: firstly, whether the GDA should adopt the improved corrections derived from the Levitus database of water samples of the Arctic region in lieu of those in Carter's Tables and, secondly, whether a new world-wide correction table could be constructed. After considerable debate it was agreed that until the GDA used a much higher resolution grid, the effect of differences between the application of these correction systems would be negligible.

42 Referring to the parallel activities of the IHO-DCDB (See Annex XIII) and its data information management of deep sea soundings, Dr. Jones said that following the phasing out of the GEBCO plotting sheets, the role of the VHOs seems to be unclear, particularly concerning the data held on the plotting sheets but not digitally transferred and also their role in seeking out, managing and validating data available in digital form.

43 Acknowledging that IHO-DCDB could not act in a pro-active fashion by searching for data, Dr. Jones invited the IHO to re-visit this issue.

44 RAdm. Neil Guy agreed that the technology was changing faster than the GEBCO Guidelines and there was now a clear need to revitalise the roles of the VHOs - see 5.1.6. Moreover, he recognised the need to investigate the formation of regional data bases. He also reported that the IHO was seeking to strengthen their links with the IOC-IBC projects. He saw these activities as synonymous.

45 Dr. Loughridge said that although IHO-DCDB cannot undertake digitising from analogue plotting sheets it was possible to help with drawing up contracts and in special circumstances US funds may be available for certain geographic areas. On the subject of VHOs, he suggested it might be worth investigating the harmonisation of areas of responsibility to match Small Scale International (INT) chart limits.

46 Additionally, addressing the issue of data collection, Dr. Loughridge suggested that if an international project to define the 500 and 2,500 metre depth contours was initiated, it might attract some funding for surveying. In any event, the 51 countries which have a potentially extended continental shelf (under Article 76 of UNCLOS), must submit complete claims including detailed high quality bathymetric surveys and it is this data that should eventually find its way into the IHO-DCDB. It was agreed that some means should be found to encourage nations collecting this depth information in support of claims, to send such data to IHO-DCDB, after examination by the UN Commission on the Limits of the Continental Shelf. (CLCS)

47 Dr. Jones concluded his verbal report by recounting the evolutionary changes experienced during the last few years of the GEBCO project. He ventured to suggest that the surmised Fourth Release of the GDA might be a Windows version using GMT to produce Postscript files with colour-fill facilities. He also predicted that, as demonstrated by the IBCAO project, current methods of assembling data on plotting sheets will be replaced by regional digital soundings data bases maintained by nominated custodians. These and other changes will call for substantial revision of the GEBCO Guidelines.

5.1.1 The GEBCO Digital Atlas - Sales and Distribution

48 By 1st June 1999 the Distribution/Sales of the GDA reached 1025 copies which have been distributed/sold to 83 countries. (See Annex VII)

5.1.2 The GEBCO Bathymetric Editor - Report

49 Mr. Hunter tabled a brief report on his activities**:** Report of the GEBCO Bathymetric Editor, March 1998 - June 1999. (See Annex IV).

50 During the intersessional period, he attended the International Workshop on Bathymetry and Coastal Topography Data Management, at the University of Washington, Seattle, USA (March 1998) and the Seventh Session of the Consultative Group on Ocean Mapping (CGOM), IHB, Monaco (April 1999).

51 Bathymetric compilations were mainly carried out in the North-Eastern Atlantic region.

5.1.3 The GEBCO Digital Atlas Manager - Report

52 Ms. Pauline Weatherall, BODC, submitted a report on her activities: Report of the GEBCO Digital Atlas Manager, April 1998-June 1999 (See Annex VI).

53 Her activities since the last meeting have included digitising and edge-matching contours from both polar regions, North Atlantic and the Indian Ocean Area. Diagrams showing the extent of the areas covered are attached to the report.

5.1.4 Update on the work of the GEBCO Grid Working Group

54 Dr. Michael Carron reported that the Grid Working Group had met periodically. He was optimistic that their efforts to produce a world-wide grid of GDA bathymetric contours were on schedule for completion in 2000, provided they received any revised contours and additions

on the coastal margin in good time.(See Annex IX)

55 He singled out the Fisher/Goodwillie team and the IBCAO as two collaborative groups which were setting technical and processing standards for the future.

56 He added that there is now a 'help group' on the net who will give instructions on how to use GMT software and provide a same-day answer assistance - this service is free.

57 Dr. Walter Smith reported on the recent upgrades to the GMT software package (Wessel and Smith), and the new one minute satellite altimetry grid. (See Annex XII). He also tabled future plans for altimetry estimates of ocean depth.

58 Mr. Bill Rankin said incorporation of NGDC display software is being considered . Among other attractions this permits easy entry to data sets, e.g. clicking on any 10' x 10' square accesses any number of displays. Dr. Michael Loughridge responded that NGDC has adopted a new philosophy with regard to access software - rather than supply as a separate product it is now regularly embedded in all new data products.

59 Finally, in discussing the GDA documentation, Dr. Carron said it is intended to include extensive analysis and explanations about the product in order to familiarise users with the contents as well as the constraints. HTML hyperlinks will be provided throughout.

60 Sir Anthony Laughton thanked Dr. Carron and his Grid Working Group for their enormously valuable work.

5.1.5 New Mapping and Technical Changes identified for inclusion in the Third Release of the GDA

61 Mr. Peter Hunter, GEBCO Bathymetric Editor, said that there were only minor changes to the comprehensive review of available mapping for the Third Release of the GDA as published in the 1998 Summary Report of GEBCO Officers-XI. These had been fully discussed in the prior SCDB meeting and would be included in the Inventory of Maps and associated diagrams showing material for the next edition of the GDA. (See Annex V)

5.1.6 GEBCO Guidelines

62 Parts 1 and 2. Sir Anthony Laughton agreed that Martin Jacobsson's 'living' database of the Arctic region was the likely basis for future bathymetric mapping projects. He observed that the GEBCO Guidelines were being rapidly overtaken by changing events and circumstances, and were now substantially out of date. Rear Admiral Guy replied that following previous debates about the role of the VHOs, the construction of regional databases and grids, and their relationship to IHO-DCDB, the IHB would review these particular Guidelines and propose suitable changes for consideration of the Guiding Committee.

63 Part 4. Dr. Loughridge reported that after several years work the quest to draft an agreed version of Part 4 was virtually complete. The changes identified by the Member States had been incorporated and now only minor small non-essential points required resolution. He submitted that Part 4 was a complex document, best corrected by its original author Dr. George Sharman. The Guiding Committee gave its general approval for licence to make minor modifications to clarify some of the language difficulties without a further redistribution to Member States.

5.1.7 GEBCO Reviewing System

64 The Chairman reminded the meeting that the role of the GEBCO Reviewers was to advise the Bathymetric Editor on the existence and acquisition of data suitable for inclusion in the GDA.

65 Dr. Loughridge raised concern that the Reviewers did not seem to be actively involved in the GEBCO process. In response, Mr. Peter Hunter said he had written his usual annual letter to all Reviewers, with a copy of the new diagrams agreed at the last meeting. He admitted that once again the response had been patchy.

66 After some debate about the changing nature of bathymetric map making, the growing use of digital sounding data bases and the general ineffectiveness of the reviewing system, it was conceded that, in the longer term, a full revision of the organization would be required. In the meantime, the Chairman asked Mr. Harper and Mr. Hunter to submit a new draft for the Reviewers' annual letter to replace the existing text.

67 Dr. Bob Fisher said he did not need an agent to find data for his mapping activities in the Indian Ocean. The Chairman commented that it was difficult to generalise over the whole world but agreed that the Indian Ocean was a special case and confessed it did not make sense to ask Dr. Fisher about data in this ocean.

5.2 Future Development of GEBCO Products

5.2.1 Digital Techniques for Labelling Undersea Feature Names

68 Dr. Jones recalled the work of Dr. Gary Robinson in 1996 which showed how the solution of labelling features on the GDA might be achieved. He added that at present there were no funds available to continue this complex task.

69 Although the latest standard products from CorelDraw, ArcView, Caris GIS and Adobe Freehand were suggested as providing a solution, it was pointed out that none of these were expert systems capable of providing optimum solutions for name placement without user intervention.

70 Dr. John Hall added that two types of questions were commonly experienced in using such data bases, they might be, ' Where is Carlsberg Ridge?' and 'What is this feature the cursor is pointing to?' Dr. Carron remarked that most information systems develop priority levels for showing names on a screen and that with US Federal guidance it would probably be possible to find such a system now.

Mr. Tony Pharaoh said that the IH 'S 57 Standard' names attribute facility permits names to change, appear or disappear automatically on a screen, according to scale selection.

71 Dr. Jones said he was interested in the debate but added that the name resolution and labelling problems would have to await the Fourth Release of the GDA - probably in 2003.

5.2.2 Derived Products from GDA

72 Dr. Jones said Fifth Edition GEBCO paper charts are seen widely displayed in marine science offices throughout the world - this 20-year old product must be replaced for it is no advertisement for the GEBCO community and their claim to provide the best seafloor bathymetry available. It was agreed that a replacement Sixth Edition of the GEBCO should be printed for the Centenary year 2003.

73 Whilst 'Print on Demand' was identified as the preferred method of production, the details of the methods to be used were not discussed. It was suggested that each GEBCO Sheet could be contained on a CD-ROM Plot Disc.

5.2.3 GEBCO Web Site

74 Dr. Loughridge reported that during the last year 475 hits from eleven countries were recorded. He welcomed additional material for the site including news items or updates on GEBCO activities. Thanks were recorded for Carla Moore's work in setting up the web pages.

75 Dr. Loughridge offered to post all GEBCO Centenary material as confirmed by the Centenary Committee. He also agreed to ask IOC to insert a link back to GEBCO.

76 Mr. Brian Harper said there was still material, supplied earlier by Mr. Desmond Scott, which had not yet appeared on the web page, he agreed to contact Carla Moore about this and also the possibility of adding and up-keeping the GEBCO Personality List.

77 As for the IOC Web Page on Ocean Mapping, The Chairman, Sir Anthony Laughton, said it was very out of date and agreed to raise this with Dr. Patricio Bernal.

78 Dr. Jones replied that most GDA sales did in fact emanate from users accessing the web pages created by BODC but the link to these pages was not obvious to users of the GEBCO web site.

5.2.4 GDA Promotion

79 The Chairman suggested that a future use of the GEBCO Web Page might include promotional material for the Third Release of the GDA.

6. REPORT BY THE CHAIRMAN OF THE SUB-COMMITTEE ON UNDERSEA FEATURE NAMES (THIRTEENTH MEETING, GEOLOGICAL SURVEY OF CANADA, DARTMOUTH, 22-25 JUNE 1999)

6.1 List of Generic Names

80 Dr. Robert L. Fisher, Chairman SCUFN, said that three definitions were left undecided at the last Guiding Committee meeting at Southampton. After correspondence with members of the GEBCO Guiding Committee and debate at SCUFN-XIII the following definitions were agreed:

- BORDERLAND. A region adjacent to a continent, normally occupied by or bordering a SHELF, and sometimes emerging as islands, that is irregular or blocky in plan or profile, with depths well in excess of those typical of a SHELF.

- MOUNTAINS. (This term was considered obsolete and should be removed from the list of definitions)

- SEAMOUNT CHAIN. A linear or arcuate alignment of discrete SEAMOUNTS with their bases clearly separated.

81 Dr. Fisher asked the Guiding Committee for their views on the use of three further feature definitions. After some debate the following definitions were agreed:

- PASSAGE. A narrow break in a RIDGE or RISE. Also called GAP.

- CALDERA. A collapsed or partially-collapsed SEAMOUNT, commonly of annular

shape.

- PROMONTORY. A major spur-like protrusion of the CONTINENTAL SLOPE extending to the deep seafloor. Characteristically the crest deepens seaward.

6.2 Report of Intersessional Activities

82 Dr. Fisher said a number of actions left over from SCUFN-XII (1997) such as clarification of definitions and name assignments had been carried out by correspondence. Of particular mention was the successful collaboration with the Australians. Although the bulk of the work was undertaken by Ing.en Chef Michel Huet, Secretary SCUFN, and himself, there were a number of action items processed by other members of the Sub-Committee.

83 **6.3 Report of SCUFN XIII**

Dr. Fisher reported a very active four days with a large number of participants with a wide range of expertise. He bade special welcome to Mr. Desmond Scott, as rapporteur, and Rear Admiral Neil Guy. He also made special mention of the work of Mr. Marco Antonio de Carvalho OLIVEIRA.

84 The absence of a valued member of the Sub-Committee, Dr. Robin Falconer, with little or no contact during the intersessionary period, was regretted. The question arose whether his increasing volume of duties in New Zealand permitted adequate time for involvement with the Sub-Committee. Sir Anthony Laughton said, as a first step, he would write to Robin Falconer asking if more active participation was possible.

85 Dr Fisher said that the Sub-Committee had considered the names and positions of some 364 undersea features during the SCUFN-XIII meeting. Of these only 114 were submissions of names for newly discovered or examined features. Many of the others were merely adjustments, or provision of greater detail, to positions of features already named and listed in the GEBCO Gazetteer.

86 On many occasions, after a study of accompanying plots, it had been found necessary to alter the generic term used by the proposer to describe the feature, but taking into account a wish to avoid altering historic names.

87 Some names were rejected, or laid aside in a new reserve section of the Gazetteer, pending provision of additional data in support of the proposal. On other occasions features were rejected as being too small to appear on the scale of the GEBCO and/or the small-scale INT Charts. However it was recognised that they may need to be reconsidered if and when they are submitted in timely fashion before publication as appropriate names for showing on regional IBC series sheets.

88 Dr. Fisher said he was concerned that names of features on future IBC sheets were properly considered and requested the Chairman GEBCO, to ask the Chief Editors, IBC Regional Mapping Projects to send proofs showing proposed names to SCUFN as soon as possible rather than just prior to a biennial meeting. Dr. Loughridge suggested that this request could lead to serious delays in the final publication of each sheet. RAdm. Guy said that although unnecessary bureaucratic influence was to be avoided he nevertheless conceded that corrections to names and their placements are regularly required. He suggested that early circulation of map proofs to the IHO could help ease the possibility of delay.

89 In answer to questions about the requirement for SCUFN to examine the underwater feature names on the IBC sheets, Michel Huet replied that according to the mandate of SCUFN, as approved at the 1993 GEBCO Guiding Committee meeting, it is the function of SCUFN to select those names appropriate for use of GEBCO graphical and digital products, on the IHO Small Scale International Charts Series, and on the IOC Regional International Bathymetric Chart Series.

90 In response to questions about production schedules for the IBC series and whether the requirement to examine these charts might create problems, Dr. Fisher replied that provided he received no more than three or four chart proofs per year, he could cope. RAdm. Guy undertook to assess the likely combined production rate for the six projects and remind the IBC Chief Editors of their requirements to submit names to SCUFN. Additionally, Sir Anthony Laughton said he would write to each of the project leaders with a similar reminder.

91 At the conclusion of the SCUFN item, Sir Anthony Laughton, Chairman GEBCO, read aloud from a letter written by Dr. John Sclater of the Geosciences Research Division, Scripps Institution of Oceanography. The letter, dated 6th March 1998, was originally sent to Michel Huet, Secretary SCUFN, as an accompaniment to an Undersea Feature Name Proposal form submitted by John Sclater and Dr. Andrew Goodwillie.

92 The letter acknowledged the unusual circumstances of proposing a feature be named after a living person but argued that since Dr. Fisher is accepted by many as the foremost living deep-sea marine hydrographer, this was a recognition long overdue.

93 The feature chosen was a long sinuous ridge that runs between the Madagascar Plateau and the Southwest Indian Ridge at 44□S , 41□E. Dr. Sclater suggested that this is the largest unnamed marine feature in the Indian Ocean, if not the world. The proposed name, 'Robert L. Fisher Ridge' would ensure that it is identified separately from the Madagascar Plateau and the Del Cano Rise and, furthermore, to demonstrate that it is not the trace of the Marion Plume southwards. He added that colleagues around the world were unanimous in the support of the proposal.

94 In response, Dr. Fisher said he was very humbled to receive this honour but asked if the feature might be known as 'Bob Fisher Ridge'. The meeting was pleased to accept this minor change and showed its appreciation for the honour to Dr. Fisher with warm applause.

