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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of Unesco)

INTERNATIONAL HYDROGRAPHIC ORGANIZATION

Twelfth Meeting of the GEBCO Officers

covering also

the Seventeenth Meeting of the Sub-Committee on Digital Bathymetry

Royal Danish Administration of Navigation and Hydrography
Copenhagen, Denmark

3-8 May 2000

TABLE OF CONTENTS

SUMMARY REPORT Page

ANNEXES

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

1 OPENING OF THE MEETINGS

1 The Twelfth Meeting of the joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO) Officers and the Seventeenth Meeting of the Sub-Committee on Digital Bathymetry (SCDB XVII) were each held at the offices of The Royal Danish Administration of Navigation and Hydrography (RDANH), Søkvæsthuset, Copenhagen, Denmark. SCDB XVII: 3-5 May and GEBCO Officers XII: 8 May 2000.

2 Mr. Arne Nielsen, Head of Oceanographic Department, RDANH, on behalf of the Director General, National Hydrographer Surveying, gave the opening address to the SCDB, Vice Admiral Knud E. Borck, who was regrettably unable to join the meeting. After warmly welcoming the GEBCO participants to RDANH and the city of Copenhagen, Mr. Nielsen gave a short interesting account of the history of the buildings occupied by the organization and concluded by wishing the participants fruitful and constructive debate.

3 In giving his thanks, Sir Anthony Laughton, Chairman GEBCO, said that the GEBCO community was very grateful to be invited to meet in the RDANH where reminders of a rich naval heritage and of the sea were in abundance.

4 He gave apologies for Dr. Meirion Jones, Chairman, SCDB, who was sadly unable to attend the meeting due to unforeseen circumstances and had thus requested Sir Anthony to take the chair for the SCDB meeting in addition to that of the GEBCO Officers. He said that in preparation for this task they had met in London during the previous week to discuss an 'Annotated Chairman's Guide for SCDB' prepared by Dr. Jones.

5 In greeting participants the Chairman expressed a special welcome for those who were attending a GEBCO meeting for the first time. He added his deep regrets that for the third consecutive year HDNO was not represented.

6 The Chairman said that although there were several notable absentees, the Sub-Committee continued to attract a high attendance with 27 participants from 12 countries including representatives from IHO and IOC.

A full List of Participants is given in Annex X.

Apologies for absence were received from: Dr. Meirion Jones, Dr. Robin Falconer, Mr. Ron Macnab, Dr. Andrew Goodwillie, Dr. Andrey Popov, and Dr. Hou Wenfeng.

2. CONDUCT OF THE MEETINGS

2.1 Adoption of the Agenda

7 The Chairman said that it had been decided to continue the pattern first adopted for the minutes of the 1998 GEBCO meetings in Wellington, New Zealand. Thus, the minutes of the 2000 SCDB XVII and the GEBCO Officers XII would be consolidated as a single documentation set.
(See Agenda at Annex I)

2.2 Documentation, Administrative Arrangements, etc.

8 Mr. Brian Harper, Permanent Secretary GEBCO, introduced the documentation. Fourteen papers were tabled. (See Annex II)

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

3.1 GEBCO Guiding Committee

No changes.

3.2 Sub-Committee on Digital Bathymetry (SCDB)

No changes.

3.3 Sub-Committee on Undersea Feature Names (SCUFN)

9 No changes. The Chairman said he would write to Dr. Robin Falconer, asking him if he is able to continue with his GEBCO duties, in particular with respect to his membership of SCUFN.

3.4 Scientific Advisers

10 The Permanent Secretary said he had written to Dr. Garrik Grikurov confirming the appointment of Dr. German Naryshkin as a Scientific Adviser.

3.5 GEBCO Reviewers (See Annex III)

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

Antarctic Waters: Dr. Schenke said it was important to have another reviewer working on the other side of Antarctica from the Weddell Sea, and he was pleased to report that his proposal for the inclusion of Dr. Henk Brolsma as an additional reviewer had met with support. Dr. Brolsma was waiting final clearance from his employer before taking up his reviewing duties. Dr. Schenke agreed to inform the Permanent Secretary when this appointment was confirmed.

S W Pacific Ocean: Mr. Peter Hunter said that the proposal for Dr. Russell Howorth, Programme Manager SOPAC, had been accepted and his name would be added to the list.

Caribbean Sea & Gulf of Mexico: The Secretary reported that Dr. Troy Holcombe, now retired from NGDC, had indicated his wish to continue as a reviewer.

3.6 General Review of the GEBCO Personality List

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

13 The following names were added to the Personality List:
Dr. Robert Anderson, Dr. Ray Cramer, Mr. Martin Jakobsson, Mr. George Newton, Mrs. Lois Varnado and Mr. John Woodward.

14 Dr. Gleb Udintsev expressed his wishes, via Dr. Schenke, that an experienced colleague, Dr. Dmitry Teterin should be invited to join the list. The meeting expressed a keen interest that Dr. Udintsev had found someone to continue his valuable work but declined to add this name to the Personality List without further evidence.

15 Concerns were raised about reported failed e-mail contacts with Dr. Galina Agapova. The Permanent Secretary was asked to make enquiries about a possible change of her address.

4 MATTERS ARISING FROM REPORTS OF PREVIOUS MEETING

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

Agenda items cover all matters arising from this report.

5. ACTIVITIES OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY. SEVENTEENTH MEETING, ROYAL DANISH ADMINISTRATION OF NAVIGATION AND HYDROGRAPHY (RDANH), COPENHAGEN, DENMARK

5.1 Review of Bathymetric Mapping World Wide

16 The Chairman said that due to a range of difficulties, the SCDB recognized that the original target date of mid-2000 for the next release of the GDA was no longer attainable. However, the delay in production would provide an opportunity to include of a number of extra bathymetric maps. He invited the Bathymetric Editor, Mr. Peter Hunter, to display an index of maps already identified for inclusion in the next release of the GDA and opened discussion on others that might be considered.

The following mapping review, apart from the Arctic Ocean, concerns only those areas or maps where issues about inclusion in the GDA are not yet resolved.

Atlantic Ocean

17 Pauline Weatherall gave details of three data sets for the North Atlantic (See Annex VI - Report of the GEBCO Digital Atlas Manager). Peter Hunter said that despite entreaties to the Portuguese, by IOC and Dr. Jones, there was no answer to the requests that IBCEA Sheet 1 should be released for incorporation into the GDA.

18 Mr. Jean Meyrat, SHOM, was invited to make his presentation of the prototype SHOM tera-data base covering the N. E. Atlantic entitled 'La Base de Donnes Bathymetriques du SHOM' (BDBS). While showing a series of OHPs he explained the development and aims of the database. He made it clear that, although currently holding nearly100 million soundings, BDBS was far from complete. He added that the contours derived from the 1km grid were of varying quality according to the accuracy and quantity of the sounding cover and altimetry data. A full description of this database can be obtained from Mr. Jean Meyrat, SHOM. (See Annex X)

19 When asked by the Chairman if SHOM would be prepared to contribute raw depth data to IHO-DCDB, Mr. Meyrat responded by saying that it was the intention of SHOM to send grids only to the GEBCO community but these would include all data for the continental shelf areas. The Chairman said he liked the layered levels of input data and congratulated Mr. Meyrat for unveiling an interesting and ambitious project.

20 Mr. Hunter said he had received information from Ron Macnab (Canada) that some problems had arisen about the release of Canadian data in the NW Atlantic. Mr. David Monahan said he knew of these difficulties and would seek a resolution of the problem as a matter of urgency.

21 Dr. George Sharman, introduced a colour poster 'Bathymetry of the Northern Gulf of Mexico and the Atlantic Ocean East of Florida'. He explained that this had been compiled using data from four USA responsibility IBCCA Sheets (1- 4). Bathymetry has been completed for most of the remaining 13 Sheets and digitally scanned. Editing and the creation of data sets are proceeding. One map of this series is printed - the remaining sheets will be obtainable only as PoD versions. Data sets of some of these sheets may be available for GDA 2001.

22 Dr. John Hall, speaking for the IBCM, said that there had been little development since the GEBCO-XVII meeting in June 1999. He reported that he had rejected a proposal by the French to enlarge the grid size for the second edition IBCM from one tenth of a minute to two or three tenths. He agreed to deliver a digital contour set of the Black Sea to the GDA Manager.

23 Dr. Hall added that by 2002-3 it was expected that swath mapping would cover 80% of the Mediterranean.

24 Mr. Arne Nielsen, introduced the Baltic Sea Regional Committee, a Working Group set up in 1996 to investigate the possibility of producing a digital bathymetric data set of the region that was freely available to all. To date, only Germany and Denmark, who have depth data in digital form, are willing participants in this project. Mr. Nielsen added that he was anxious to persuade other HOs in the region to participate. Dr. John Woodward, who will be building the grid, showed a data plot of part of the North Sea and the Danish Waters within the Baltic Sea.

25 Mr. Nielsen said it was now Denmark's intention to take the initiative and persuade other Member States that they should co-operate in establishing a regional IOC project for the Baltic Sea, perhaps similar to the IBCAO. He added that the IOC had already expressed interest in this idea.

Pacific Ocean

26 Mr. Hunter said he had been informed of three more bathymetric maps in the regions of the Bering Sea, Tonga Trench and the Galapagos Islands. (See Annex V for details).
Mr. Norman Cherkis added that a set of digital contours were also available of the Arafura Sea, between New Guinea and Australia.

27 Mr. Shin Tani indicated the Plotting Sheet areas around Japan, which were digitised during the last year. Three new maps created from Sea Beam data followed this: Shikoku Basin, Okinawa and South, and Okino-Torishima. He also displayed a recent complex map of the waters off Japan showing results of the JHD survey activity for UNCLOS. Two scientists were dedicated to the production of this map that contained the results of 15 years of multibeam data collections.

28 The Chairman asked if this map and those for three other areas could be released for the GDA. Mr. Tani replied that it might be possible to release gridded versions. Dr. Carron said he would write to JHD asking for degraded versions of the grids. Dr. Smith added a word of caution about the complexities of the degrading process; he asked Mr. Tani if he would test his degrading work by the use of different algorithms. Mr. Tani agreed to negotiate for the release of the grids and, if degrading were required, would heed Dr. Smith's suggestion.

29 The Chairman added that if there was any difficulty about the release of the grids he was willing to make a special plea to the Japanese Hydrographer. He concluded by expressing his congratulations to Mr. Tani for a most impressive display.

30 Mr Hunter displayed the index diagram for the IBCWP project. Dr. Travin said that agreement had been reached with SOPAC about their involvement with the scheme. He added that, to date, no map was available from this project but he hoped this position would soon change. He promised to provide updated information on mapping progress to Mr. Hunter after the next meeting of the IBCWP Editorial Board scheduled for September 2000. Dr. Sharman said he believed that some of the boundaries of the index diagram had been moved. Mr. Hunter said he would examine this point.

31 The Chairman invited Dr. Carron to read an e-mail message sent by Mr. Ron Macnab that included some tentative ideas about kick-starting an initiative to improve the mapping of the Pacific Ocean. In his message he suggested that the IBCAO project '...has demonstrated a reasonably effective way of achieving international co-operation in the conduct of a major bathymetric compilation over a wide region'

32 The letter sparked a vigorous debate about how to improve data collection including suggestions for harnessing the remote sensing buoys, which were used by the 'Service Argos' scheme.

33 Lt. Cdr. Patricio Carrasco announced that Chile was holding discussions with the IOC concerning the possibilities for the formation of another IBC project to map the South-east Pacific - to be known as IBCSEP. Dr. Travin said he was very interested in the proposals by the Chilean Hydrographer and Mr. Macnab to explore mapping initiatives in the Pacific Ocean. He said he expected the Chilean authorities to come forward with positive proposals at the IOC Executive Council Meeting in June.

34 The Chairman said that the bathymetry of the Pacific Ocean, more than any other, was in need of major updating. He welcomed the ideas about new methods of data collection put forward by the participants and the two initiatives to improve mapping in the ocean. He added that a report on the GOMaP meeting to be held in June might have something to say on these subjects. (See Item 7)

Arctic Ocean

35 The Chairman voiced Dr. Jones's regret that it had not been possible to achieve his aim of linking the SCDB meeting with that of the IBCAO as had been the case during the Sixteenth meeting in Halifax, June 1999. 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, was invited to give a presentation about his continuing work with that programme. He reported that data collected by the SCAMP System have provided enormous quantities of new information some of which was totally unexpected. Perhaps most important, the swath system has enabled recovery of more than 25 million new bathymetric data points - from both cruises. Prior to this infusion of data, there were only one million data points available.

36 He explained that the SCAMP System was operated continuously in the Arctic and, depth permitting; its swath extended 6 km either side of the SSN. The primary areas targeted for surveys were the Chukchi Plateau, Northwind Ridge, Gakkel Ridge, Lomonosov Ridge and Yermak Plateau.

37 On the Chukchi Plateau the swath bathymetry system enabled identification of scours on the ocean bottom left by iceberg keels where the water depth is now around 350 metres. The presence of massive ice sheets was also detected. In one area of the Plateau, in 350m-400m depths, parallel delineations called flutes, created by an advancing ice sheet, were evident. On the southern flank of

the Plateau a field of flutes was detected in water 600m - 700m deep. In this area the flutes also show a reorientation to the north, indicating perhaps the meeting of two ice sheets - one off Siberia and the other off the Canadian Archipelago. Glacial moraines were also detected. A survey of the Northwind Ridge revealed numerous previously unknown features on the bottom, including a block-faulted terrain that may be evidence as to how this shallow area was formed.

38 The submarine next surveyed the Lomonosov Ridge where more icebergs scours were detected in water depths in excess of 900m, giving some credence to the theory that a massive ice sheet in excess of 1000 metres thick once covered the Central Arctic basin. Sub-bottom profiles showed where the sediments had been clipped off the crest of the ridge by the icebergs. Bathymetry revealed that the east side of the ridge was an area of gradual shoaling to the crest, whereas the west side of the ridge was defined by a long, nearly vertical drop off. This is in distinct contrast to existing ETOPO 5 data.