7. SCOR WG 107 IMPROVED GLOBAL BATHYMETRY - REPORT ON ACTIVITIES

95 Mr Hunter said that Dr. Colin Summerhayes, Chairman SCOR WG 107, had asked all members of the WG to send final contributions for the preparation of the first draft text, expected by August 1999, and for subsequent revision by members.

96 Sir Anthony Laughton said this Working Group initiative is seeking to identify, on behalf of IOC, those areas which are under-surveyed. The report should make a case for focussing survey efforts in crucial parts of the world's oceans. Since IOC has a mandate to improve bathymetry, this report can, and should, be used to influence ship expeditions for future data collection.

8. IHO REPORTS ON GEBCO RELATED ACTIVITIES

8.1 Global Spatial Data Infrastructure (GSDI)

97 Ing.en chef Michel Huet explained that GSDI was a worldwide initiative led by an European body active in promoting geographic/geospatial information links with US and Canadian organisations with a goal of 'co-ordination' and 'harmonisation' rather than 'centralisation'. These groups were working together to establish a world-wide structure to maximise geospatial data sets, appropriate software tools and standards. No formal organisational structure exists at present.

98 Dr. Michael Loughridge gave a brief account of parallel activities in the USA where the Federal Government Data Committee (FGDC) mandated that data bases and data exchanges should be governed by FGDC standards. He said although this requirement turned the world of metadata upside down it was probably wise of GEBCO to keep aware of the efforts to ensure that generated data is at least translatable into standard compliant formats.

99 Dr. Meirion Jones said he was aware of work in Europe which ignored FGDC standards. He suggested that any data with a 'time' element was difficult to straightjacket and it was often impracticable and unnecessarily complicated to use FGDC standards.

100 RAdm. Guy suggested that this initiative may have future implications for GEBCO. He added that the next GSDI meeting will be held in Cape Town in 2000 - although no IHB representation was planned. GSDI web site: http//www.eurogi.org/gsdi/

8.2 Continental Margin Data

101 RAdm. Neil Guy introduced IHO Circular Letter 43/1998 dated 2 October 1998 together with a summary of replies. He explained that the letter, inviting Member States to release their data to GEBCO, was written in response to concerns raised at the GEBCO Officers meeting in March 1998, where it was agreed that GEBCO did not adequately represent sea floor topography up to the shore line. He said that the results from the request for the release of continental margin data by the Member States had been generally encouraging. 67% of responders had opted for category *b) Only the 0, 10, 20 or 25, 50, 100, 150 and 200 metre bathymetric contours to be provided for inclusion in the GDA;* the remaining 33% for category *c), "The contours are retained by the Hydrographic Office but are available on request."*

102 Mr. Peter Hunter reported on an informal meeting with the UKHO where he demonstrated the results of digitising a portion of the contours from a 1: 500,000 scale chart of the Bristol Channel. The datum for the contours was subsequently reduced from LAT to MSL from which a 2.5 minute grid was produced. Comparison of the contours on this plot against those from the original chart clearly demonstrated that the two versions bore almost no resemblance. The experiment was a compelling argument against commercial espionage and demonstrated that GEBCO was not seeking to replicate navigational contours in any way whatsoever. MSL data or grids would suffice for GEBCO purposes.

103 Dr. John Hall said that even if grids are put out in much finer detail than GEBCO require, the data can be easily hidden. Gridding provided the way to overcome the problem of supplying such shallow water data without compromising the HOs.

104 Ingénieur général de l'armement Patrick Souquière indicated that SHOM had no objection to releasing a grid of their data when ready.

105 Clarifying the IHO position RAdm. Guy said it would go back to the Member States asking all of them to permit GEBCO to use charted data at scale < 1: 500,000 and, additionally, to supply details of vertical datums in order to permit data conversion to MSL. Alternatively, if digital data or grids are supplied, these should be sent direct to Ms Pauline Weatherall, GEBCO Digital Atlas Manager, BODC.

8.3 IHO 10-Year Strategic Plan - Implications for GEBCO

106 RAdm. Guy reported that a Working Group will meet in October 1999. One of their tasks will be to put into operation plans for an intensive Conference to discuss the Strategic Plan. This is likely to take place sometime in the spring of 2000. One of its aims will be to define the relationship between the Member States and GEBCO and to develop capacity building so that data held by HOs can be used for other products.

9. UNITED NATIONS INTERACTIVE ATLAS OF THE OCEANS

107 Unfortunately, because of the lack of HDNO representation it was not possible to glean any more direct news on this project.

108 Mr. Tony Pharaoh, IHB, said that two members of the food and Agriculture Organisation (FAO) had visited Monaco with a proposed database designed to support fishing activities. Although FAO had already produced a CD-ROM of the Mediterranean they thought it was unlikely that they could complete the remainder of the project within its allotted time frame. Accordingly, they had sought the help of IHB to obtain or supply more detailed bathymetry in coastal waters. Meanwhile, the FAO had also sought the help of HDNO to supply this data as part of their contribution to the United Nations Interactive Atlas of the Oceans. These activities were recorded in correspondence during June 1999, between FAO, IHB and IOC. Sir Anthony Laughton asked Mr. Peter Hunter to bring this correspondence to the attention of Dr. Colin Summerhayes, Chairman SCOR WG 107.

109 Dr. Arne Nielsen reported that a similar Fisheries Data Base product is being built by Norway, UK and Denmark. Other countries around the North Sea have been asked to contribute. Additionally, Canada, Greenland and USA will also become involved.

110 The meeting expressed great interest in the promise of the reported contribution of data by the Russians and asked that details could be made available to GEBCO. The Chairman noted that, in his letter of 14 June 1999, RAdm. Angrisano had stated the IHB's opinion that the FAO requirement should be forwarded to the GEBCO Guiding Committee and to the Chairmen of the Editorial Boards of the six IBC Mapping Projects.

111 Sir Anthony Laughton said he will await news from the IOC. In the meantime he would welcome some concrete information on the proposed supply of data by the HDNO.

10. CONTINENTAL SHELF AND OTHER DEFINITIONS UNDER UNCLOS

112 Dr. Gallo Carrera addressed the meeting in his personal capacity rather than directly in his role as a member of the United Nations Commission on the Limits of the Continental Shelf (CLCS). He thanked the Chairman for his kind invitation to meet members of the GEBCO Community and for extending his offer to attend the Guiding Committee meeting which he found extremely interesting and useful.

113 He added that during the previous week he was also indebted to Drs. Jones and Fisher who had permitted him to witness SCDB and SCUFN at work. As a result of attending these meetings he had a number of observations to make which were directly connected to his work with CLCS.

114 Firstly, SCUFN, for which he had the following observations:

115 He said it is possible that States wishing to interpret the definitions of a number of undersea features mentioned in the United Nations Convention on the Law of the Sea, might wish to consult a number of sources in the scientific literature. One of these sources might be the list of definitions produced and updated by SCUFN. It would be perhaps appropriate and potentially useful, to revise

this list in order to make sure that all the undersea features mentioned in the Convention, now in force, are in fact defined in it.

116 He added that it is understandable and desirable that the definitions contained in the list compiled by SCUFN be generic and broad in nature. This is a worthy objective to the extent that the simplification of a definition is such that it still helps maintain a substantial informative value, which might help its understanding, recognition and application.

117 Dr. Carrera suggested that various definitions of terms, such as continental margin, have been made exclusively from a morphological perspective but they have been substantially modified by new data and ideas in the context of geology and geophysics. He said it might be useful to explore in SCUFN a definition for the continental margin which might take into account these new data and ideas.

118 He stated that in recognition of the fact that different national and international organisations may have assigned different names, for various reasons, to a given undersea feature over time, the CLCS has indicated in its Scientific and Technical Guidelines that it will not follow any one source as a guide for the definition and use of names of undersea features. Instead, it will consider the terminology employed by a submitting State but it will make its own recommendations on the limits of the continental shelf solely in view of all the supporting data provided on a case by case basis.

119 Secondly, SCDB, for which he added the following comments:

120 Dr. Carrera congratulated those involved with the work of the SCDB and in particular for the compilation and progress of the GEBCO Digital Atlas (GDA). He affirmed his belief that the soon-to-be available Third Release of the GDA, otherwise known as 'GEBCO 2000', will be of great assistance to many scientists charged by their countries with the task to compile the best available preliminary bathymetric data set and track line data in a given region of the world.

121 He went on to suggest that there might be a useful application, in particular, for the Third Release of the GDA vis-a-vis the implementation of article 76 of the UN Convention on the Law of the Sea by States. He explained that the preparation of continental shelf submissions to the CLCS is carried out by States as an iterative process. The first step usually taken by States is one in which the feasibility of a claim alone is investigated. This step involves the clarification of the following question by the scientists of a given State:

122 What is the breadth of the outer limit of our continental shelf based on all the provisions contained in article 76 of the UN Convention on the Law of the Sea according to limited but existing data?

123 He said that as a session convenor for the forthcoming ABLOS Conference, Monaco, September 1999, he would like to invite Dr. Jones to give a paper, the purpose of which would be to investigate the potential usefulness of the 3rd Release of the GDA as a tool to answer specifically the above initial question in various regions of the world.

124 In conclusion, Dr. Carrera said it is clear that it is not necessary to open any official channels of communication between GEBCO and the CLCS at this time. However, he pledged his support for any future initiatives which, in a spirit of co-operation, might be designed to establish communication links if and when both organisations feel that these links are necessary and appropriate under their terms of reference.

125 Sir Anthony Laughton thanked Dr. Carrera for his comprehensive review of the progress of work on UN Article 76 and how it may have implications for GEBCO. He said that from a GEBCO point of view it was very important to preserve a degree of independence from CLCS, maintaining

a strict scientific basis for its products, such as the GDA, which are useful tools for those seeking information. He said in recognising that the imprecisions surrounding UN Article 76 were deliberate, GEBCO would nevertheless watch UNCLOS developments with a special interest.

126 He added that the IOC/IHO publication *"Sovereign Limits Beneath the Oceans Delimiting the New Continental Shelf ",* a book written to interpret Article 76 of the United Nations Law of the Sea (UNCLOS), would be presented at the above ABLOS Conference. Several contributions to this publication had been made by members of the GEBCO community.

127 Speaking about terms and definitions of Undersea Feature Names, Dr. Fisher stated that the GEBCO mandate for naming features would not suit UNCLOS requirements. He added that the background and expertise of the SCUFN Sub-Committee was equipped to make specific applications to broadly written guidelines for long term use. Although this arrangement ideally suited GEBCO's purposes, he conceded that UNCLOS may have to find their own short-term solutions to identify some specific features.

11. GEBCO CENTENARY PLANS

128 Mr. Desmond Scott introduced this item by explaining that there were three separate elements to the GEBCO Centenary Plans. A formal committee had been set up to plan two of these: 'Centenary Conference' and 'Other Commemorations'. Centenary Organizing Committee (COC) members were given as: Sir Anthony Laughton, RAdm. Neil Guy,
M. Laurent Anselmi (Monegasque Government), Mr. Desmond Scott and Mr. Brian Harper.
He added that the planning work for the publication of two books, closely linked to the centenary, was his responsibility. (See Annex VIII)

129 Mr. Scott added that the Monegasque Government, IOC and IHO were co-sponsors for the celebration events with additional support given by IGU. In addition, ICA, CGMW, SCOR, IAPSO, ICSU, and FIG will be asked if they wish to be involved.

11.1 Centenary Conference

130 Mr. Scott explained that the Conference, planned for April 2003, will last for 2-3 days. It will embrace the history of GEBCO, its development phases to the present day and conclude with a key presentation on: 'Ocean Mapping in the 21st Century - the Future'. It is hoped to hold the conference in the new Grimaldi Conference Centre in Monaco (See Page 3, Annex VIII).
Dr. Gallo Carrera suggested that the conference planners might consider a topic such as the role of bathymetry in international maritime law and UN Article 76.

131 Dr. Loughridge warned that there were several changes of key players in the process particularly in the final year - planning across boundaries needs continuity of purpose. In response, RAdm. Guy said that although he will not be a member of the new Directing Committee from September 2002, provisions have been made to employ existing members of the Directing Committee on a consultative basis for a period. He stressed the importance of GEBCO to IHB and its position in Monaco.

132 The need to form a Finance Committee to deal with exhibition fees, sponsorship contributions and general expenditure was accepted. Much discussion also took place about identifying the prospective audience and ways of advertising the event; these ideas will be considered by the organising committee who will meet again soon. It was agreed that, if possible, speakers should be funded for their fares and accommodation.

133 RAdm. Guy stressed the importance of GEBCO to the Bureau and said the IHB would do everything in its power to ensure a successful centenary celebration. The Bureau would undertake

the Conference administration and cover the costs.

11.2 Publications

134 Mr. Scott reminded the meeting that two separate publications were planned. The first of these, provisionally known by its working title as 'The Official History of GEBCO', will be published in 2003. For updates on the production stages for that book - see Page 4, Annex VIII. The second, envisaged as a popular book, will be written by a commercial author using material from the first, but directed toward the general public; it is scheduled for publication in 2005.

135 He reported the discovery, in the archives of the Oceanographic Museum, Monaco, of a photograph showing the first meeting of the first GEBCO Committee Commission de nomenclature sous-océanique), with Prince Albert 1er in the chair, taken at Wiesbaden, 15 April 1903. The photograph will be included in 'The Official History'.

136 He added that the authors of the various sections had been appointed, with a working deadline of 2002. Gleb Udintsev, a member of the Nomenclature Committee in 1963, will provide details of the Russian input.

11.3 Other Commemoration Events

137 Mr. Scott, spoke briefly about other possible associated events. Chief among these was a proposed display of all the editions of GEBCO including a sixth edition and a running demonstration of the GDA. Other ideas included commemorative stamp issues, film, TV and radio coverage.

138 He announced that a design for a Centenary celebration logo had been commissioned.

12 THE FUTURE OF GEBCO

12.1 The next generation of GEBCO

139 Sir Anthony Laughton, Chairman GEBCO introduced his paper entitled 'The Future of GEBCO - Ideas for Discussion.' In writing the paper he said he had tried to think ahead as to what GEBCO is likely to become and what problems were liable to occur. He stressed that the questions raised were primarily for discussion rather than seeking solutions.

140 He explained that a great deal of voluntary effort had enabled GEBCO to flourish. However, noting that the passing of that older generation, who worked in a classic paper chart method, was fast approaching, he asked where are the younger generation that might get involved in taking the GEBCO programme forward.

141 Sir Anthony Laughton said that unless the GEBCO products can be shown to be steadily improving, and meeting the needs of the scientific and commercial communities, the funding from IOC and NERC could be in jeopardy.

142 He went on to identify six specific problems and five alternative ways ahead, some of which included some element of self funding ideas.

143 In the lengthy discourse which followed it became evident that the provision of the best available set of deep water bathymetric contours had not caught the general imagination of fund holders. Instead, GEBCO, which was very poorly funded, relied on voluntary support to keep it operating. It was suggested that the scientific community was pleading for a grid of GEBCO data primarily for climatic and global change research, at a time when not one cent of the considerable budget for their work ever found its way to GEBCO.

144 In recognising that there was a reluctance to fund work which was not cutting-edge, it was agreed nevertheless that the latest climate research had to have a strong bathymetric component and that fact should be understood by the funders for this research. Hopes were expressed that the SCOR WG 107 Report would directly address these issues. The clear message emerged that it was necessary to influence science funding policy.

145 He went on to point out that GEBCO might soon be in the position to need to fund someone to compile or update a GEBCO Sheet but have no financial provision to do so. RAdm. Guy observed that other users of the data such as pipeline or cable laying consortia might be in a position to help.

146 In summary, the Chairman said he recognised the value of the patronage approach for it had been the very cause of bringing GEBCO into being. He agreed that the Guiding Committee needed to formulate its image of GEBCO, explore the prospect of pro-active marketing and seek to increase its commercial application.

12.2 The use of GEBCO in commercial products

147 Continuing on the theme of self financing initiatives Sir Anthony Laughton re-opened the dialogue held in the GEBCO Officers meeting in New Zealand in March 1998, on the possibility of providing an educational component of the GDA for sale to schools and colleges. As well as a degraded version of the GEBCO grid, the educational model could demonstrate geo-tectonic activity and other features not found in the parent product. He suggested that this may require setting up a joint venture with a commercial organisation with a proven market capability.