39 Mr. Newton observed that at the Gakkel Ridge perhaps the most serendipitous event occurred. USS HAWKBILL arrived at the ridge to complete a survey it started in 1998. Its timing coincided with the final stages of a very energetic seismic swarm in the area. In addition to the extensive bathymetry data recovered, there is evidence of very recent volcanism in the immediate vicinity of the seismic swarm epicenters. The occurrence was not recognized during the cruise, but was the result of a conversation between the chief scientist for SCICEX, Dr. Margo Edwards University of Hawaii, and a seismologist from Lamont Doherty Earth Observatory.

40 The Yermak Plateau was the subject of the final survey of the cruise and was conducted at the request of the Norwegian government. The system depicted a semicircular basin flanked by topographic highs to the north and south which showed channeling pathways for sediment to the central basin. Detailed bathymetry was collected of the entire area requested.

41 Mr. Newton concluded that it is important to note that in spite of the six SCICEX cruises (two with SCAMP) only a small fraction of the Arctic basin has been mapped. A continuation of time-series data is necessary for understanding the Arctic and its role in the study of Global Climate Change.

42 Dr. Smith said that notwithstanding the last comment, this has been a very valuable initiative. Mr. Newton was asked to carry forward GEBCO's endorsement of the project to a meeting to be held in London with the Royal Navy on 9th May 2000.

43 Mr. Newton said the question now was: since the US Navy no longer has submarines capable of carrying SCAMP, how can this initiative be carried forward? In parallel with his efforts to persuade the US of the importance of continuing this programme he was also active in trying to generate a consensus of interest between several nations with interests in the Arctic Ocean.

44 The Chairman said that GEBCO acknowledged the crucial role of SCICEX, and its contribution to improve the bathymetry of the Arctic Ocean. He expressed his hopes for its continuation.

45 Mr Norman Cherkis, a member of the IBCAO Editorial Board, said that the second Session of the Editorial Board for the IBCAO was held at the IHB in Monaco, 2- 4 November 1999. A draft copy of the report of that meeting was made available to participants. It is planned to hold the Third session of IBCAO in the autumn of 2000.

46 He showed a number of OHPs, which demonstrated the contouring results from the IBCAO project against those on earlier maps, notably GEBCO 5.17. He demonstrated that the IBCAO grid, benefiting from increased data sources, revealed a far more complex morphology of several major Arctic Ocean undersea features than had hitherto been understood. The Lomonosov and Gakkel Ridges were highlighted as excellent examples of these changes.

47 Mr Cherkis drew attention to a paper and a map submitted (in absentia) by Mr. Ron Macnab: (1) An extract from Volume 81 Number 9 of EOS dated 29 February 2000. An article entitled 'New Grid of Arctic Bathymetry Aids Scientists and Map Makers', gave a detailed account of the background, methodology and future plans for the IBCAO project. The article includes two comprehensive index diagrams showing data availability from ships tracks and as contours extracted from other data sets. (2) A provisional version of IBCAO (26 x 26 cm) dated January 2000.

48 Mr. Martin Jakobsson distributed copies of his thesis entitled 'Mapping the Arctic Ocean: Bathymetry and Pleistocene Paleoceanography'. Using OHPs he gave some further insights into the project, demonstrating for example, how the addition of shaded relief in the background markedly increases the legibility of the contours. He re-emphasised that the derived contours were produced from a mass of different material blended together. Some produced directly from dense multibeam ship track data while others were derived from assorted grids.

49 In the debate that followed about quality control for the IBCAO, the Chairman said it is the policy of GEBCO to ensure the credibility of all products incorporated into the GDA and, further, that in the case of the IBCAO, this assurance could only be achieved by some critique of the contours and track sheets. Mr. Jakobsson said that after the beta version of the map was posted on the web it received 1800 hits per week with only minor comments.

50 It was agreed that Norman Cherkis should have an initial overview of the map, making any necessary corrections. Thereafter, it would be passed to the assigned GEBCO Arctic Ocean Reviewers, David Monahan and Valeriy Fomchenko. The Chairman agreed that this reviewing process should be completed by 1st July 2000.

51 The final contours and ships' tracks passed to Pauline Weatherall for incorporation into the GDA would be a 'locked set'. However, between releases of the GDA, it was recognised that the IBCAO Editorial Board would actively update the Arctic contours.

52 Dr. Michael Loughridge said that, from the reviewing standpoint, the use of a beta version of any map posted on the web, with an invitation to comment, had much to commend it. He asked if this procedure could be considered in future debates concerning the role of GEBCO Reviewers.

53 Dr. Loughridge once again raised his concern about the huge deteriorating analogue datasets held by Dr. Yuri Kiselev, which were gathered over many years from floating ice stations. He explained that despite several past attempts to obtain these data, he had not been successful. It was agreed that this important collection should be rescued and preserved in digital format. Dr. Loughridge offered to make yet another 'last ditch' effort to resolve this problem. Firstly, he proposed to make enquiries via Dr. Gleb Udintsev to see if there was a mechanism to preserve these data and, if this failed, he would consider another approach, perhaps trying to acquire the datasets with the help of the International Lithosphere Observations project.

54 The Chairman congratulated Mr. Martin Jakobsson on his work for the IBCAO and wished him well in the defence of his forthcoming thesis.

Southern Ocean

55 Dr. Schenke began with an overview of the work carried out in the southern Weddell Sea. In addition to Sheet 553, already prepared for the next release of the GDA, he reported that data for Sheets 533, 534 & 535 had now been assembled from Dr. Udintsev's group, R/V Polarstern, HDNO, and UKHO Plotting Sheets and charts. He expected the digital files of the contour maps to be available later in 2000. These will be passed to Pauline Weatherall. Print-on-Demand versions

(PoD) will be available over the Internet. Sheets 536, 537 & 554 will not be available for GDA 2001.

56 Dr. Schenke reported that AWI is preparing a preliminary map of the Antarctic Peninsula showing a new coastline with shelf ice limits compiled from SCAR Landsat images. This revised coastline will be incorporated into the BAS database. This will be made available for GDA 2001.

57 He added that following Australian and UK demands for the construction of an Antarctic GIS database, SCAR is now showing positive interest in the idea. In discussing land topography for the database, it was agreed that all current versions had drawbacks that were not likely to be resolved until 2002-2003 when results from the CRYOSAT and NASA missions become available. Meanwhile, Dr. Walter Smith suggested that the GLOBE topography was probably the best available. Dr. Schenke said he would make enquiries about this and report to the next meeting of SCAR to be held in Tokyo in June 2000.

58 Dr. Schenke then raised the subject of the Ross Sea map prepared by Fred Davey, IGNS. This map was compiled from the ANTOSTRAT Project Seismic Stratigraphic Atlas of the Ross Sea CD-ROM covering 1601W-1601E; 701- 801S. The data set consists of bathymetric contours at 50m intervals between 0m and 1000m and 250m intervals between 1000m and 3500m. Dr. Schenke added that since there had been no formal editorial review of this map, the data required evaluation.