148 Dr. Jones said there was very little imagery available to schools about the nature of the deep oceans - a light blue sea revealed nothing. However, he went on to report that during a recent visit to BODC, a teacher and school children were confronted with the three-dimensional experimental map of GEBCO contours in waters off the coast of Portugal - huge interest was shown in the contents of the map. He added that a Gridded version of the GDA together with topographic data would provide a basis for an excellent teaching tool into which other software applications could be incorporated.

149 There was enthusiastic support for the concept of an educational spin-off from the Third Release of the GDA . During lengthy deliberations many points arose over the possible content for the proposed product and how it might be marketed and sold. Additionally, a number of organisations were identified which may have advice to offer.

150 In concluding the discussion on the topic of the Educational GDA, Sir Anthony Laughton said it had been a very useful exchange of views. The justification for proceeding with this venture lay solely with the need to provide a reserve from which GEBCO could underwrite mapping activities and support other bathymetric science activities. It was arranged that a small working party be set up to draw the content of the debates together and develop a detailed description of the product together with proposals for its marketing, pricing policy and financial controls. A small working group was formed comprising: Dr. Jones, Dr. Carron, Mr. Cherkis, Mr. Hadjiantoniou and Mr. Harper. The latter volunteered to start the process by passing some initial ideas to the group. Dr. Loughridge offered to operate another NGDC list server to facilitate the operation of the working group.

151 Speaking of the Second Release of the GDA, Dr. Jones raised the issue of copyright. He reported two approaches to him by commercial companies wanting to incorporate the GDA into their own products. He had sought advice from IHO. RAdm. Guy said he was aware of these problems and the need to balance the interests of the Member States and GEBCO against the legitimate wishes

of such commercial companies as SevenCs, with whom the IHO was actively engaged in discussion on other topics.

152 Sir Anthony Laughton said these approaches raised the difficult issue of licence agreements, royalties and appropriate conditions of use. Dr. Schenke added his concerns about the proposal by SevenCs to use coastline data, particularly that produced by SCAR.

153 RAdm. Guy said that he understood the real concerns raised by the GEBCO community and added that while it was the intention of the Bureau to seriously consider the SevenCs proposals, or any others, it would do so with the full consultation of Member States and a promise to report back fully to GEBCO.

13. RESOLUTION ON OCEAN MAPPING ADOPTED BY THE 20TH SESSION OF THE IOC ASSEMBLY, PARIS, 29 JUNE- 9 JULY 1999

154 Mr. Peter Hunter introduced the draft Resolution to be presented to the IOC Assembly in Paris. Sir Anthony Laughton responded by saying that GEBCO was very happy to support this resolution, and that, furthermore, the contents may well be helpful to the IHB in the context of their proposed Circular Letter to Member States on the subject of the release of continental margin data for use in the scientific community. A copy of the final approved Resolution is attached as Annex XIV.

14. DATES AND PLACES FOR THE NEXT MEETINGS

14.1 Year 2000: Twelfth Meeting of GEBCO Officers

155 An invitation to host this meeting and the linked SCDB was kindly made by Dr. Arne Nielsen on behalf of the Royal Danish Administration of Navigation and Hydrography. The Chairman thanked Dr. Nielsen for his unexpected and welcome invitation which permitted another co-located session with the IBCAO team. He said these combined GEBCO meetings required four days rather than the present six. He also asked if the date of the meeting could revert to the usual period in spring thus avoiding local holidays and resultant high cost air fares. Dr. Nielsen said he would examine the available dates and send the Chairman a formal invitation.

14.2 Year 2001: Eighteenth Session of GEBCO Guiding Committee

156 Dr. Kunio Yashima conveyed the wishes of the Japanese Hydrographer and Mr. Shin Tani that this meeting of the Guiding Committee and its two Sub-Committees be held in the offices of the Hydrographic Department of Japan. Sir Anthony Laughton said the Guiding Committee was delighted to accept this kind invitation to visit Japan and see some of the work going on in that region of the world. He hoped the venue would also prove attractive to Chinese and Russian scientists who have an interest in the progress of GEBCO. No dates were discussed.

14.3 Year 2002: Thirteenth Meeting of GEBCO Officers

157 On behalf of the Diretoria de Hidrografia e Navegação, Brazil, Commander Luis GONZAGA Campos extended a warm invitation to the GEBCO Officers and SCDB to hold their meetings in Rio de Janeiro. The Chairman thanked Commander Gonzaga for his generous offer and said these meetings will hopefully give an opportunity for additional scientists from other South American countries to meet their contemporaries and see first hand how GEBCO is developing.

158 RAdm. Guy remarked the next IH Conference was scheduled for April 2002.

14.4 Year 2003: Centenary Session of GEBCO Guiding Committee

159 The Guiding Committee Session and the two Sub-Committee meetings will be held at the offices of the IHB, Monaco, immediately prior to the GEBCO Centenary Conference in April.

15. ANY OTHER BUSINESS

160 There was no further business.

16. CLOSURE OF THE MEETINGS

161 The Chairman closed the session of the Guiding Committee at 3.40 pm on Wednesday 30 June 1999. He thanked the Directors and staff of the Geological Survey of Canada for their warm hospitality and gave special thanks to Mr. Ron Macnab for all his considerable organisational efforts before and during the meeting and for his, and his wife's, generous hosting of the GEBCO party. He was also grateful for the provision of a well-equipped meeting room, and the plentiful support services that had been provided.

162 He closed by thanking Dr. Meirion Jones, Chairman SCDB, and Dr. Bob Fisher, Chairman SCUFN for their continued and most valuable work on behalf of GEBCO and said he looked forward to meeting the participants in Copenhagen next year.

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ANNEX I

AGENDA

1. OPENING OF THE MEETINGS

2. CONDUCT OF THE MEETINGS
   - 2.1 Adoption of the Agenda
   - 2.2 Documentation; Administrative Arrangements, etc.

3. COMPOSITION OF THE GUIDING COMMITTEE AND ITS SUB-COMMITTEES
   - 3.1 Guiding Committee
   - 3.2 Sub-Committee on Digital Bathymetry (SCDB)
   - 3.3 Sub-Committee on Undersea Feature Names (SCUFN)
   - 3.4 Scientific Advisers
   - 3.5 GEBCO Reviewers
   - 3.6 General Review of the GEBCO Personality List

4. MATTERS ARISING FROM REPORTS OF PREVIOUS MEETINGS:
   - 4.1 Summary Report of the Sixteenth Session of the joint IOC - IHO Guiding Committee for the GEBCO (doc IOC - IHO/GEBCO - XVI/3)
   - 4.2 Summary Report of the Eleventh Meeting of the joint IOC - IHO GEBCO Officers (doc IOC - IHO/GEBCO Officers - XI/3)

5. REPORT BY THE CHAIRMAN OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY (SIXTEENTH MEETING, GEOLOGICAL SURVEY OF CANADA, DARTMOUTH, 23-25 JUNE 1999)
   - 5.1. GEBCO ACTIVITIES
     - 5.1.1 The GEBCO Digital Atlas - Sales and Distribution
     - 5.1.2 The GEBCO Bathymetric Editor - Report
     - 5.1.3 The GEBCO Digital Atlas Manager - Report
     - 5.1.4 Update on the work of the GEBCO Grid Working Group
     - 5.1.5 New Mapping and Technical Changes identified for inclusion in the Third Release of the GDA
     - 5.1.6 GEBCO Guidelines
     - 5.1.7 GEBCO Reviewing System
   - 5.2 Future Development of GEBCO Products
     - 5.2.1 Digital Techniques for Labelling Undersea Feature Names
     - 5.2.2 Derived Products from GDA
     - 5.2.3 GEBCO Web Site
     - 5.2.4 GDA Promotion

6. REPORT BY THE CHAIRMAN OF THE SUB-COMMITTEE ON UNDERSEA FEATURE NAMES (THIRTEENTH MEETING, GEOLOGICAL SURVEY OF CANADA, DARTMOUTH, 22-25 JUNE 1999)
   - 6.1 List of Generic Names
   - 6.2 Report of Intersessional Activities
   - 6.3 Report of SCUFN-XIII.

7. SCOR WG 107 IMPROVED GLOBAL BATHYMETRY - REPORT ON ACTIVITIES

8. IHO REPORTS ON GEBCO RELATED ACTIVITIES

8.1 Global Spatial Data Infrastructure (GSDI)
8.2 Continental Margin Data
8.3 IHO 10-Year Strategic Plan - Implications for GEBCO

9. UNITED NATIONS INTERACTIVE ATLAS OF THE OCEANS

10. CONTINENTAL SHELF AND OTHER DEFINITIONS UNDER UNCLOS

11. GEBCO CENTENARY PLANS
11.1 Centenary Conference
11.2 Publications
11.3 Other Commemoration Events

12 THE FUTURE OF GEBCO
12.1 The next generation of GEBCO
12.2 The use of GEBCO in commercial products

13. RESOLUTION ON OCEAN MAPPING ADOPTED BY THE 20TH SESSION OF THE IOC ASSEMBLY, PARIS, 29 JUNE- 9 JULY 1999

14. DATES AND PLACES FOR THE NEXT MEETINGS
14.1 Year 2000: Twelfth Meeting of GEBCO Officers
14.2 Year 2001: Eighteenth Session of GEBCO Guiding Committee
14.3 Year 2002: Thirteenth Meeting of GEBCO Officers
Year 2003: Centenary Session of GEBCO Guiding Committee

15. ANY OTHER BUSINESS

16. CLOSURE OF THE MEETINGS

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ANNEX II

LIST OF DOCUMENTS, PAPERS & MAPS

Documents *

IOC-IHO/GEBCO-XVII/1 prov	Provisional Agenda
IOC-IHO/GEBCO-XVII/2	Annotated Agenda (Chairman only)
IOC-IHO/GEBCO-XVII/3	Summary Report of the Session
IOC-IHO/GEBCO-XVI/3	Summary Report of the sixteenth session of the GEBCO Guiding Committee, Hydrographic Office, Taunton, UK, 23-25 June 1997
IOC-IHO/GEBCO Officers-XI/3	Summary Report of the eleventh meeting of the GEBCO Officers, IGNS & NIWA, New Zealand, 12-17 March 1998
B-7	Guidelines for the GEBCO (excepting Part 4)
GEBCO Personality List	Revised 24 May 1999

* For reference only. Only stocks of Summary Reports of Sessions are maintained.

The following papers and maps were tabled for the consideration of the meeting:

Papers

- The GEBCO Bathymetric Editor - Annual Report (see Annex IV)
- List of Maps for the GEBCO Digital Atlas (See Annex V)
- The GEBCO Digital Atlas Manager - Annual Report (see Annex VI)
- GEBCO Digital Atlas - Distribution/Sale (see Annex VII)
- Outline Plans for the GEBCO Centenary (see Annex VIII)
- Report of the Grid Working Group to the GEBCO SCDB, 23-25 June 1999, (see Annex IX)
- GEBCO Grid Working Group Notes - 24 March 1999
- Draft Minutes of the Grid Working Group to the GEBCO SCDB, 9-10 July 1998
- National Geophysical Data Center & IHO/DCDB - 3-part report to GEBCO.
- National Geophysical Data Center - International activities - 2-part report
- National Geophysical Data Center - Internal activities - 3-part report
- Review of the International Bathymetric Chart of the Mediterranean and its Geological - Geophysical

Series (IBCM)

- Review of the International Bathymetric Chart of the Western Indian Ocean (IBCWIO)
- Review of the International Bathymetric Chart of the Western Pacific (IBCWP)
- Review of the International Bathymetric Chart of the Arctic (IBCAO)
- Review of the International Bathymetric Chart of the Caribbean and the Gulf of Mexico (IBCCA).
- Review of the International Bathymetric Chart of the Central Eastern Atlantic (IBCEA)
- British Oceanographic Data Centre - Annual Report 1997-98.
- List of World Wide Seafloor Swath-mapping Systems. (copies available from Norman Cherkis)
- Global Spatial Data Infrastructure: Policy and Organisational Issues
- World Vector Shoreline Plus (WVSPLUS) - NIMA
- Digital Nautical Chart (DNC) - NIMA
- Tsunami Researchers Outline Steps for Better Data - Harry Yeh
- Simple Approach to the Creation of Digital Evaluation Models Based on Isobaths - Schenke & Dijkstra
- IHO Circular Letter 43/1998 - GEBCO: Continental Margin Data
- President of the Directing Committee IHO - copy of letter to Dr Patricio Bernal, Executive Secretary IOC, 14 June 1999 - Coastal Data etc
- Physiography of the Southwest Indian Ridge - Fisher & Goodwillie
- Report to GEBCO SCDB - Walter Smith (see Annex XII)
- New Bathymetric Charts of the Weddell Sea - AWI BCWS
- The Future of GEBCO - Laughton
- Undersea Feature Terms and Definitions - SCUFN-XIII - June 1999
- International Conference notification - Technical Aspects of Maritime Boundary Delineation and Delimitation, including UNCLOS Article 76 Issues - IHB, Monaco, 9-10 September 1999
- GLOBE: Global Land One-kilometer Base Elevation - Version 1.0 - NOAA

- Draft Resolution on Ocean Mapping presented by CGOM to the 20th Session of the IOC Assembly, Paris, 29 June - 9 July 1999

Maps

- Western Indian Ocean: physiography (grid and track plot - each 2 sheets) @ 1:5,000,000. 36°S – 27°N, 20°E –70°E,- Fisher & Goodwillie

- Northeast Atlantic - working plot of bathymetric contours –32°- 38°N, 5°- 15°W- Hunter

- Northeast Atlantic- Draft IBCEA Sheet 1.04 @1:1,000,000. 32°- 38°N, 5°- 15°W (1999) - Hunter

- Northeast Atlantic - Draft of Bathymetry and Tracks@1:2,400,000. 20°- 30°N, 20°- 50°W (1999) - Hunter

- Ross Sea - Plot of Bathymetric contours @ 1: 2,000,000. 70°S-80°S, 160°W-160°E - taken from Antostrat Project CD-ROM - Hunter

- Cyprus: Hypsometry @ 1:250,000, based on 25m DTM (1998) - Hall

- Mediterranean and Black Seas: Unconsolidated Bottom Surface Sediments IBCM @1:5,000,000 (1997) -Hall

- Israel and Adjacent Areas - Landforms @1:500,000 (1997) Hall

- Arctic - Poster comparing GEBCO 5.17 and profiles from SCICEX - 65□N- North Pole - Monahan & Coakley

- Arctic Basin - Shelf contours of Siberian Region and adjacent oceans including shaded relief model @ various scales 60°N - North Pole, 90°E-180° (1999) - Cherkis & Jakobsson

- Taiwan region - Bathymetry @1:800,000. 20°- 26°N, 117°- 124°E (1998) - Cherkis & McDonnel

- Antarctica: Southern Weddell Sea Bathymetry @1:1,300,000. 66°- 78.30°S, 2°- 66°W (1998) - AWI

- Antarctica: Southern Weddell Sea Escarpment Exploration @1:1,000,000. 72°- 66°S, 25°W – 0° (1999) - AWI

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ANNEX III

LIST OF REVIEWERS

Antarctic Waters south of 46□40'S	Hans-Werner Schenke	Accepted
North Atlantic Ocean (excluding Caribbean Sea & Gulf of Mexico)	Peter Hunter David Monahan	Accepted Accepted
Caribbean Sea & Gulf of Mexico	Troy Holcombe	Accepted
Mediterranean & Black Seas	John K Hall Andrey Popov	Accepted Accepted
Arctic Ocean	David Monahan & Valeriy Fomchenko	Accepted Accepted
South Atlantic Ocean	Norman Z Cherkis Marco Antonio de Carvalho OLIVEIRA	Accepted Accepted
Indian Ocean	Robert L Fisher	Accepted
North-west Pacific Ocean	Gleb B Udintsev Alexander Svarichevskiy	Accepted Accepted
Central west Pacific Ocean	Kunio Yashim	Accepted
South-west Pacific Ocean	Alfred Simpson	Accepted
North-east Pacific Ocean	George Sharman	Accepted
Central east Pacific Ocean	Juan GARCIA Abdeslem Luis DELGADO Argote	Accepted Accepted
South-east Pacific	Patricio CARRASCO Hellwig	Accepted
New Zealand region	Ian Wright	Accepted

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ANNEX IV

REPORT OF THE GEBCO BATHYMETRIC EDITOR, MARCH 1998 – JUNE 1999

Meetings attended

The International Workshop on Bathymetry and Coastal – Topography Data Management, University of Washington, Seattle, USA, March 1998.