59 During an extended coffee break, participants with knowledge of this area closely examined the Fred Davey map against other known data. They discovered that his data came only from ships carrying out seismic profiling, but there was no data from GEODAS or reference to many tracks currently shown on GDA-97. The initial response to this data set was that it should not be included in the next release of the GDA.

60 Dr. Loughridge commented that GEBCO should give due credit to the author for the construction and the offer of this map for the GDA. Dr. Mike Carron added that the map deserved a considered examination by experts in this area before a final decision was reached.

61 It was agreed to ask Drs. Schenke, Falconer and Brolsma to make the necessary detailed review to include an assessment of the navigation control of all available data and to report their findings to the GEBCO Digital Atlas Manager.

62 Dr. Loughridge asked how might the data from the Fred Davy map get into GEODAS. Mr. Shin Tani replied that none of the data was in digital format but he would ask the Japanese Antarctic Research Establishment (JARE) if it could be released to the SCAR Working Group of Geodesy and Geographic Information.

63 Dr. Schenke reported that the Nautical Chart Scheme of the Antarctic Hydrographic Commission was in preparation. Dr. Loughridge said, that notwithstanding the significant improvement in the content of nautical charts in this area, several of the 16 contributing countries had yet to send their depth data to the IHO/DCDB. RAdm. Guy said this omission ran counter to the proposed Memorandum of Understanding (MoU) between the IHO and the lOC (See Item 9.6). He agreed to make enquiries about these data.

Indian Ocean

64 Dr. Carron raised the problem of overlaps between Dr. Fisher's contours for the Southern Indian Ocean and two other joining versions. Firstly, against contours previously supplied by Dr. Schenke in the area of the Weddell Abyssal Plain and secondly, over the Agulhas Ridge where there were differences with the revised version of GEBCO 5.12. Mr. Monahan agreed to examine both areas of discrepancy and provide rulings for the gridding team. The GDA Manager said she would supply Mr. Monahan and Mr. Cherkis with relevant rectangle copies of Dr. Fisher's contours.

65 Mr. Hunter reported that IBCWIO Sheets 1.04 and 1.07 were printed. The Chairman added that it was not intended to use any of these sheets in the GDA.

Red Sea and Gulf of Aden

66 Dr. Hall promised that after liaising with Dr. Goodwillie he would supply contours to the GDA in time for the next release.

Persian Gulf

67 Mr. Cherkis said he thought there was little possibility of NRL releasing data for this area. Dr. Loughridge promised to ask Mr Andreasen, NIMA, for his help in obtaining this data set.

Inland Seas and Lakes

68 **Caspian Sea:** Dr. Hall said he was ready to digitise contours from HDNO charts and present them for inclusion in the GDA. Dr. Travin said that four independent nations shared the coastline around this sea and he was unsure how they might react to this proposal. He offered to make enquires to see if Dr. Hall's offer was acceptable.

69 The Chairman said although he was acutely aware of the difficulties of integrating the work of the contour providers and gridders, he expressed his hope that, apart from the shallow water regions, the aim of matching the GDA bathymetry and the grid would be achieved.

5.2 The GEBCO Bathymetric Editor - Report

70 Mr. Hunter submitted a report on his activities: Report of the GEBCO Bathymetric Editor, June 1999 - May 2000. (See Annex IV).

5.3 The GEBCO Digital Atlas Manager - Report

71 Ms. Pauline Weatherall submitted a report on her activities: Report of the GEBCO Digital Atlas Manager, June 1999 - May 2000 (See Annex VI).

5.4 Updates on the work of the GEBCO Grid Working Group

72 Dr. Michael Carron reported that the Grid Working Group had continued to make significant progress. He began his presentation with an OHP entitled 'GEBCO Gridded Bathymetry-International Effort'. This showed a coloured map of the world divided into numerous 'keystone areas' each bearing the name of a member of the GEBCO community who had agreed to take responsibility for providing the necessary grids for inclusion in the Third Release of the GDA.

73 Dr Carron talked at length about the status of the grid construction and the numerous unresolved problems. He said that although he was confident of resolving most of the outstanding difficulties, some remained for which a solution lay outside his control, e.g. obtaining Canadian data. He added that one of his main dilemmas was about resolving co-ordination issues between data suppliers and gridders. However, rather than enter into lengthy dialogues about data delivery at this point in the meeting, he said he would take the opportunity to have off-line discussions about pending issues with particular participants.

74 In discussing the Indian Ocean, Dr. Carron said he fully understood Dr. Fisher's wish to present the most authoritative map of the area but voiced some concern about cut off dates for amending

contours. Bearing in mind the subsequent digitising and gridding processes required at Bidston and Scripps, he said he would now like to have firm schedules for the conclusion of contouring, digitising and gridding routines for specific areas of the Indian Ocean. Pauline Weatherall agreed to enquire of Drs. Fisher and Goodwillie to see if this request could be met.

75 Dr. Carron continued by saying that although topographic data was not a goal of the Gridding Group, he nevertheless agreed that its inclusion could be useful. While no decisions had been made about which database might be used, he said the GLOBE data set, at 2.5 minute grid size, looked an attractive choice - it was freely available from NGDC and was available with full documentation. He added that WVS would be used throughout, except in the Arctic and Antarctic regions where more accurate coastlines were available.

76 The Chairman raised the question as to whether the contours and the grid were being developed together, e.g. for the western Atlantic, would depth contours match if derived from a grid of the Canadian data with those hand-drawn versions supplied by Mr. Hunter in the east - might configurations from an east and west compilation look different? In reply, Dr. Carron said there would be a slight difference; he added that for the first version of the grid, GEBCO would have to live with some inconsistencies. He suggested that this question was really about the ability to capture something in flux, and that it was not possible to attain a perfect match of information throughout. He said that in the future, perhaps in 2003-2005, GEBCO would have to grapple with the mechanics of building the grid where data are changing all the time.

77 Dr. Carron said he was concerned about certain Quality Control (QC) issues stemming from the production of the GDA grid. He said he was very anxious to ensure that the GDA procedural documentation was informative and clear, and was supported by several examples of grid/bathymetry comparisons. He invited the Grid Working Party to meet at the Stennis Space Centre in early autumn, with the aim of resolving outstanding QC problems.

78 Dr. Carron went on to discuss the issue of copyright. He said he understood the general need to impose restrictions on the release of the grid and contours particularly when specifically requested to do so by contributing agencies. However, he mentioned the exceptions in areas such as the Arctic where data, primarily captured for another mapping initiative, and bound by different regulations, would be made freely available. He said it was his belief that in the long term all data should be freely available worldwide.

79 He concluded his overview of the construction of the GDA grid saying that the Gridding Group was getting to the point where publicity and PR campaigns needed to be addressed. Dr. Loughridge said that the Third Release of GDA would undoubtedly reach a much larger audience than its previous versions, including not only geophysicists but others concerned with deep water boundary conditions, deep water flows and deep water wave refractions, dynamic modellers - a whole new range of customers.

80 The Chairman closed by saying he recognized the immediate short-term publicity and PR demands for the third release of the GDA adding that these needs are tied up with other funding requests he will shortly make to the IOC Executive in Paris, June 2000. For future releases of the GDA he said it would be necessary to re-establish the Gridding Group to examine the technical and administrative problems of how to construct the next version of the grid.

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

81 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, published in the 1999 Summary Report of GEBCO-XVII. These are included in a new version of the Inventory of Maps and associated diagrams showing material for the next edition of the GDA. (See Annex V)

82 The Chairman invited Dr. Ray Cramer to make a presentation of his early design work on the construction of a prototype Windows version of the GDA. Using a real time computer link, Dr. Cramer demonstrated some of the tools he had developed to replace those on the present DOS version including the facility to overlay contours and tracklines on a linear latitude/longitude projection of the gridded bathymetry. He explained that his main purpose in giving this brief demonstration was less with the need to inform but rather to acquire a list of prioritised requirements that he could address.

83 In noting that the DOS version had five different projections, he was particularly concerned with the question of whether to replicate these in GDA 2001 and for finding the time and expertise to do so. Participants suggested that in designing this version Dr. Cramer should make use of existing software that already addresses these and other points raised. They added that the following should be kept in mind:

- Some guidance should be included about output into GMT,
- Do not replicate features which have been overtaken by events,
- Many of the tools developed for DOS are now included in Windows,
- Users may want to export data into GIS,
- Many tools now available for GIS requirements for spatially registered data,
- Keep aware of the need to match industry standards,
- Get out of the business of developing software and converting one system for different operating platforms - look for common threads, e.g. browsers,
- Make optimum use of existing software such as ArcView,
- Use Java script to generate Lat/Long insertions,
- User interfaces should be in national language - an advantage of using a browser,
- Consider using HTML - platform independent.

84 A long debate followed about the need and the difficulties of providing Quality Attributes (QA) for acoustic data used in the next generation of the GDA. The Chairman said he recognised the many inherent difficulties in providing an acceptable QA that might satisfy international data collection standards - if that was required. He suggested that this complex problem should be one of the first considerations to be addressed by the Grid Working Group, after the Third Release of the GDA in 2001.

5.6 The GEBCO Digital Atlas - Sales and Distribution

85 By 1st April 2000 the Distribution/Sales of the GDA had reached 1118 copies which had been distributed /sold to 83 countries. (See Annex VII)

5.7 GEBCO Guidelines

86 The Chairman said the Guiding Committee had agonised for years over the content of the GEBCO Guidelines and now wondered to what extent the need for these had been overtaken by changes in technology. He asked if this was also the view of the IHB?

87 RAdm Neil Guy agreed that the technology was changing faster than the GEBCO Guidelines but the IHB was convinced of the requirement for this 'living' publication. Following responses to IHB CL 60/1999 he said there was now a clear need for the IHB to carry out a substantial revision of the GEBCO Guidelines, particularly Part 2. He agreed to examine the entire content of the Guidelines and draft proposed changes and additions. He added that Part 4 Digital Bathymetric Data (Multibeam Echo Sounders) was finalised and about to be published.

88 The Chairman drew attention to the Area of Responsibility (Diagram F of IHB CL 60/1999). He pointed out that there was no area of responsibility shown for the UK, he asked if this omission was correct. RAdm Guy said he would check this with the UKHO.

5.8 GEBCO Reviewing System

89 Mr. Hunter said that he and Mr. Harper had designed a new version for the Reviewers' annual letter, to replace the existing text. However, because of the very tight schedules, to digitise and grid all the outstanding data for the Third Release of the GDA, it was decided to defer sending these letters until after the publication in 2001.

5.9 GEBCO Web Site

90 Dr. Loughridge said that the GEBCO web pages have undergone a major revision and upgrade. A new draft of the pages was posted in April 2000 and is now available to the public, pending final approval of the Permanent Secretary GEBCO. Enhancements include a complete, multi-part GEBCO Personality List; information about hard copy maps and plans for the GEBCO Centenary celebrations to be held in 2003.

91 He reported that access to the GEBCO web pages had been steady over the last year, averaging 296 unique users per month, growing to 341 in the last month as the updates became available.

92 Dr. Loughridge said he had tried unsuccessfully to achieve a connection back from the IOC page to the GEBCO web page. Dr. Travin replied he would ask the IOC Webmaster to contact Carla Moore at NGDC to insert this link.

6 THE FUTURE OF GEBCO

6.1 The next generation of GEBCO

93 The Chairman said he wished to have an extended revisit to the paper he presented for discussion at GEBCO XVII in 1999, entitled 'The Future of GEBCO - Ideas for Discussion'. He said although GEBCO was indebted to the support from some organisations he was increasingly concerned that there was little permanent funding for the project. Additionally, many of the key players in the GEBCO community who gave freely of their time to support the enterprise, were likely to leave the scene in 5-10 years. He emphasised the need for a future where GEBCO activities are properly constituted and funded.

94 He spoke of meetings held in 1995 with Prince Rainier where he and Desmond Scott tried to persuade the Prince to chair a committee to raise permanent funds for GEBCO. Although sympathetic, the Prince did not carry through the idea and the prospect of finding a financial patron from this quarter evaporated.

95 He then considered the prospect of introducing self-financing activities, perhaps by wider sales and distribution of GEBCO products. He recognised that this policy might raise questions about ownership and copyright and would have to be referred to the IOC and IHO for their consideration and approval.

96 The Chairman said that at this important and difficult juncture in GEBCO's history he had been invited to make a presentation to the IOC Executive Council on the behalf of GEBCO, this would take place in Paris, 23 June 2000. He said he saw this as a signal opportunity to bring GEBCO, its aims and achievements, to the direct knowledge of the representatives of the Member States of the IOC. It was his intention to draw up a formal resolution to the IOC Executive Council asking for financial support for three initiatives as discussed in items 6.2, 6.3, and 6.4 below. (A copy of Resolution EC -XXXIII.7, submitted to IOC Executive Council, is at Annex VIII)

6.2 Proposed GEBCO Fellowship

97 The Chairman said that his concept behind the fellowship was to provide financial support for an experienced/post doctorate scientist to work at one of the major institutions on a 3-5 year appointment, undertaking specific work identified by the GEBCO Guiding Committee. An annual figure of $25,000 was proposed. He invited comments on this idea.

98 RAdm. Guy said that while he wholeheartedly agreed with the proposal, the IHB would not be able to give any financial support. Mr. Travin said the IOC was in much the same position and suggested that it was up to the Member States to make the necessary contributions. Mr Meyrat said that while SHOM could not directly support such a person, it might be possible to secure this type of fellowship through a local university.

99 Other participants added numerous comments about the complexities of university fellowships and funding applications but no clear course of action emerged. The Chairman commented that practically all educational systems are national and students bid for fellowships within a programme. He concluded that perhaps this initiative would have to be progressed in a more general way. Dr Loughridge said he would make some enquires whether it might be possible to fund a GEBCO project through the NGDC Global Programme - he thought this would be an appropriate allocation. He would try to convince funders.