A report is contained as Annex XII to the last minutes of the GEBCO officers Meeting – XI/3. A second workshop has been arranged for the evening of July 28, at IUGG 99 in Birmingham, UK. It will focus on data collected by narrow-beam echo sounders.

The seventh session of the Consultative Group on Ocean Mapping, at the offices of the IHO, Monaco, 12 – 14 April 1999.

Bathymetry compilations

International Bathymetric Chart of the Eastern Atlantic

IBCEA sheet 1.04 has been completed and digitized by BODC. (Displayed at this meeting).

IBCEA sheet 1.05 was completed but the area around the main islands is being revised following a new SOC compilation that includes other data including new multibeam bathymetry. This will be sent to BODC.

SOC Bathymetry of the North-east Atlantic

Bathymetry for an area stretching west from 20°W to include the Mid-Atlantic Ridge (~ 50°W), and between 20°N and 30°N has been scanned for digitizing by BODC. (Displayed at this meeting).

Bay of Biscay

Work has begun on adding the 500 metre interval contours to the compilation of Dr J-C Sibuet.

The continental shelf around the United Kingdom

A small area of chart BA 1121, part of the Bristol Channel, was digitized by BODC; the scale of the chart was 1:500 000. It was used to show the UK Hydrographic Office that contours digitized from medium scale charts along with selected depths, and gridded at 2.5 minutes (as selected for the GEBCO grid) would not replicate the UKHO's contours very well. The resulting grid was sufficient to depict the seafloor for GEBCO purposes.

Interesting Web-sites

A http://www.monumental.com/rshorne/3dem.htm there is a freeware programme called 3DEM that performs terrain visualisation and flyby animations. It uses, amongst many other data sources, GMT derived grids as input.

Although it is fairly rudimentary it does create very realistic views of the datasets and basic flying operations over them.

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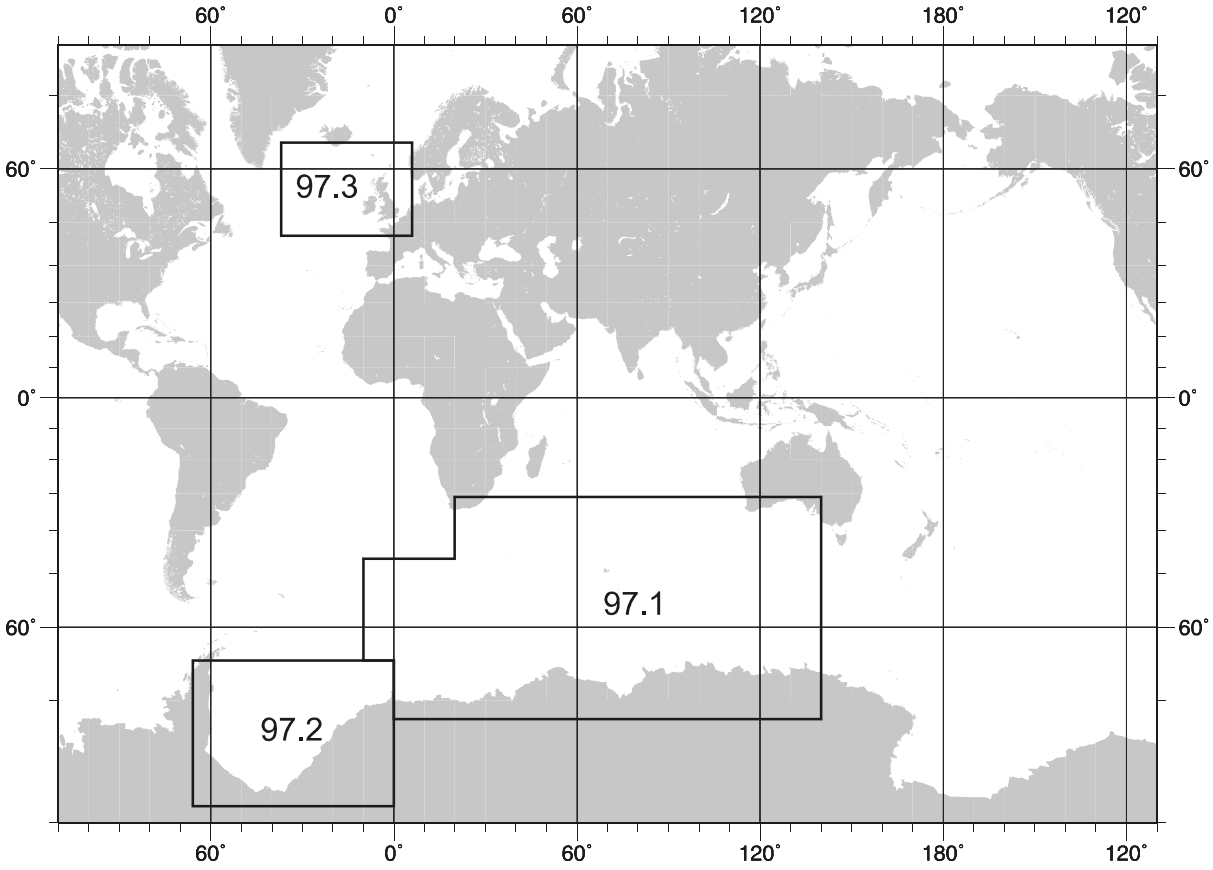
ANNEX V

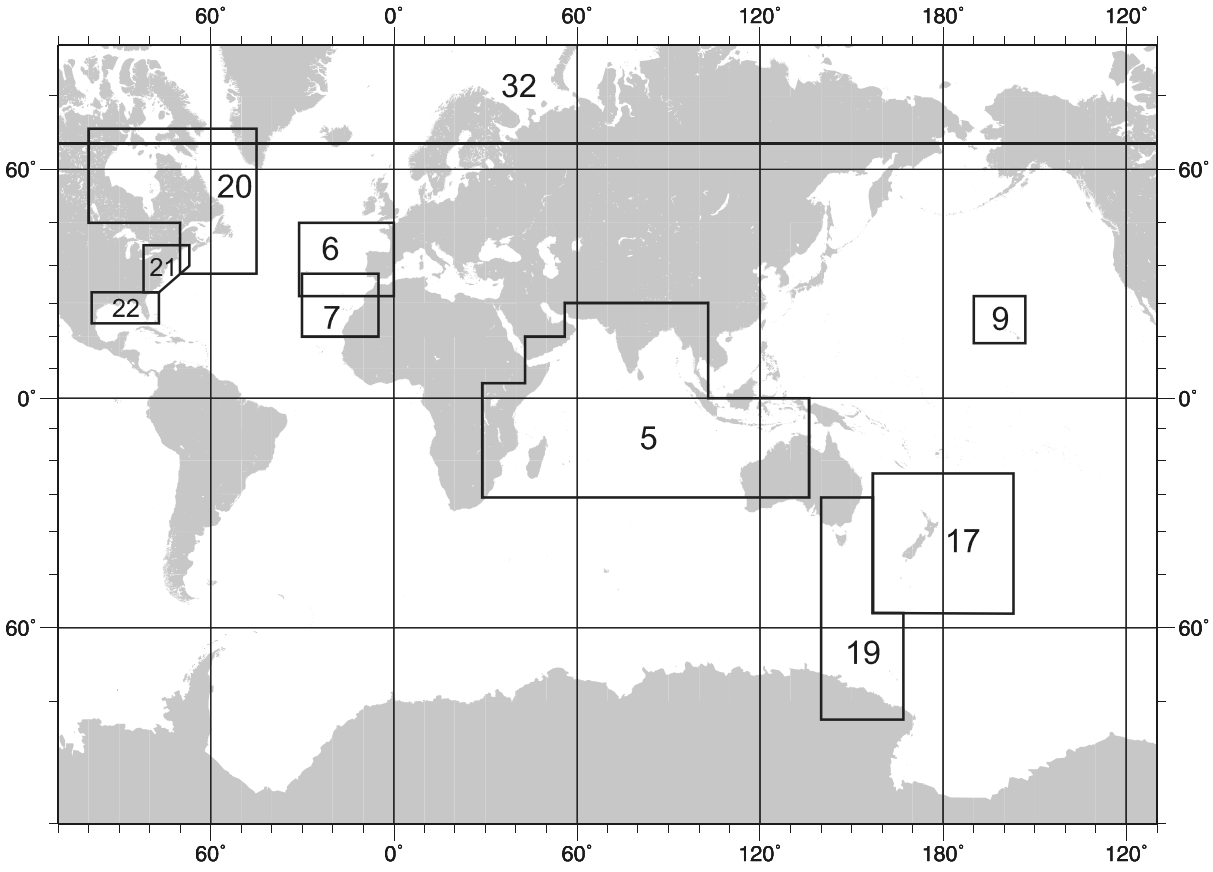
Maps included in the original and 1997 Editions of GDA And others (including grids) considered for the 2000 Edition

No.	Author	Source	Date	Title	Scale	Status
5.01 – 5.18	GEBCO	CHS	1975-84	General Bathymetric Chart of the Oceans	1:10,000,000	GDA
IBCM	EB-IBCM	IOC/IHO/ HDNO	1981	International Bathymetric Chart of the Mediterranean	1:1,000,000	GDA
5.12 Rev	Hunter PM et al.	CHS	1994	GEBCO Sheet 5.12 (Revised) – South Atlantic	1:10,000,000	GDA
97.1	Fisher RL	SIO		Bathymetry of the Southern Indian Ocean	1:1,000,000	GDA97
97.2	Schenke H-W et al.	AWI	1997	AWI Bathymetric Map of the Weddell Sea	1:250,000	GDA97
97.3	Hunter PM	IOS/SOC		Bathymetry of the Northwest Atlantic off the British Isles	1:1,000,000	GDA97
1	Cherkis NZ	NRL	1991	Bathymetry of the Barents and Kara Seas	1:2,313,000	GDA2000/1
2	Cherkis NZ & Vogt PR	NRL	1994	Regional Bathymetry of the Northern Norwegian – Greenland Seas	1:3,000,000	GDA2000/1
3	Matishov GG	MMBI/NRL	1995	Bathymetry Map of the Franz Josef Land Area	1:500,000	GDA2000/1
4	HDNO	HDNO	1995	GEBCO Plotting Sheet areas 593 & 594	1:1,000,000	GDA2000/1
5	Fisher RL	SIO		Bathymetry of the Northern Indian Ocean	1:1,000,000	GDA2000/1
6	Sibuet J-C	IFREMER		Bathymetry of the Bay of Biscay	1:1,000,000	GDA2000/1
7	Hunter PM	SOC		Bathymetry of the Northeast Atlantic	1:1,000,000	GDA2000/1
8	Mammerickx J	SIO	1992	Bathymetry of the Southcentral Pacific	1:6,442,194	GDA2000/2
9	Duennebir T et al.	HIGP	1995	Northwestern Hawaiian Islands	1:4,000,000	GDA2000/1
10	Keeton JA et al.	SOC	1997	Bathymetry of the Reykjanes Ridge	1:200,000	Unassigned
11	RIDGE	LDEO	1996	Northern Mid-Atlantic Ridge Terrain Model – Multibeam Survey Project	Grid	Unassigned
12	EQUARIDGE	Geol Inst RAS		Equatorial Atlantic	Various	Unassigned
13	Svarichevskiy A	Pac Oc Inst RAS	1995	Bathymetric Map of the Obruchev Rise	1:2,500,000	Unassigned
14	Svarichevskiy A	Pac Oc Inst RAS	1995	Bathymetric Map of the North-west Pacific Basin	1:5,000,000	Unassigned
15	Japan HD	JHD	1995	Continental Shelf Areas of Japan	1:1,000,000	Unassigned
16	Hsu S-K et al.	IFREMER	1996	Bathymetric Map Around Taiwan	1:1,600,000	Unassigned
17	CANZ	NIWA	1997	New Zealand Region Bathymetry	1:4,000,000	GDA2000/1
18	Fisher RL	SIO		Bathymetry of the Southeastern Indian Ocean (Update ?)	1:1,000,000	GDA2000/1
19	Fisher RL	SIO		Bathymetry of the Southeastern Indian Ocean	1:1,000,000	GDA2000/1
20	Macnab R	GSC		Bathymetry of Canadian Waters, including Hudson Bay		GDA2000/1
21	NGDC	NGDC		Bathymetry of the US East Coast	Grid	GDA2000/1
22	NGDC	NGDC		Bathymetry of the (US) East Coast and Gulf of Mexico	Grid	GDA2000/1
23	Japan HD	JHD	1998	Continental Shelf Survey Project	Grid	GDA2000/2
24	Henrys S	LINZ		Bathymetry of the Ross Sea		GDA2000/2
25	Hall JK	GSI		Bathymetry of the Red sea		GDA2000/2
26	Pardee D	HIGP	1999	Bathymetry of the Easter and Juan Fernandez Microplates	Grid 0,005°	Unassigned
27	Taiwan Littoral Project	ONR/NRL	1999	Bathymetry of the Taiwan Region	1:804,726	Unassigned
28	Schenke H-W et al.	AWI	1999	AWI Bm Chart of the Weddell Sea: AWI BCWS 553	1:1,000,000	Unassigned
29	Schenke H-W et al.	AWI	1998	AWI bm Chart of the Weddell Sea: Southern Weddell Sea	1:3,000,000	Unassigned
30	Russian Navy	HDNO/VNIIOk	1999	Bottom Relief of the Arctic Ocean	1:5,000,000	Unassigned
31	Lonsdale P	SIO		Various swath maps on the East Pacific Rise		Unassigned
32	IBCAO ed. Board	IOC/IHO		International Bathymetric Chart of the Arctic Ocean	Grid	GDA2000/1

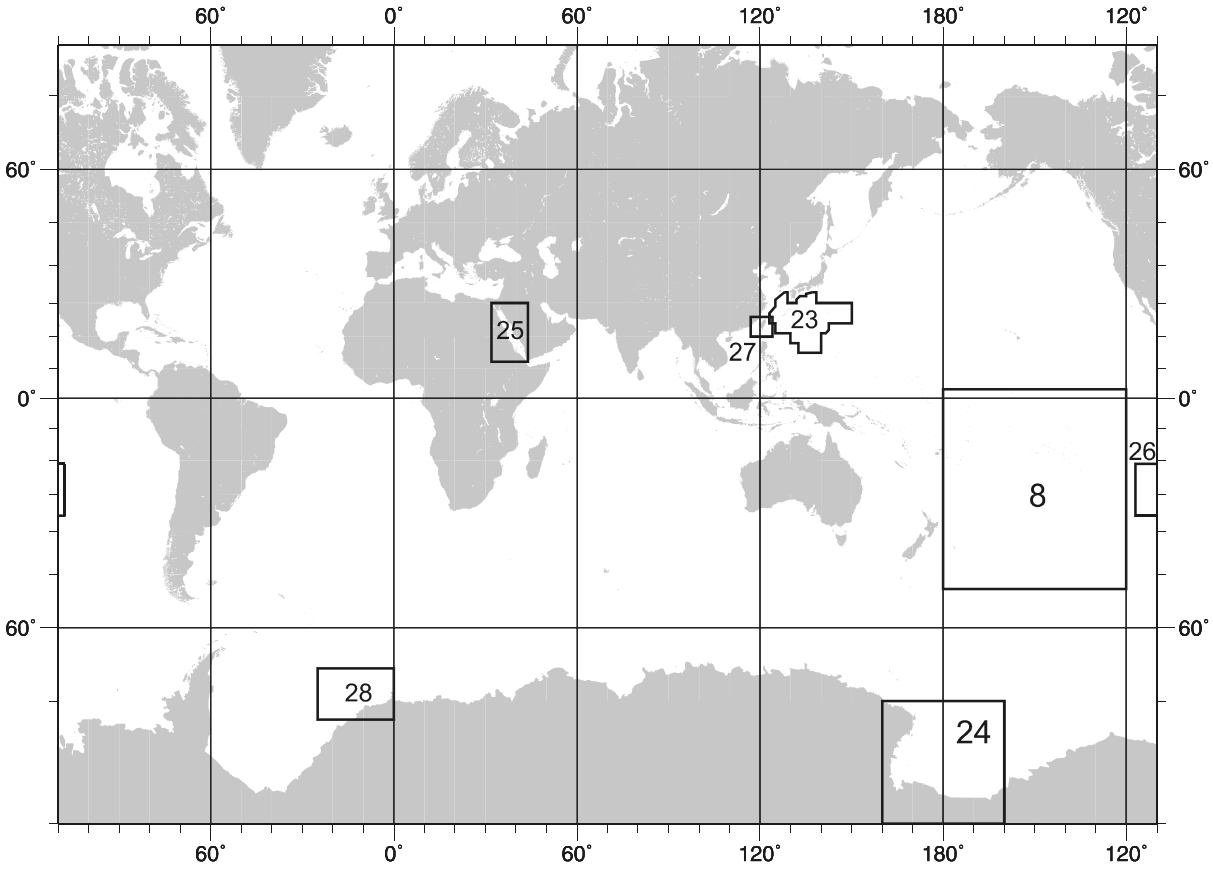
Maps included in 1997 Edition of GDA
(See Page 1 for details)



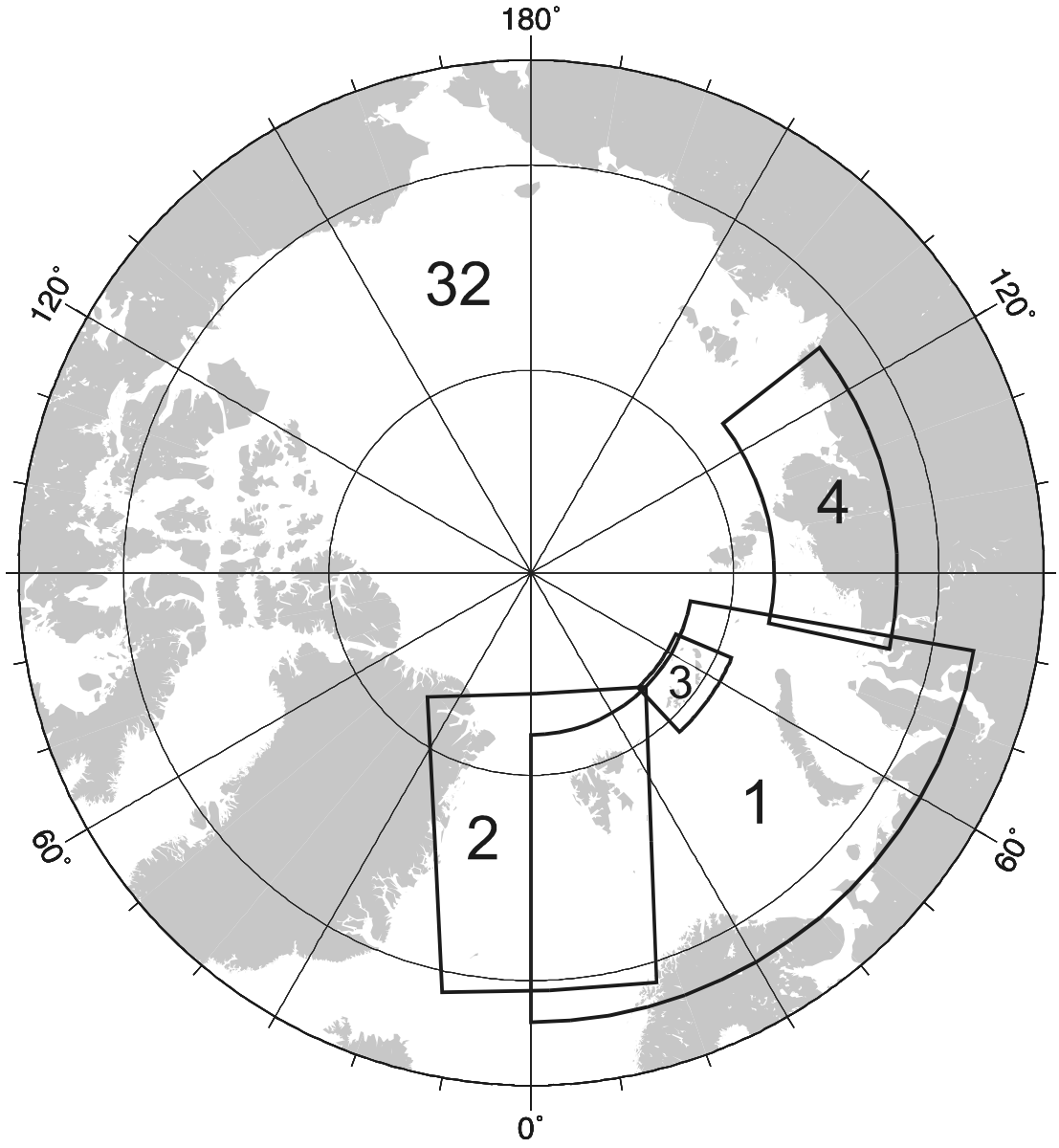
Category 1 maps (excluding Arctic region) to be included in 2000 Edition of GDA
(See Page 1 for details)



Category 2 maps (excluding Arctic region) to be included in 2000 Edition of GDA
(See Page 1 for details)



Category 1 maps (Arctic region) to be included in 2000 Edition of GDA



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ANNEX VI

REPORT OF THE GEBCO DIGITAL ATLAS MANAGER, APRIL 1998 – JUNE 1999

Indian Ocean Area

Work has continued with the digitization of Dr. Robert Fisher's bathymetric contour and tracking control charts for the Indian Ocean area. This includes the following:

1. The digitization of 12 bathymetric contour and 17 trackline control charts for the area 23°S-70°S; 140°E-160°E.

2. Carrying out quality control checks on 16 bathymetric contour charts for the area 23°N-31°S; 90°E-140°E.

3. The digitization of bathymetric contour and trackline control data from 36 update charts for the area 17°N-36°S; 20°E-70°E and incorporating the updates into the existing data set.

A working version of the digital bathymetric contour and trackline control data set for the region 23°N-36°S; 20°E-70°E has been supplied to Scripps Institution of Oceanography.

The attached diagram shows the current status of the preparation of the date set for the whole of the Indian Ocean.

North Atlantic Area

Bathymetric contour data for the area 15°W-5°W; 32°N-38°N has been digitized from 12 charts supplied by Mr. Peter Hunter, (charts at scales from 1:275,000 – 1:520,000).

Digital trackline control information has been received for the area 20°W-5°W; 26°N-38°N.

A further 11 bathymetric contour charts have been received for the area 48°W-20°W; 18°N-32°N, (charts at scales from 1:720,000 to 1:1,200,000).

The attached diagram shows the current status of the data set for this area.

Ross Sea Area

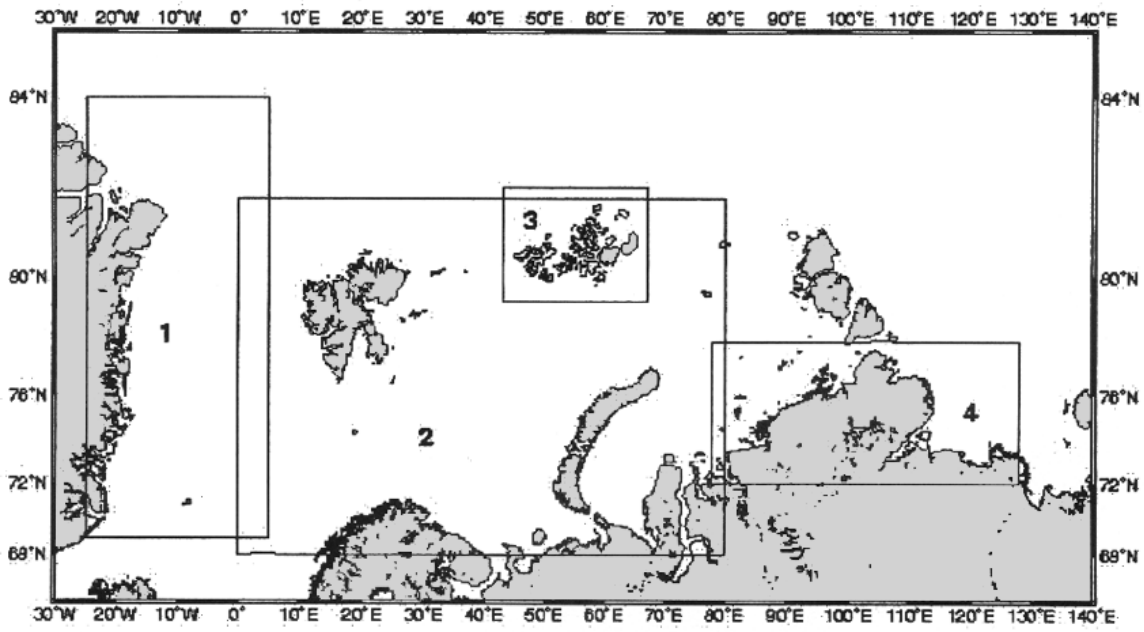
Digital bathymetric contour, trackline control and coastline data has been received for the Ross Sea Area, (160°W-160°E; 70°S-80°S). The data is taken from the ANTOSTRAT Project Seismic Stratigraphic Atlas of the Ross Sea.

The data set consists of bathymetric contours at 50m intervals between 0m and 1000m and 250m intervals between 1000m and 3500m.

Arctic Area

The bathymetric contour data for the area 25°W-5°E; 69°N-84°N has been digitized from the chart: "Regional Bathymetry Of the Northern Norwegian – Greenland Sea" by N.Z. Cherkis and P.R. Vogt. The chart is on a Polar Sterographic projection with a scale of 1:3,000,000 at 71°N.

The bathymetric contour data for this area will now be edgematched with the existing digital bathymetric contour data sets shown in the diagram below



1. Norwegian / Greenland Sea data set
2. Barents and Kara Seas data set ("Bathymetry of the Barents and Kara Seas" by N.Z. Cherkis, H.S. Fleming, M.D. Max, P.R. Vogt and M.F. Czarnecki – map scale 1:2,313,000)
3. Franz Josef Land Area data set, ("Batjhymetric Map of the Franz Josef Land Area", compiled by G.G. Matishov, N.Z. Cherkis, M.S. Vermillion and S.L. Forman – map scale 1:500,000)
4. Bathymetry data supplied by HDNO

Shallow Water Bathymetry Data

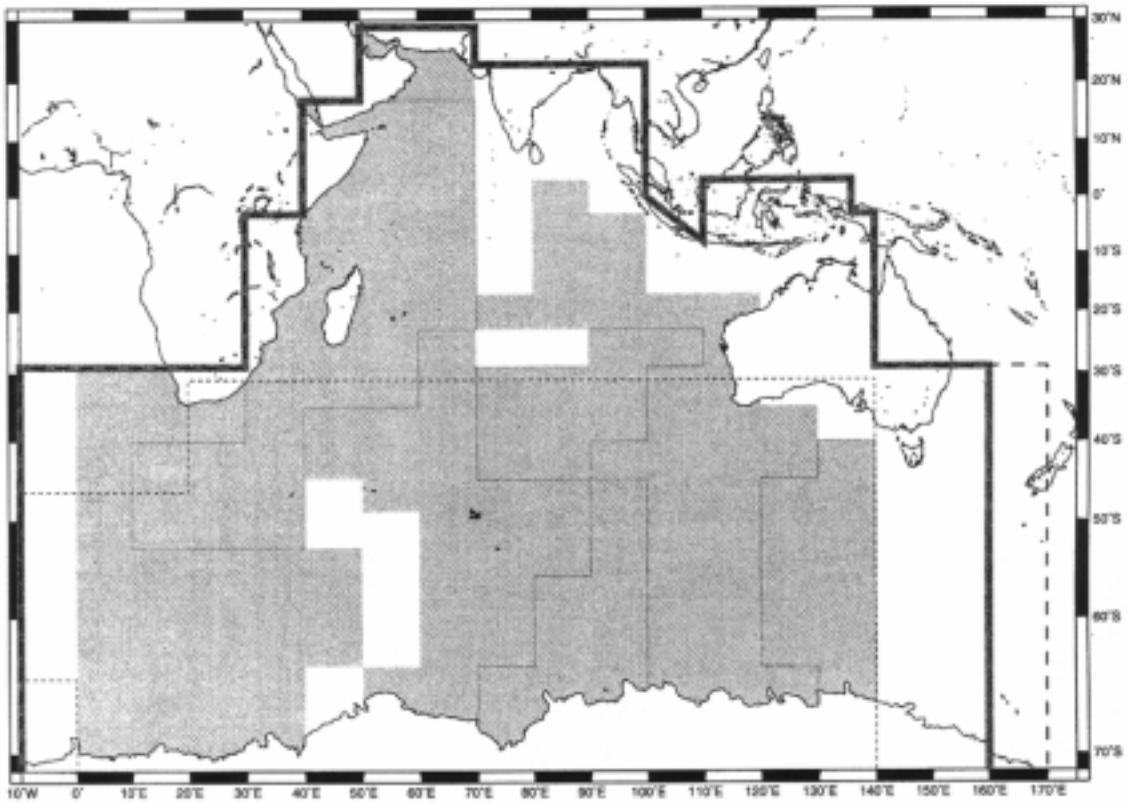
South African Coastal Area

The South African Hydrographic Office has supplmied BODC witgh digital shallow water bathymetric contour and coastline data for use in the GEBCO Digital Atlas. The data set covers the coastal area from 11° 22'E, 17° 56'S to 33°E, 26° 45'S and consists of contours at following depths: 15m, 20m, 30m, 50m, 100m and 200m.