6.3 Educational GDA

100 The Permanent Secretary said that following the Halifax meeting, he had received some ideas from Mr. Hadjiantoniou about the Educational GDA (E-GDA) and had incorporated these in a preliminary attempt to describe the product and its distribution. Before passing this draft to the other members of the small E-GDA Working Group, he had sent a copy to Dr. Jones to ensure that the proposals for this product were synchronised with the evolution of the GDA. In conversation, Dr. Jones suggested a radical new approach of raising money from this spin-off product.

101 His proposal was that the E-GDA/CD-ROM should be given freely to educational establishments throughout the world. The funding to support this venture should be sought from large international commercial organisations acting as co-sponsors for the GEBCO project. Additionally, a significant portion of the sponsorship funding would be directed for further work on GEBCO. Mr. Harper added that due to unforeseen circumstances, Dr. Jones was unable to find time to progress his ideas further and thus the matter stood at present.

102 The subject of the E-GDA gave rise to considerable debate that ranged over numerous topics connected with the proposal. The following is a synopsis of the comments and ideas put forward:

- Educational experts should design the product with advice from earth scientists,
- The US National Science Foundation is very supportive of such projects and may have advice on construction and content,
- Dr. Kim Kastens, Co-Director of Columbia University and a marine geologist, was identified as a key player in the production and design of aids for teaching map skills
- Dr Loughridge said he had attended one of Dr. Kastens presentations and was very impressed with her ability to motivate and teach via such electronic products,
- Funders may incorporate their own logos and describe something of their own products on the E-GDA,
- Product to carry IOC and IHO logos,
- Possible funding sources: GIS companies, Cable networks, IT companies,
- Product to be written in HTML and thus platform independent,
- Content should be multi-layered and available to a wide range of educational abilities,
- To be available in the world's major languages,
- IHO endorses and promises support,
- NGDC might be able to add some support in respect of development of animation engines,
- Some companies may be willing to make free contributions of software applications (ESRI & Arc Info).

103 The Chairman said it was evident that there was a lot of interest in this product. However, he reiterated several points raised by participants about the need to prepare an appropriate product description and promotion plan. Additionally, he agreed that it was only worth progressing the E-GDA if the product was of a high-class order and fully met the requirements of the educational and scientific communities to introduce and expand interactive knowledge of the bathymetry of the world's oceans and its role in predictive technology.

104 The E-GDA Working Group was identified as: Dr. Carron, Mr. Cherkis, Mr. Hadjiantoniou, Dr. Jones, Dr. Loughridge and the Permanent Secretary. Mr Harper agreed to provide a first draft of TOR's for the WG.

6.4 GEBCO Centenary - Funding Support

105 The Chairman said he will be seeking funding from the IOC to support the organization and running of the Centenary Conference and also for the publication of the official GEBCO books.

7. GOMAP (GLOBAL OCEAN-FLOOR MAPPING PROJECT)

106 Mr. Cherkis introduced an invitation he had received to attend a 2.5-day exploratory workshop to focus on the science and technology aspects of GOMaP. The workshop, limited to about thirty persons, is scheduled for 12-14 June, to be held at Bay St. Louis, Mississippi. He added that organisers of this initiative invited participants to lay the groundwork for a proposed long-term international effort to map the entire world's ocean floor to a spatial resolution of at least 100m for backscatter imagery and at least 250m for swath bathymetry.

107 Dr. Loughridge said he would be attending the workshop also, partly in his role as a member of the GEBCO Guiding Committee. He agreed that this venture could be a 50-year project and added he was particularly anxious to learn about the budgetary support for GOMaP.

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

108 The Chairman said he was very disappointed to relate that the long awaited report from Dr. Colin Summerhayes, Chairman SCOR WG 107, although expected by August 1999, had still not been published.

109 Dr. Travin promised to contact Dr. Summerhayes to ask if a preliminary copy of the report could be made available for the meeting of the IOC Executive Council in Paris, June 2000.

110 Dr. Loughridge said a copy of this report would also be useful at the forthcoming initial GOMaP meeting.

9. REPORTS ON GEBCO RELATED ACTIVITIES

9.1 IHO - The Role of the VHOs - Plotting Sheets and GEBCO Areas of Responsibility

111 RAdm. Guy reported that the IHB had written to Member States and VHOs (IHB CL 60/1999) Firstly, asking them to give information about the status of their Plotting Sheets and in particular to state how many remained to be digitised. He drew attention to a tabled paper entitled 'Responses to IHB CL 60/1999' that indicated that most of the Plotting Sheets were, or will soon be, digitised.

112 Secondly, recognising that Member States will establish databases in support of their INT Chart and ENC programmes, IHB CL 60/1999 also included a request for comments on an IHB proposal to change the areas of GEBCO responsibility to match those of the International Chart Regions - this met with almost unanimous approval.

9.2 IHO - Release of Continental Margin Data

113 Thirdly, RAdm. Guy said that following the generally positive responses by Member States to IHB CL 60/1999 asking for the release of their data on the continental margins. The business for making specific requests should now be pursued by the Digital Atlas Manager. He made it clear that the Bureau should not be included in correspondence loops. This strategy should also be followed for the small minority of Member States who had yet to respond to the IHB letter.

9.3 IHO - Undersea Feature Names Database

114 RAdm. Guy reported that all new names approved by the 13th SCUFN Meeting, June 1999, Halifax, Canada, have been entered into the GEBCO Gazetteer database that is maintained at the IHB. Also, the database has been updated from the supplementary historical data that was supplied at that meeting by the Chairman of SCUFN, Dr. R.L. Fisher, on a number of names. A copy of the up-to-date Gazetteer will be provided to the GDA Manager for incorporation in the 2001 edition of the GDA

115 He added that the management programme for the Gazetteer database is currently in the process of being upgraded. It will be in line with the latest technological developments and should therefore be far more user friendly and efficient than the existing programme. It is planned to complement it with a presentation programme intended for users of the Gazetteer and which will be made available on the IHO website

9.4 IHO - Undersea Feature Names - Naming Policies

116 RAdm. Guy raised the issue of ACUF's policy on the naming of undersea features. He suggested that not only were ACUF duplicating naming activities but also were not acting in an acceptable scientific manner in assigning names.

117 Mr. Norman Cherkis, Chairman ACUF, said this body was mandated by the US Board of Geographic Names (USBGN) to provide standardisation of names outside the 12-mile limit, for US mapping products only. ACUF is free to accept or reject GEBCO decisions. In practice this freedom may give rise to different spellings but not to change the descriptive terms of features.

118 He agreed that annually USBGN had asked that some features be named for living people and that this practice was in direct opposition to the policy adopted by SCUFN where only living scientists, connected with GEBCO, were very occasionally honoured. He also reported that attempts had been made to overturn some decisions made by USBGN on the basis that the requests did not match accepted policies

119 It was generally agreed that some inappropriate names had appeared on bathymetric maps. A debate ensued as to whether there should be a controlling body or standard, e.g. ISO to control the policies of these naming groups. Dr. Loughridge advised caution when there was a contentious issue between national and international interest bodies. He said it was better to go forward together than seek overarching control.

120 RAdm. Guy acknowledged the co-operation between SCUFN and ACUF and said the IHB would take the initiative to resolve the minor differences in the policies adopted by these bodies.

121 The Chairman said he would like to revisit this topic at GEBCO XVIII in 2001.

9.5 IHO - S 23 -Limits of Oceans and Seas

122 RAdm. Guy reported that Adam Kerr was well advanced with the production of a new Edition of S 23-Limits of Oceans and Seas. He only needed to resolve minor problems from a few sensitive areas, before publication can begin. If it proves impossible to obtain resolution of these obstacles the IHB intends to publish the document with a disclaimer saying that where two or more names are shown, they have no preference for any.

123 RAdm. Guy stated that the name 'Southern Ocean' was now officially recognized. He added that although 60° S, has not been included in S 23 as the northern limit of the Southern Ocean, it appears that it has the broad acceptance of Member States and will be included later.

124 He suggested that the boundaries from S 23 could be incorporated as a digital file into the GDA and other products; boundary lines still in doubt could be shown as dots. Draft copies of S 23 will be sent to Member States for agreement.

9.6 IOC & IHO - Memorandum of Understanding

125 RAdm. Guy reported that in recognition of the close co-operation between GEBCO and the IBCs, the IHB had written to the IOC with a draft Memorandum of Understanding (MoU) setting out an understanding of the relationship between the two organisations and their respective mapping programmes.

126 Dr. Travin said the draft MoU between IOC and IHO is currently awaiting the IOC Executive Secretary's signature, expected during summer 2000. The Chairman said he was anxious to see what the two sponsoring bodies had to say about their support for GEBCO.

9.7 Reports of IHO DCDB & NGDC Activities in support of IOC and GEBCO

127 Dr. Loughridge gave a brief introduction to his reports, which are reproduced in full at Annex IX.

10. CONTINENTAL SHELF AND OTHER DEFINITIONS UNDER UNCLOS

128 Mr. David Monahan gave a comprehensive and informative presentation about the development of UNCLOS, and indicated spheres where GEBCO may have a part to play. He suggested that countries making claims for extended jurisdiction (30-70 potential claimants) might well begin their preparations by first exploring GEBCO Charts and the GDA. He identified the potential roles for GEBCO:

- Charts are consistent, neutral, multinational,
- Worldwide bathymetry produced under organizations mentioned in the Convention,
- Charts are source of first look for 'desk study' by any Coastal State,
- Members are source of expertise in seafloor morphology,
- Organization includes infrastructure of data bases, and
- A source of training (material) for third world countries.

129 Mr. Monahan drew attention to Annex 11 of UNCLOS which states: The Commission may co-operate, to the extent considered necessary and useful, with the Intergovernmental Oceanographic Commission of UNESCO, the International Hydrographic Organization and other competent international organizations with a view to exchanging scientific and technical information which might be of assistance in discharging the Commission' responsibilities. He perceived four elements of the preliminary claim procedure as possible GEBCO activities:

- Mapping the 2,500 depth contour,
- Mapping the foot of the slope
- Preparing data bases of the above, and
- Preparing output in the form of charts, maps and diagrams

130 After reporting that no claims had yet been submitted, he went on to explain the difficulties facing countries that currently lacked the resources to make site surveys of their potential claims. Dr. Loughridge suggested that GEBCO might undertake the generation of specialised maps, to a specified accuracy level, thus providing sufficient information for countries intent on making a 'partially substantiated claim' as a preliminary holding mechanism. The Chairman said that the extraction of GDA data to generate specific maps was an interesting idea but one that had severe implications for BODC. He promised to seek the views of Dr. Jones on this topic.

131 Mr. Monahan said although he recognised the necessary delays in the production of the Third Release of the GDA he was very aware that countries such as India, Australia and New Zealand had made plans for large bathymetric and seismic surveys in their area of interest. He said it was important to make the latest GEBCO bathymetry available as soon as possible.

11. UNITED NATIONS INTERACTIVE ATLAS OF THE OCEANS

132 Dr. Travin said that Russia was responsible for the construction of this atlas. FAO and HDNO (Viktor Sedov - Chart Division) were working together on the project. He promised to enquire of Dr. Peter Peterson, IOC, for further information about its progress and whether it was a digital or paper product.

12. GEBCO CENTENARY PLANS

133 The Chairman reported that the Centenary Organizing Committee (COC) met in Salisbury, UK, in August 1999 and again in Copenhagen on the evening of the previous day on 7th May 2000. RAdm. Guy said that the Palace had concurred with the provisional month of April 2003 but had yet to agree with the suggested dates of Monday14th - Wednesday16th. He said he realised that much activity was waiting on confirmation of the precise dates and promised to press the Palace for an answer.

134 The Chairman said he was pleased to announce that earlier this year Dr. Loughridge had agreed to become the Conference Director. Dr. Loughridge had since examined a draft Conference Programme, designed in Salisbury, and made several important and improving proposals. He will include these in a re-draft for consideration by the COC.

135 The Chairman said he was pleased with the progress so far but now needed to turn his attention to securing the services of a Conference Financial Director and to form a Finance Committee to deal with exhibition fees, sponsorship contributions and general expenditure. He added that the Monegasque Government, IOC and IHO were co-sponsors for the celebration events with additional support given by IGU.

136 Once again, 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. He also expected support from Prince Albert, who is very keen on Hydrographic matters, and the Oceanographic Museum. He said the IHB would ask the Principality to host a function and provide some funding to run the new Grimaldi Forum Conference Centre.

137 The Chairman 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 and hopefully available for sale at the Conference. The second, envisaged as a popular book, to be written by a commercial author using material from the first, but directed toward the general public, is scheduled for publication in 2005.

138 RAdm. Guy said that promises have been received from several ships to visit the Port during the Centenary celebrations, notably an NAVOCEANO vessel and HMS 'Scott'.

139 He added that the designs for the Centenary Logo and letterheads were finalized by Mr. Desmond Scott and printed stationery distributed to members of the COC. Finally, he reminded the meeting about the proposed display of all the editions of GEBCO including a Print-on-Demand Sixth Edition and a running demonstration of the GDA. Other ideas included commemorative stamp issues, film, TV, and radio coverage

13. DATES AND PLACES FOR THE NEXT MEETINGS

13.1 Year 2001: Eighteenth Session of GEBCO Guiding Committee

140 Mr. Shin Tani offered three possible meeting venues: Tokyo, Kobe and Kyoto. As for dates he pointed out that it was wise to avoid the period 28th April - 5th May known locally as the 'Golden Week'. Additionally, he would be grateful if it was possible to avoid the beginning of April.

141 After much discussion it was agreed to hold the SCDB meeting in Tokyo. This location will provide the best opportunity to demonstrate the latest JHD technological developments and engage in discussions with the widest possible audience. It is hoped that this venue will also prove attractive to Chinese, Korean and Russian scientists who have an interest in GEBCO or ocean mapping.

143 The Guiding Committee to be held in Kobe on Monday - Wednesday of the following week. Those participants attending the Guiding Committee meeting will travel to Kobe by train or plane on either Saturday or Sunday (to be decided).