P. Weatherall

17 June 1999

Progress in the Digitisation of Bathymetric Contour Charts for the Indian Ocean Area



Limits of the digitised data set

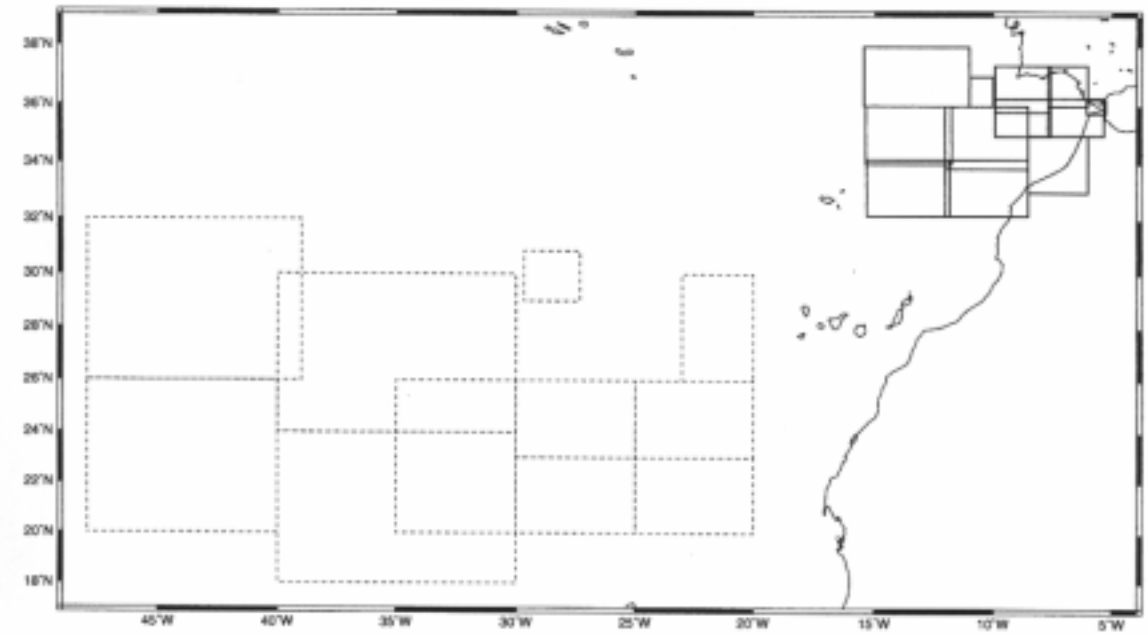
Area for which bathymetric contour charts are being produced

Limits of GEBCO-97 data set

Areas where update charts have been digitised

Area for which update charts have been received since the completion of the GEBCO-97 data set

Progress in the Digitisation of Bathymetric Contour Charts for the North Atlantic Area



Bathymetric contour data in digital form

Bathymetric contour charts to be digitised

ANNEX VII
DISTRIBUTION/SALES OF GEBCO DIGITAL ATLAS (1 JUNE 1999)

	SECTOR							SECTOR					
	Gov	**Univ**	**Comm**	**Other**	**Total**	**(sold)**		**Gov**	**Univ**	**Comm**	**Other**	**Total**	**(sold)**
Albania	1	-	-	-	1	(0)	**Malaysia**	1	-	-	-	1	(0)
Algeria	2	-	-	-	2	(1)	**Malta**	-	1	-	-	1	(1)
Argentina	1	-	-	-	1	(0)	**Mauritania**	1	-	-	-	1	(0)
Australia	27	13	9	-	49	(43)	**Mauritius**	-	1	-	-	1	(0)
Austria	1	-	-	-	1	(1)	**Mexico**	1	1	-	-	2	(1)
Brabados	-	-	1	-	1	(1)	**Monaco**	-	-	-	10	10	(7)
Belgium	5	7	1	2	15	(12)	**Morocco**	2	-	-	-	2	(1)
Bermuda	-	-	1	-	1	(1)	**Mozambique**	2	-	-	-	2	(0)
Brazil	5	12	-	-	17	(15)	**Netherlands**	4	3	7	2	16	(15)
Bulgaria	1	-	-	-	1	(0)	**New Caledon**	-	-	-	1	1	(1)
Canada	23	14	5	4	46	(37)	**New Zealand**	6	1	3	1	11	(9)
Chile	2	2	-	-	4	(4)	**Nigeria**	1	-	-	-	1	(0)
China	2	1	-	-	3	(1)	**Norway**	15	3	14	3	35	(30)
Colombia	2	1	-	-	3	(0)	**Papua N. Guinea**	1	1	-	-	2	(1)
Costa Rica	-	1	-	-	1	(1)	**Peru**	1	-	-	-	1	(1)
Cote d'Ivoire	2	-	-	-	2	(1)	**Philippines**	-	2	-	2	4	(3)
Croatia	3	-	-	-	3	(1)	**Poland**	2	-	-	-	2	(2)
Cuba	1	-	-	-	1	(0)	**Polynesia (Fr)**	-	1	-	-	1	(1)
Denmark	8	3	1	1	13	(11)	**Porto Rico**	-	1	-	-	1	(1)
Ecuador	2	-	-	-	2	(0)	**Portugal**	2	2	-	-	4	(3)
Egypt	2	-	-	-	2	(0)	**Reunion**	1	-	-	-	1	(1)
Falkland Is.	2	-	1	-	3	(3)	**Romania**	1	-	-	-	1	(0)
Faeroes	2	-	1	-	3	(3)	**Russia**	16	1	-	1	18	(1)
Fiji	-	-	-	1	1	(0)	**Seychelles**	1	-	-	-	1	(0)
Finland	1	-	-	-	1	(1)	**Singapore**	1	-	-	-	1	(1)
France	19	9	9	12	49	(37)	**South Africa**	5	-	2	-	7	(5)
Gabon	-	-	1	-	1	(1)	**Spain**	7	10	9	3	29	(27)
Germany	27	28	8	2	65	(61)	**Sri Lanka**	-	-	-	1	1	(1)
Greece	4	1	-	1	6	(4)	**St. Vincent**	1	-	-	-	1	(1)
Guinea	1	-	-	-	1	(0)	**Sweden**	1	2	-	-	3	(2)
Hungary	-	1	-	-	1	(1)	**Switzerland**	-	1	1	-	2	(2)
Iceland	6	2	1	-	9	(9)	**Taiwan**	1	3	-	-	4	(4)
India	5	1	-	-	6	(3)	**Tanzania**	2	-	-	-	2	(0)
Indonesia	-	-	1	-	1	(1)	**Thailand**	1	-	-	1	2	(2)
Iran	1	-	-	-	1	(0)	**Tunisia**	1	-	-	-	1	(0)
Ireland	4	3	4	-	11	(9)	**Turkey**	3	2	1	-	6	(4)
Israel	1	1	-	-	2	(1)	**Ukraine**	4	-	-	-	4	(0)
Italy	13	7	2	7	29	(26)	**UK**	98	62	57	16	233	(138)
Jamaica	-	-	-	1	1	(1)	**USA**	52	78	50	7	187	(151)
Japan	8	11	28	1	48	(46)	**Vietnam**	2	-	-	-	2	(1)
Kenya	4	-	-	-	4	(0)							
Korea	6	-	1	-	7	(5)							
Madagascar	1	-	-	-	1	(0)	**TOTAL**	**432**	**294**	**219**	**80**	**1025**	**(760)**

Figures above refer to total number of copies sold or distributed up to 1 June 1999. GOV = Government/Public funded organization; UNIV = University; COMM = Commercial organization. Number in parenthesis refers to total number of copies sold as opposed to complementary copies.

DISTRIBUTION OF GEBCO DIGITAL ATLAS – SUMMARY STATISTICS (1 JUNE 1999)

a) Total number sold/distributed = 1025 copies
Total number sold = 760 copies
Number of complementary copies = 265 copies

b) Copies sold/distributed to 83 countries

c) Breakdown of copies sold/distributed by sector:

Government bodies = 432 copies
University groups = 294 copies
Commercial bodies = 219 copies
Other organizations = 80 copies

d) Distribution of 265 complementary copies:

GEBCO community = 88 copies
International exchange = 93 copies
UK national exchange = 84 copies

d) Sales/distribution by month:

Month	Copies Sold	Gratis Copies	Total Copies
May 1994	17	18	35
Jun 1994	33	52	85
Jul 1994	20	3	23
Aug 1994	8	9	17
Sep 1994	21	7	28
Oct 1994	16	1	17
Nov 1994	18	2	20
Dec 1994	13	6	19
Jan 1995	16	1	17
Fev 1995	48	5	53
Mar 1995	31	8	39
Apr 1995	18	5	23
May 1995	28	8	36
Jun 1995	20	3	23
Jul 1995	23	6	29
Aug 1995	16	2	18
Sep 1995	18	4	22
Oct 1995	15	3	18
Nov 1995	20	3	23
Dec 1995	13	2	15
Jan 1996	10	1	11
Feb 1996	10	23	33
Mar 1996	10	1	11
Apr 1996	9	-	9
May 1996	17	5	22
Jun 1996	6	-	6
Jul 1996	6	2	8
Aug 1996	4	2	6
Sep 1996	3	-	3
Oct 1996	15	2	17
Nov 1996	11	1	12
Dec 1996	5	2	7

Month	Copies Sold	Gratis Copies	Total copies
Jan 1997	7	2	9
Feb 1997	13	-	13
Mar 1997	5	3	8
Apr 1997	11	2	13
May 1997	7	-	7
Jun 1997	18	8	26
Jul 1997	11	-	11
Aug 1997	8	1	9
Sep 1997	10	2	12
Oct 1997	8	2	10
Nov 1997	10	2	12
Dec 1997	8	11	19
Jan 1998	15	3	18
Feb 1998	11	2	13
Mar 1998	8	2	10
Apr 1998	5	3	8
May 1998	7	1	8
Jun 1998	8	4	12
Jul 1998	7	2	9
Aug 1998	1	2	3
Sep 1998	9	3	12
Oct 1998	6	2	8
Nov 1998	1	1	2
Dec 1998	3	0	3
Jan 1999	12	1	13
Feb 1999	7	4	11
Mar 1999	8	2	10
Apr 1999	10	11	21
May 1999	8	2	10
TOTAL	**760**	**265**	**1025**

ANNEX VIII

GEBCO CENTENARY CONFERENCE, MONACO, 14-16 APRIL 2003

Co-sponsors with the Monegasque Governement:
The International Hydrographic Organization (IHO)
The Intergouvernmental Oceanographic Commission (IOC) (of UNESCO)

Introduction

The history of the General Bathymetric Chart of the Oceans (GEBCO) starts in 1899 when discussions were held during the 7th International Geographic Congress in berlin on the need for a world series of bathymetric charts, and improved definition of undersea nomenclature. A Commission of Undersea Nomenclature, under the chairmanhip of Prince Albert I of Monaco, met at Wiesbaden, 14-15 April 1903, and work started on the project.

It is proposed to celebrate in April 2003 the Centenary of the start of work of the GEBCO, by holding a Conference on ocean charting and sea floor morphology at the new Grimaldi Conference Centre in Monaco (now under construction). This will be linked to the nineteenth session of the Joint IOC/IHO Guding Committee for the GEBCO, and its accompanying Sub-Committee meetings.

Conference

The Conference lasting 2 ½ days, will cover both the history of the GEBCO project and appropriate linked topics, as well as a concluding key presentation and debate on: **"Ocean Mapping in the 21st Century – The Future".** See attached preliminary list of proposed conference topics.

Links are being sought with the following Organizations:

- The Scientific Committee on Oceanic Research (SCOR) of ICSU
- The International Association for the Physical Sciences of the Oceans (IAPSO)
- The International Union of Geological Sciences (IUGS) – *parent body of The Commission for Marine Geology (CMG) (now defunct)*

- The International Council of Scientific Unions (ICSU) *which was actively involved during the International Geophysiscal Year (IGY), and co-sponsored the GEBCO Committee (1957-1972) with IAPO (now IAPSO) and IHB (now IHO).*

- The International Geographical Union (IGU)
  [This Union was active at IGC-VII (Berlin, 1899) and IGC-VIII (Washington DC and New York, 1904) in sponsoring the first edition of the GEBCO]

- The Commission for the Geological Map of the World (CGNW)
- The Inernational Cartographic Association (ICA)
- Fédération Internationale des Géomètres (FIG)
- Institut Géographique National (IGN)
- The Hydrographic Society
- Scientific Committee on Antarctic Research (SCAR) of ICSU
- Commission of Oceanography, Division of History of Science (of IUHPS)

Associate Events

The following is a preliminary list of possible events and other items which might be associated with the Conference:

- Wall Display of the whole of the 6th (print on demand) Edition.
- Display of all editions of the GEBCO of one (or more) areas showing the development of style and content over the century.
- Demonstration of the GEBCO Digital Atlas and associated Geographic Information Systems (GIS).
- Exhibition of relevant technology (commercial and academic).
- Sales display (and sales) of a centenary publication on the History of GEBCO.
- Guided tour of the International Hydrographic Bureau.
- Visits of national Research and Hydrographic Surveying Vessels to Monaco
- Visit to the Musée Océanographique, Monaco.
- Conference Reception.
- Social Programme for Partners.
- Commemorative Stamp Issues.
- Film, Television and Radio coverage.
- Memorabilia.

Finances

Sponsor are being sought.

The Monegasque Government has already indicated its willingness to support the programme.

Conference fees will be set.

Organization of the Conference

This will be undertaken in close co-operation with the International Hydrographic Bureau, by a small Centenary Organizing Committee (COC) consisting (at present) of: the Chairman GEBCO, the Permanent Secretary GEBCO, a Director IHB, a representative of the Monegasque Government, and the Centenary Arrangements Co-ordinator. [This Committee has already met twice and has started work].

Conference and Finance Committees are being established.

Preliminary Ideas for Topics for the GEBCO Centenary Conference

1. History of GEBCO
   - Knowledge of the deep ocean by the end of the 19th century leading up to the decision taken in 1899 at IGC-VII to compile a world series of bathymetry charts.
   - The Role of Prince Albert I of Monaco in initiating the GEBCO, including development and publication of the 1st and 2nd Editions.
   - Transfer of responsibility to the IHB, including development and publication of the 3rd and 4th Editions.
   - SCOR Working Group 41 Morphological Mapping of the Ocean Floor.
   - Co-sponsorship with the IOC.
   - Production of the GEBCO (5th Edition).
   - Into the digital age – the GEBCO Digital Atlas (GDA).

2. Depth measurement techniques – from wire line to echo-sounder to swath to laser.

3. Position determination – from astronomy to satellites.

4. Data collection, compilation, archiving and distribution.

5. Interpretation, interpolation and contouring of sparse sounding data.

6. Use of satellite data to enhance such interpretation.

7. Creating a Digital Terrain Model (gridded data base) from manually contoured sparse sounding data.

8. Principles and Application of Ocean Feature Nomenclature.

9. Symbiosis between marine science and hydrography.

10. The impact of ocean morphology on the dynamic modelling of the oceans, including climate and tsunami prediction.

11. Ocean morphology as a key indicator of the geological evolution of the oceans.

12. The role of bathymetry in international maritime law and in the provisions of the U.N. Convention on the Law of the Sea (UNCLOS).

13. Commercial drivers for improved ocean floor charts.

14. Key Visionary Topics (Concluding session)

OCEAN MAPPING IN THE 21ST CENTURY – THE FUTURE

To be followed by Presentations and Closing of the Conference.

PROPOSED LAYOUT FOR GEBCO CENTENARY VOLUME
(for publication early 2003)

Photograph of Prince Albert I

Introductory Remarks by Prince Rainier III (or Prince Albert)

Preamble President of the Directing Committee IHB and Executive Secretary IOC

Introduction Chairman GEBCO

Reproductions of the various editions (or parts thereof)

Preface Desmond Scott - this will be an updated (shortened) version of Section 1of the present GEBCO Supporting Volume.

Part 1 Rear Admiral Steve Ritchie. Pre-GEBCO history of bathymetric observations leading up to the 1899 decision.

Part 2 Jacqueline Carpine-Lancre. The early history of GEBCO from conception in 1899 to the death of Prince Albert I in 1922, followed by publication of the remaining sheets of the 2nd Edition by 1930 under the supervision of the Musée Océanographique.

Part 3 Adam Kerr. The IHB period. 3rd and 4th Editions (which overlap). Involvement of ICSU (Mike Baker) and the French Service Hydrographique de la Marine,1930-1972.

Part 4 Desmond Scott. SCOR Working Group 41 Morphological Mapping of the Sea Floor. Formation of a joint IOC-IHO Guiding Committee for the GEBCO.
Publication of the 5th Edition 1975-1982 (World Sheet 1984).
Digitization. Issue on magnetic tape, then on CD-ROM. Up to 1995.

Part 5 Meirion Jones, 1996-latest date pending publication. SCOR Working Group 107 Improved Global Bathymetry. To be written just before publication, bringing it right up to date with the latest developments.

Appendices Biographical Notes on all Persons involved with each edition from the original Commission set up in 1903, and Prince Albert's Scientific Committee, up to the membership of the GEBCO Guiding Committee and Sub-Committees at the time of publication.

Bibliography and References

Note: Part 2 will be written in French and translated. All quotes/extracts from documents will be in their original language (with translation if considered necessary).

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ANNEX IX

REPORT OF THE GRID WORKING GROUP TO THE GEBCO SCDB, 23-25 JUNE 1999
Dr. Michael Carron, 29 June 1999

1. Note: The following papers were distributed at the SCDB meeting in Halifax but are not included in these minutes - copies are available from Dr Michael Carron:

- Minutes of the SCDB GEBCO Grid Working Group meeting, 9-10 July 1998

- SCDB GEBCO Grid Working Group Notes 24 March 1999 (containing reports given at the AGU meeting in December 1998)

2. During the meeting of the GEBCO Sub-Committee on Digital Bathymetry 23-25 June 1999, members of the Grid Working Group presented the results of their efforts to produce a worldwide digital grid of bathymetry. Dr. Michael Carron presented an overview of the Group's efforts. He supplemented his report with the results of his and Mr.William Rankin's work in GEBCO chart regions for 5.06, 5.07, 5.ll and 5.12. Mr. Rankin also presented some results of his analyses of artifacts produced by gridding contours. Dr.Carron reported that both the National Geophysical Data Center of the United States and Meteorological Research Center of Japan have supplied an high-resolution shallow-water bathymetry grid for inclusion in the GEBCO Grid. The IHB has passed to Dr. Goodwillie shallow-water contours around southern Africa. These were supplied by the South Africa Hydrographic Office.

3. Dr. Andrew Goodwillie reported on gridding efforts performed in co-ordination with Dr. Robert Fisher for the Indian Ocean region (97.1/5.05/5.09). He distributed copies of his and Dr. Fisher's report and chart, "The Physiography of the Southwest Indian Ridge". Dr. Goodwillie reported that the Indian Ocean updated charts and grids should be completed in the summer of 2000. The Sub-Committee seemed impressed by the co-operation of Drs. Fisher and Goodwillie and indicated that future production efforts of the organization will probably need to follow their prototype.

4. Dr. Hans-Werner Schenke reported on his and Dr. Peter Morris' work in the Southern Oceans (97.2/5.16/5.18). Production is on schedule and discussions will be held with Dr. Goodwillie and Mr. Rankin to merge their respective grids with the Schenke/Morris grids.

5. Dr. Jones (Sub-Committee Chairman) reported that New Zealand is considering the release of a 2.5-minute gridded subset of their high-resolution grid of the seas around New Zealand. A decision is expected shortly.

6. Dr. John Hall (IBCM) reported that he will produce a 2.5-minute grid of the Mediterranean, Red and Black seas for inclusion in the GEBCO grid. He also volunteered to supply Dr. Goodwillie with the available digitized shelf soundings for the southern coast of the Arabian Plate.

7. The Arctic team (Mr. Martin Jakobsson/Mr. Ron Mcnab/Mr. Norman Cherkis) presented a report on their work on producing a grid of the Arctic Ocean (including the region from 65N to the pole). The grid is more than 50% complete and interesting charts were presented to the Sub-Committee. This team has demonstrated that in some regions contours can be produced directly from gridded data.

8. Mr. Peter Hunter reported on his work in gridding regions 97.3 and portions of 5.04 and 5.08. At this point he is not planning on producing grids for the Gulf of Mexico and Caribbean Sea. This will be a point of future discussion between Hunter/Carron/Rankin and the International Bathymetric Chart of the Caribbean and Gulf of Mexico (IBCCA).

9. Dr. Larry Mayer discussed the search for the SwissAir aircraft lost off Peggy's Cove and demonstrated the Fledermouse software package.

After reviewing the attachments the Working Group, in co-ordination with the Sub-Committee, agreed on the following points for the grid construction:

(a) Grid will be worldwide 2.5 arc-minute

(b) Grid will, as closely as possible, match the version of the GEBCO Digital Atlas produced simultaneously with the grid.

(c) A 5 arc-minute subset of the 2.5 arc-minute grid will be produced by Carron/Rankin from the complete grid and available on the production CD-ROM.

(d) Where appropriate, higher resolution grids may be placed on the production CD-ROM.

(e) Standard reference datum will be WGS-84.

(f) World Vector (WVS) and SCAR Shorelines will be used. If WVS II is available in time it will be substituted for the WVS. This may require some analysis vis-à-vis the synchronization of the shoreline used in production of GTOPO-30 with WVS II.

(g) If the new GLOBE topography is available in time for final production it will be considered for use instead of GTOPO-30.

(h) In addition to the GEBCO grid, the production CD-ROM will contain the Sandwell and Smith Altimetric Gravity grid.

(i) NGDC software used in the production of their Coastal Relief Model has been offered by Dr. Mike Loughridge for use in distribution of the grids.Carron/Rankin Hunter/Jones will work with NGDC to obtain software and data format requirements.

(j) Documentation will be in HTML with appropriate hyperlinks.

(k) Schedule for final production will be summer 2000.

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ANNEX X

LIST OF PARTICIPANTS

1. Members of the Joint IOC-IHO Guiding Committee for GEBCO

Sir Anthony Laughton PhD FRS Chairman GEBCO (also representating SCOR) Okelands, Pickhurst Road Chiddingfold, Godalming Surrey GU8 4TS UNITED KINGDOM *Fax: +44 (1428) 683967* *Tel: +44 (1428) 683941* *Email: anthony.laughton@soc.soton.ac.uk*	**Mr. David Monahan** Vice-Chairman GEBCO Director, Marine Geomatic Canadian Hydrographic Service Department of Fisheries & Oceans 615 Booth Street Ottawa, Ontario K1A OE6 Canada *Fax: +1 (613) 996 9053* *Tel: +1 (613) 995 4666* *Email: monahand@dfo-mpo.gc.ca*
Mr. Alexis E. Hadjiantoniou Hellenic Navy Hydrographic Service TGN 1040 Athens GREECE *Fax: +30 (1) 651 7811* *Tel: +30 (1) 655 1830* *Email: hnhs@helnavy.gr*	**Ingénieur général de l'armement Patrick Souquière** Directeur adjoint du Service hydrographique et Océanographique de la Marine 3, avenue Octave Gréard, Paris, 7ème BP 5-00307 ARMEES FRANCE *Fax: +33 (1) 40 65 99 98* *Tel: +33 (1) 44 38 41 53* *Email: souquiere@shom.fr*
Dr.-Ing. Hans-Werner Schenke Alfred-Wegener Institut für Polar- und Meeresforschung Postfach 12 01 61 Columbusstrasse D-27515 Bremerhaven GERMANY *Fax: +49 (471) 4831 149* *Tel: +49 (471) 4831 122* *Email: schenke@awi-bremerhaven.de*	**Dr. Kunio Yashima** Coastal Surveys and Cartography Division Hydrographic Department of Japan 5-3-1, Tsukiji, Tokyo 104-0045 JAPAN *Fax: +81 (3) 248 1250* *Tel: +81 (3) 541 3685* *Email: yashima@cue.jhd.go.jp*
Dr. Michael Loughridge Director National Geophysical Data Center NOAA Mail Code: E/GC 325 Broadway Boulder, Colorado 80303 UNITED STATES OF AMERICA *Fax: +1 (303) 497 6386* *Tel: +1 (303) 497 6215* *Email: mloughridge@ngdc.noaa.gov or msl@ngdc.noaa.gov*	**Dr. Gleb B. Udintsev** Vernadsky Institute of Geochemistry 19 Kosygina Street 117975 Moscow RUSSIAN FEDERATION *Fax: +7 (095) 938 2054 (for Udintsev)* *Tel: +7 (095) 977 5125 (home evenings)* *+7 (095) 137 86 48 (office)* *Email: elkor@geokhi.msk.su or vernadsky@glas.apc.org*

2. Sub-Committee on Digital Bathymetry (SCDB)

Dr. Meirion T. Jones, Chairman Director British Oceanographic Data Centre Bidston Observatory Murkenhead Merseyside L43 7RA UNITED KINGDOM *Fax: +44 (151) 652 3950* *Tel: +44 (151) 653 8633* *Email: mtj@ccms.ac.uk*	**Mr. Peter Hunter** GEBCO Bathymetric Editor Challenger Division for Seafloor Processes Southampton Oceanography Centre Empress Dock Southampton SO14 3ZH UNITED KINGDOM *Fax: +44 (1703) 596 554* *Tel: +44 (1703) 596 559* *Email: cart@sea.soc.soton.ac.uk*
Dr. Michael Carron Senior Scientist Code OTT United States Naval Oceanographic Office 1002 Balch Boulevard Stennis Space Center Mississippi 39522-5001 UNITED STATES OF AMERICA *Fax: +1 (228) 688 4931* *Tel: +1 (228) 688 4459* *Email: carronm@navo.navy.mil*	**Dr. John K. Hall** Marine Geology, Mapping and Tectonics Division Geological Survey of Israel 30 Malchei Israel Street Jerusalem 95501 ISRAEL *Fax: +972 (2) 534 6590 or (2) 531 4257* *Tel: +972 (2) 534 6455* *Email: john.hall@mail.gsi.gov.il*
Mr. Norman Z. Cherkis Senior Oceanographer/Bathymetrist Neptune Sciences, Inc. 12310 Pinecrest Road Reston, VA 20191-1636 UNITED STATES OF AMERICA *Fax: +1 (703) 620-3900* *Tel: +1 (703) 620-5858* *Email: cherkis@neptunesci.com* *Website: http:// www.neptunesci.com*	**Mr. Ron Macnab** Geological Survey of Canada (Atlantic) PO Box 1006 Dartmouth Nova Scotia B2Y 4A2 CANADA *Fax: +1 (902) 426 6152* *Tel: +1 (902) 426 5687* *Email: macnab@agc.bio.ns.ca*
Dr. Andrew Goodwillie Geosciences Research Division Scripps Institution of Oceanography La Jolla, California 92093-0220 UNITED STATES OF AMERICA *Fax: +1 (858) 534 0784* *Tel: +1 (858) 534 1899* *Email: andrewg@baltica.ucsd.edu*	**Mr. William Rankin** Code OTT United States Naval Oceanographic Office 1002 Balch Boulevard Stennis Space Center Mississippi 39522-5001 UNITED STATES OF AMERICA *Fax: +1 (228) 688 4931* *Tel: +1 (228) 688 5709* *Email: rankin@navo.navy.mil*
Mr. Anthony Pharaoh Professional Assistant (Data Management) International Hydrographic Bureau 4 quai Antoine 1er B.P. 445 – MC 98011 Monaco cedex PRINCIPALITY OF MONACO *Fax: +377 93 10 81 40* *Tel: +377 93 10 81 08* *Email: pad@ihb.mc* *Website: http://www.iho.shom.fr*	

3. Sub-Committee on Undersea Feature Names (SCUFN)

Dr. Robert L. Fisher, Chairman Geosciences Research Division Scripps Institution of Oceanography La Jolla, California 92093-0220 UNITED STATES OF AMERICA *Fax: +1 (858) 534 0784* *Tel: +1 (858) 534 3597*	**Ing. en chef Michel Huet** (Secretary) Professional Assistant (Cartography) International Hydrographic bureau 4 quai Antoine 1er B.P. 445 – MC 98011 Monaco cedex PRINCIPALITY OF MONACO *Fax: +377 93 10 81 40* *Tel: +377 93 10 81 04* *Email: pac@ihb.mc* *Web: http://www.iho.shom.fr*
Mr. Marco Antonio de Carvalho Oliveira Diretoria de Hidrografia e Navegaçao Rua Barão de Jaceguay S/no Ponta da Armação CEP – 24. 048-900 Niterói, RJ BRAZIL *Fax: +55 (21) 620 0073* *Tel: +55 (21) 620 0073/613 8249* *Email: gebco@dhn.mar.mil.br* *marcoantonio-br@hotmail.com.*	**Mr. Desmond P D Scott** Cumbers Mill Lane Sidlesham Chichester West Sussex PO20 7LX UNITED KINGDOM *Fax: +44 (1243) 641 222* *Tel: +44 (1243) 641 222* *Email: desmond.scott@messages.co.uk*

4. GEBCO Digital Atlas manager

Ms. Pauline Weatherall
GEBCO Digital Atlas manager
British Oceanographic Data Centre (BODC)
Bidston Observatory
Murkenhead
Merseyside L43 7RA
UNITED KINGDOM
Fax: +44 (151) 652 3950
Tel: +44 (151) 653 8633
Email: bodcmail@pol.ac.uk

5. Representative of the I.H. Bureau

Rear Admiral Neil Guy
Director
International Hydrographic bureau
4 quai Antoine 1er
B.P. 445 – MC 98011 Monaco cedex
PRINCIPALITY OF MONACO
Fax: +377 93 10 81 40
Tel: +377 93 10 81 01
Email: dir1@ihb.mc
Website: http://www.iho.shom.fr

6. Invited Experts

Dr. Bernard Coakley Assistant Professor Department of Geology Tulane University New Orleans Louisiana 70115 UNITED STATES OF AMERICA *Fax: +1 (504) 865 5199* *Tel: +1 (504) 862 3168* *Email: bcoakley@mailhost.tcs.tulane.edu*	**Commander Luis CONZAGA Campos** Diretoria de Hidrografia e Navegaçao Rua Barão de Jaceguay S/no Ponta da Armação CEP – 24. 048-900 Niterói, RJ BRAZIL *Fax: +55 (21) 620 0073* *Tel: +55 (21) 620 0073* *Email: 22@dhn.mar.mil.br*
Dr. Gallo Carrera Member, UN Commission on the Limits of the Continental Shelf 53 Hawthorne Street Dartmouth Nova Scotia CANADA B2Y 2Y7 *Fax: +1 (902) 466 3768* *Tel: +1 (902) 466 3678* *Email: carrera@fox.nstm.c*	**Mr. Martin Jakobsson** Stockholm University Department of Geology and Geochemistry 10691 Stockholm SWEDEN *Fax: +46 (8) 674 7857* *Tel: +46 (8) 164747* *Email: martin.jakobsson@geo.sue.se*
Dr. Richard A. Martino Chief Navy Customer Support Office National Imagery and Mapping Agency Code (COTN), Mail STOP P-33 12310 Sunrise Valley Drive Reston, VA 20191-3449 UNITED STATES OF AMERICA *Fax: +1 (703) 264 3133* *Tel: +1 (703) 254 3002* *Email: martino@nima.mil*	**Dr. Larry A. Mayer** Ocean Mapping Group Dep; of Surveying Engineering University of new Brunswick PO Box 4400 Fredericton New Brunswick E3B 5A3 Canada *Fax: +1 (506) 453 4943* *Tel: +1 (506) 453 3577* *Email: larry@atlantic.cs.unb.ca*
Dr. Arne Nielsen Head of Oceanographic Division Royal Danish Administration Of navigation and Hydrography Overgaden O. Vandet 62B DK 1023 Copenhagen K DENMARK *Fax: +45 (3) 157 4341 or 4((3) 254 1012* *Tel: +45 (3) 268 9605* *Email: ar@fomfrv.dk*	**Ms. Margaret Harris** Scientific Assistant Scientific Technology Staff, Code OTT Naval Oceanographic Office 1002 Balch Boulevard Stennis Space Center Mississippi 39522-5001 UNITED STATES OF AMERICA *Fax: +1 (228) 688 4931* *Tel: +1 (228) 688 4459* *Email: harrism@navo.navy.mil*

Mr. George B. Newton Chair, Arctic Research Commission 4350 N. Fairfax Drive, Suite 630 Arlington, VA 22203 UNITED STATES OF AMERICA *Fax: +1 (703) 525 0014* *Tel: +1 (703) 525 0111* *Email: msti@erols.com*	**Dr. Walter H.F. Smith** NOAA Lab for Satellite Altimetry NOAA code E/OC-2 1315 East-West Highway, Room 3711 Silver Spring Maryland 20910-3282 UNITED STATES OF AMERICA *Fax: +1 (301) 713 4598* *Tel: +1 (301) 713 2860* *Email: walter@raptor.grdl.noaa.gov* *Web: http://ibis.grdl.noaa.gov/SAT*
Mr. John Woodward Technical Hydrographer Royal Danish Administration Of Navigation and Hydrography Overgaden O. Vandet 62B DK 1023 Copenhagen K DENMARK *Fax: +45 (3) 157 4341* *Tel: +45 (3) 268 9500* *Email: jjw@fomfrv.dk*	**Mrs. Lois C. Varnado** Scientific Technology Staff, Code OTT Naval Oceanographic Office 1002 Balch Boulevard Stennis Space Center Mississippi 39522-5001 UNITED STATES OF AMERICA *Fax: +1 (228) 688 4931* *Tel: +1 (228) 688 4459* *Email: harrism@navo.navy.mil*

7. Permanent Secretary GEBCO

Mr. Brian Harper
Park House
Donyatt
Somerset
TA19 ORN
UNITED KINGDOM
Fax: +44 (1460) 52994
Tel: +44 (1460) 52994
Email: 101524.3422@compuserve.com

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ANNEX XI

LIST OF ACRONYMS

(Acronyms used only in the paragraph in which they are already defined are not included)

ABLOS	Advisory Board on Geodetic, Hydrographic and Oceanographic aspects of the Law of the Sea (IHO)
ACUF	Advisory Committee on Undersea Features (of BGN)
AGSO	Australian Geological Survey Organization
AGC	Atlantic Geoscience Centre, Geological Survey of Canada
AGU	American Geophysical Union
AWI	Alfred-Wegener-Institut für Polar- und Meeresforschung (Bremerhaven, Germany)
BAS	British Antarctic Survey
BGN	Board on Geographic Names (USA)
BODC	British Oceanographic Data Centre (Bidston Observatory, Birkenhead, UK)
BRIDGE	British mid-ocean RIDGE project (of NERC)
CAP	Circum-Atlantic Project (of IUGS)
CGM	Carte générale du monde (IGN)
CGMW	Commission for the Geological Map of the World
CGOM	Consultative Group on Ocean Mapping (of IOC)
CHRIS	Committee on Hydrographic Requirements for Information Systems (IHO)
CHS	Canadian Hydrographic Service
CICESE	Centro de Investigación Científica y Educación Superior de Ensenada (Mexico)
CLCS	Commission on the Limits of the Continental Shelf (UNCLOS)
CMG	Commission for Marine Geology (now defunct) (of IUGS)
CSIRO	Commonwealth Scientific and Industrial Research Organization (Australia)
DBDB5	Gridded Bathymetric Data Set on 5 minute squares, produced by USNOO
DCDB	Data Centre for Digital Bathymetry (IHO - at NGDC, Boulder, Colorado, USA)
DEM	Digital Elevation Model

DMA	Defense Mapping Agency (predecessor to NIMA)
DNC	Digital Nautical Chart
EB	Editorial Board
ECDIS	Electronic Chart Display and Information System (IHO)
EEZ	Exclusive Economic Zone
ENC	Electronic Navigational Chart
EPSHOM	Etablissement Principal du Service Hydrographique et Océanographique de la Marine (France)
ESA	European Space Agency
ETOPO5	Earth Topography on a 5-minute grid (NGDC)
EU	European Union
FIG	Fédération Internationale des Géomètres
GBE	GEBCO Bathymetric Editor
GDA	GEBCO Digital Atlas
GEBCO	General Bathymetric Chart of the Oceans (IOC/IHO)
GEODAS	GEOphysical DAta System for Marine Geophysical Data (NGDC)
GIS	Geographic Information System
GMT	Generic Mapping Tools (P. Wessel and W.H.F. Smith)
GOOS	Global Ocean Observing System (IOC, ICSU, UNEP & WMO)
GPS	Global Positioning System
GSA	Geological Society of America
GSC	Geological Survey of Canada
GSDI	Global Spatial Data Infrastructure
HDNO	Head Department of Navigation & Oceanography (Russian Federation Ministry of Defence, St Petersburg)
HIGP	Hawaii Institute of Geophysics and Planetology
HTML	HyperText Mark-up Language
HYDAS	HYdrographic DAta System for Marine Geophysical Data (NGDC)

IAPSO	International Association for the Physical Sciences of the Ocean
IASC	International Arctic Science Committee
IBCAO	International Bathymetric Chart of the Arctic Ocean(IOC/IASC/IHO)
IBCCA	International Bathymetric Chart of the Caribbean Sea and Gulf of Mexico (IOC)
IBCEA	International Bathymetric Chart of the Central Eastern Atlantic (IOC)
IBCM	International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series (IOC)
IBCWIO	International Bathymetric Chart of the Western Indian Ocean (IOC)
IBCWP	International Bathymetric Chart of the Western Pacific (IOC)
ICA	International Cartographic Association
ICSU	International Council of Scientific Unions
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IGN	Institut Géographique National (Paris, France)
IGNS	Institute of Geological and Nuclear Sciences Ltd. (Wellington, New Zealand)
IGU	International Geographical Union
IH	International Hydrographic (Review and Bulletin)
IHB	International Hydrographic Bureau (Secretariat of IHO)
IHO	International Hydrographic Organization
INEGI	Instituto Nacional de Estadística, Geografía e Informática (Mexico)
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOSDL	Institute of Oceanographic Sciences Deacon Laboratory (now part of SOC)
IUGS	International Union of Geological Sciences
KORDI	Korea Ocean Research and Development Institute
LDEO	Lamont-Doherty Earth Observatory (Palisades, New York, USA)
LINZ	Land Information New Zealand (Wellington, New Zealand)
MGD77	Magnetics, Gravity and Depth Format 1997 (NGDC)
MMBI	Murmansk Marine Biological Institute
NATO	North Atlantic Treaty Organisation

NavOceano	US Naval Oceanographic Office
NERC	Natural Enviroment Research Council (Swindon, UK)
NGDC	National Geophysical Data Center (Boulder, Colorado, USA)
NGS	National Geographic Society (USA)
NIMA	National Imagery and Mapping Agency (USA)
NIO	National Institute of Oceanography (predecessor to IOSDL)
NIWA	National Institute of Water and Atmospheric Research (New Zealand)
NMDIS	National Marine Data and Information Service (China)
NOAA	National Oceanic and Atmospheric Administration (USA)
NOS	National Ocean Service (USA)
NRL	Naval Research Laboratory (USA)
NSF	National Science Foundation (of USA)
NZOI	New Zealand Oceanographic Institute (NIWAR)
OMG	Ocean Mapping Group (University of New Brunswick, Canada)
PSMSL	Permanent Service for Mean Sea Level
PWGCA	Permanent Working Group for Co-operation in the Antarctic
RAN	Royal Australian Navy
RAS	Russian Academy of Sciences
RNC	Raster Navigational Chart
R/V	Research Vessel (IHO Hydrographic Dictionary)
S-57	IHO Transfer Standard for Digital Hydrographic Data
SACLANT	Supreme Commander Allied Command Atlantic (NATO)
SAR	Synthetic Aperture Radar
SCAR	Scientific Committee on Antarctic Research (ICSU)
SCDB	Sub-Committee on Digital Bathymetry (GEBCO)
SCICEX	Submarine Science Exercise (US Navy under-ice cruises in the Arctic)
SCOR	Scientific Committee on Oceanic Research (ICSU)

SCUFN	Sub-Committee on Undersea Feature Names (GEBCO)
SHOM	Service Hydrographique et Océanographique de la Marine (France)
SIO	Scripps Institution of Oceanography (La Jolla, USA)
SOC	Southampton Oceanography Centre (UK)
SOPAC	South Pacific Applied Geoscience Commission
TSMAD	Transfer Standard Maintenance and Applications Development WG (IHO)
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USGS	United States Geological Survey
USNOO	US Naval Oceanographic Office
VHO	Volunteering Hydrographic Office (IHO)
WDC	World Data Centre
WESTPAC	Western Pacific regional programme of the IOC
WGS-84	World Geodetic System 1984
WHOI	Woods Hole Oceanographic Institution
WMO	World Meteorological Organisation
WVS	World Vector Shoreline (NIMA)
WWW	World Wide Web

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ANNEX XII

REPORT TO GEBCO SCDB-XVI
by Dr. Walter Smith, 25 June 1999

1. Update on GMT

- Current Version is 3.3.
- 3.3.1 is anticipated to be released in early July 1999.

New features of interest to the GEBCO community include:

- more flexible map projections
- problems with Transverse Mercator over polar regions are fixed
- more flexible import/export of grids
- more flexible Post Script formats
- more mapping and modelling algorithms
- many routines are now faster
- all Unix and Win 95/98/NT supported

Other news of interest to GEBCO:

- "surface" gridding algorithm not yet changed; scheduled for improvement soon
- WVS shoreline has been in at full resolution, and other resolutions reduced by the Douglas-Peucker algorithm, since version 2
- users have requested the SCAR/BAS coastline be placed in future GMT releases. (If anyone has a version assembled into ordered polygons, I would like to hear of this.)

The GMT installation is now much easier.

The GMT Web site is www.soest.hawaii.edu/gm

2. Update on Satellite Altimeter Gravity

"World-Gravity Image 7.2" was released a few years ago and described in an article by Sandwell and Smith in 1997 in the Journal. of Geophysical Research. It was on a 2-minute grid and used the JGM-3 gravity model as a reference. It combined all Geosat and ERS data.

We now have a new version:

- 1 minute grid
- EGM 96 reference mode 1
- Topex data included
- filtering improved, especially at profile ends

the result is higher resolution, more nearly correct over small features, and very much improved near coastlines. The root-mean-square difference with respect to ship gravity is 4 to 5 milliGals.

We have also made a geoid which may useful for geophysical and oceanographic studies.

All of these products extend between ± 72° latitude. Altimetry can be recovered over sea ice to ± 81.5° latitude. Some of this has been done by Laxon and McAdoo in two papers in Science.

There is much good work in Europe and Japan also.

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ANNEX XIII

EXTRACTS FROM REPORTS TO SCDB
by Dr. Michael Loughridge, NGDC

1. Bathymetric Data Holdings

1.1 Global Trackline Geophysical Data Base (GEODAS) CD-ROM

In December 1998, version 4.0 of the Global Trackline Geophysical Data Base (GEODAS) CD-ROM, was released. Version 4.0 contains over 13.4 million nautical miles of bathymetry from 4111 cruises with 34.9 million digital records.

Since the 15th Meeting of the GEBCO Sub-Committee on Digital Bathymetry held in New Zealand, March 1998, the National Geophysical Data Center (NGDC) has responded to 442 international requests for data or information from 62 countries, of which 40 are IHO Member States. Version 4.0 of the Global Trackline Geophysical Data Base (GEODAS), assimilates an additional 220 cruises/legs of bathymetric data, including over 760 thousand soundings from 19 agencies located in 11 countries.

NGDC is continuing the development of the GEODAS software, and with the new release of version 4.0, GEODAS, is now Y2K compliant. Version 4.0 runs under Microsoft® Windows™ for PCs and X Windows for SUN/SOLARIS UNIX™ platforms. These window driven interfaces simplify data searches, guide users with an on-line Windows-style help system and support colour postscript plotting capabilities. Source code is also available for other UNIX operating systems. Originally developed to manage marine geophysical trackline data, GEODAS now consists of two distinct applications, GEODAS/TRKDAS for marine geophysical trackline data and GEODAS/HYDDAS for hydrographic (bathymetric) survey data. Data can now be downloaded in the MGD77 format or in a space delineated X, Y, Z, ASCII format.

1.2 WOCE Data Assembly Center for Bathymetric Data

In December 1993, NGDC was officially named as a Data Assembly Center for Bathymetric Data acquired on World Ocean Circulation Experiment (WOCE) cruises. During 1994, procedures were established for data submission and for data exchange with WOCE participants. The data collection period for WOCE ended in 1997, however cruise data continues to arrive for assimilation into the DCDB database. There has been a consistent attribution problem with WOCE data. Institutions have not properly identified WOCE data as such, making submissions difficult to identify when we receive data or information requests specific to WOCE.

1.3 Creation of the International Hydrographic Database (IHD)

NGDC is currently developing a new International Hydrographic Database (IHD) using a modified version of the GEODAS software. These data come from files consisting of depth values organized by geographic area rather than time sequential points along a trackline. These data do not easily fit into the existing GEODAS Marine Trackline Geophysics Database.

To date, eleven data sets, from nine institutions, containing a total of over 1.5 million soundings comprise the International Hydrographic Database (IHD). Data were submitted in several different data formats requiring modification of the GEODAS assimilation programs to incorporate the various data formats. Data coverage is primarily in the Barents and Kara Seas, Caribbean, Canadian Arctic, and the Mediterranean.

1.4 GEODAS is no longer just Trackline Geophysics

GEODAS, a name long synonymous with trackline geophysical data management has become a family of data management tools expanded to handle not only trackline data, but survey, point, and grid data as well. The original GEODAS was written to manage trackline data, whose model might well be described as data "beads" strung along a trackline thread, with the ordering of the beads and the positioning of the thread determined by time series of observations and navigation.

With the recent addition of a second data model, GEODAS has been expanded to manage data where the data "beads" are contained within a polygon, rather than strung along a trackline. With only minor modifications to the GIS aspects of search engines for intersections of these polygon-bounded data sets with areas of interest, GEODAS was able to manage both trackline and survey data sets. Surveys are regarded as collections of data, not necessarily time-tagged, nor time-continuous, but rather spatially grouped and bounded by a small number of polygons.

Most recently, GEODAS has been modified to manage gridded data sets, in our case conveniently partitioned into one-degree squares. This made them extremely similar to data bounded by squares, only with position implicit in the order of the data rather than explicitly associated with each point. Again minor modifications permitted the power of the GEODAS system to be applied to yet another type of data, permitting access, partitioning, joining, and, specifically for gridded data, resampling at selected grid intervals.

Thus GEODAS is now a data management system for marine geophysical, bathymetric and hydrographic data in a very broad sense. It deals with the trackline bathymetry, magnetics and gravity as it always has. It now deals with National Ocean Service hydrographic surveys and other survey data. It also now deals with NGDC's gridded Coastal Relief Models and the potential exists for expansion to other forms of data, maps and products.

2. GEBCO On Line Activities

The official GEBCO pages were approved for public distribution in the fall of 1998. During the period from 1 May 1999 through 15 June 1999, 475 individuals downloaded 1455 "files" from the GEBCO pages. There were an average of 10 individuals accessing the pages per day. Hits were from 37 countries, with US access the heaviest, followed by the UK, France, Canada, Germany, Australia, Norway, Italy, Brazil, Spain and the Netherlands.

3. GEBCO Gridders List Server

During the past year there has been continuing traffic on the GEBCO-Gridders list server operated by NGDC. A new, secure FTP exchange site was created on a Linux machine at NGDC to replace the older public FTP exchange area on NGDC@s main FTP server. Two files have been posted on the new FTP area by members of the gridders group to date. NGDC welcomes comments from the GEBCO community on how we can improve or enhance these services.

4. U.S. - Canada Co-operation on New Bathymetry for the Great Lakes

New bathymetry for the Great Lakes has resulted from a long-term international co-operative effort between NOAA-NGDC/NOAA-GLERL, and the Canadian Hydrographic Service. Bathymetry has now been completed for Lakes Erie, St. Clair, Michigan and Ontario and is well along to completion for Lakes Superior and Huron.

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ANNEX XIV

RESOLUTION XX-5 OCEAN MAPPING

The Intergovernmental Oceanographic Commission,

Recalling that Ocean Mapping is a matter of high importance to all IOC Member States as well as to global and regional science and service programmes, such as climate programmes, ICAM, tsunamis and storm surges,

Noting with satisfaction:

(i) that, in accordance with Resolution XIX-3 of the IOC Assembly, the Joint IOC-IASC-IHO Editorial Board for the International Bathymetric Chart of the Arctic Ocean (IBCAO) has been established and held its inaugural meeting in the Royal Danish Administration of Navigation and Hydrography in Copenhagen, Denmark, 19-20 October 1998,

(ii) the close co-operation in Ocean Mapping with the International Hydrographic Organization (IHO) and the progress made in Ocean Mapping due to the efficient co-operation of the IOC Consultative Group on Ocean Mapping (CGOM) with the Editorial Boards for the International Bathymetric Charts for six selected areas of the World Ocean, of which the Arctic Ocean is the most recent,

Takes note of:

(i) the Report of the Seventh Session of the Consultative Group on Ocean Mapping (CGOM), which met in the International Hydrographic Bureau in Monaco,12-14 April 1999;

(ii) the comprehensive Report of the Consultative Group on Ocean Mapping (CGOM) which was submitted to the Twentieth Session of the Assembly in accordance with Clause 1 of its Terms of Reference;

Considering the, international co-operative aims of Agenda 21 and in recognition of the demands of the Ocean Scientific Community for seamless gridded data sets embracing deep ocean and continental margin data,

Invites Member States:

(i) to provide assistance to the Centenary Conference for the General Bathymetric Chart of the Oceans (GEBCO), to be held in Monaco in the year 2003;

(ii) to assist developing countries, at their request, in the exploration, and protection of their Exclusive Economic Zones (EEZs) in providing technical assistance, or assisting in the production of large-scale bathymetric charts for areas of particular interest such as coastal zones and near shore shelf areas;

(iii) to give increased support to TEMA and capacity building in Ocean Mapping in national and regional programmes, for instance by offering ship borne and land-based courses for professional and student trainees of developing countries; and

Instructs the Executive Secretary IOC to support the United Nations' initiative to publish the UN Atlas under the auspices of the ACC Sub-Committee on Oceans and Coastal Areas.

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