144 Tentative dates, covering both meetings, were 18 - 25 April and 16 - 24 May - confirmation of dates will be subject to further discussions between Mr. Tani and the Permanent Secretary.

145 Mr. Tani also suggested that participants might wish to consider a one-day (Tuesday) workshop on Geomorphology to precede the three-day SCDB meeting. He asked participants to respond to this invitation.

13.2 Year 2002: Thirteenth Meeting of GEBCO Officers

146 The meetings will be held in the Diretoria de Hidrografía e Navegação,Rio de Janeiro. Brazil. No dates have yet been fixed. RAdm. Guy said the next IH Conference was scheduled for April 2002.

13.3 Year 2003: Centenary Session of GEBCO Guiding Committee

147 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.

14. ANY OTHER BUSINESS

There was no further business.

15. CLOSURE OF THE MEETINGS

148 The Chairman closed the session of the GEBCO Officers at 4.30 pm on Monday 8th May 2000. He thanked the Directors and staff of The Royal Danish Administration of Navigation and Hydrography (RDANH), for their warm hospitality and gave special thanks to Mr. Arne Nielsen and Mrs Birthe Cumberland Dahl for their considerable organisational efforts before and during the meeting and for the most generous hosting of the Gala Evening, for all the splendid fare during the meetings and for an unforgettable GEBCO Tour all of which had been greatly enjoyed.

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 Seventeenth Session of the joint IOC-IHO Guiding Committee for the GEBCO (doc IOC-IHO/GEBCO-XVII/3)

5. ACTIVITIES OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY (SEVENTEENTH MEETING, ROYAL DANISH ADMINISTRATION OF NAVIGATION AND HYDROGRAPHY (RDANH), COPENHAGEN, DENMARK

   5.1. Review of Bathymetric Mapping World Wide

   5.2 The GEBCO Bathymetric Editor - Report

   5.3 The GEBCO Digital Atlas Manager - Report

   5.4 Update on the work of the GEBCO Grid Working Group

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

   5.6 The GEBCO Digital Atlas - Sales and Distribution

   5.7 GEBCO Guidelines

   5.8 GEBCO Reviewing System

   5.9 GEBCO Web Site

6. THE FUTURE OF GEBCO

6.1 The next generation of GEBCO

6.2 Proposed GEBCO Fellowship

6.3 Educational GDA

6.4 GEBCO Centenary - Funding Support

7. GOMAP (GLOBAL OCEAN-FLOOR MAPPING PROJECT)

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

9. REPORTS ON GEBCO RELATED ACTIVITIES

9.1 IHO - The Role of the VHOs

9.2 IHO - Continental Margin Data

9.3 IHO - Undersea Feature Names Database

9.4 IHO - Undersea Feature Names - Naming Policy

9.5 IHO - S 23-Limits of Oceans and Seas

9.6 IHO & IOC - Memorandum of Understanding

9.7 Reports of IHO DCDB and NGDC activities in support of IOC and GEBCO

10. CONTINENTAL SHELF AND OTHER DEFINITIONS UNDER UNCLOS

11. UNITED NATIONS INTERACTIVE ATLAS OF THE OCEANS

12. GEBCO CENTENARY PLANS

13 DATES AND PLACES FOR THE NEXT MEETINGS

13.1 Year 2001: Eighteenth Session of GEBCO Guiding Committee

13.2 Year 2002: Thirteenth Meeting of GEBCO Officers

13.3 Year 2003: Centenary Session of GEBCO Guiding Committee

14. ANY OTHER BUSINESS

15 CLOSURE OF THE MEETINGS

ANNEX II

LISTS OF DOCUMENTS, PAPERS & MAPS

Documents *

IOC-IHO/GEBCO Officers-XII/1 prov	Provisional Agenda
IOC-IHO/GEBCO Officers-XII/2	Annotated Agenda (Chairman only)
IOC-IHO/GEBCO Officers-XII/3	Summary Report of the Session
IOC-IHO/GEBCO-XVII/3	Summary Report of the Seventeenth Session of the GEBCO Guiding Committee, Geological Survey of Canada, Dartmouth, Nova Scotia, CANADA. 23-30 June 1999.
B-7	Guidelines for the GEBCO (excepting Part 4)
GEBCO Personality List	Revised 1 April 2000

* 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)
- Diagrams and Inventory of Maps considered for inclusion in the GEBCO Digital Atlas (See Annex V)
- The GEBCO Digital Atlas Manager - Annual Report (see Annex VI)
- GEBCO Digital Atlas - Distribution/Sales (see Annex VII)
- The Future of GEBCO - A discussion document prepared by Sir Anthony Laughton
- Action Paper for IOC EC-XXXIII - Prepared by Sir Anthony Laughton
- GEBCO Centenary Fellowships -A discussion document prepared by Sir Anthony Laughton
- Extract from EOS 'New Grid of Arctic Bathymetry Aids Scientists and Mapmakers'
- Deep Ocean Mapping - Correspondence between the IHO and Member States
- GOMaP Workshop Notice and Invitation
- GEBCO Centenary Update
- IBCAO - Summary Report of the Second Session, 2-4 November 1999
- La Base de Donnees Bathymetriques du SHOM - Summary report by Ing. de l'Arm. Jean Meyrat
- South Pacific Mapping - Extracts from a letter Mr Ron Macnab to Dr Mike Carron
- National Geophysical Data Center & IHO/DCDB - 3-part report to GEBCO.

Note: The List of World Wide Seafloor Swath-mapping Systems which formerly appeared as an Annex to this report, is now available from the GEBCO website

Maps

- The World: Surface of the Earth @ 1: 40,000,000. 80°N-80°S, 90°E-120°E - NGDC
- The World: Map constructed from Smith and Sandwell data by T Yoshida (2000)
- Asia: Map constructed from Smith and Sandwell data by T Yoshida (2000)
- Japan: 500m grid from combination of Smith and Sandwell data and Asada grid - T Yoshida
- Japan: Bird's eye view of 500m grid from combination of Smith and Sandwell data and Asada grid - T Yoshida
- Japan: JHD multibeam survey activity for UNCLOS - T Yoshida (1999)
- Japan: Shikoku Basin - Sea Beam data plot - T Yoshida (1999)
- Japan: Shikoku Basin - Asada Grid @ 500m - T Yoshida (1999)
- Japan: Okinawa and South - Sea Beam 2000 plot - T Yoshida (1999)
- Japan: Okiro-Torishima - Sea Beam 2000 plot - T Yoshida (1999)
- Ross Sea: Plot of Bathymetric contours @ 1: 2,000,000. 70°S-80°S, 160°W-160°E - taken from Anstostrat Project CD-ROM -Fred Davey IGNS
- Ross Sea: Anstostrat Project - Siesmic Stratigraphic Atlas of the Ross Sea - Vol. 68
- Gulf of Mexico: Northen Part including Atlantic east of Florida @ 1: 2.116.805 33°N-24°N, 99°W-69°W- NGDC
- Israel: Landsat/Spot orthoimage set - 12 sheets @ 1: 1,000,000 (2000) Hall
- Israel: Gulf of Elat - Bathymetric map showing 50m contours @ 1: 250,000 (2000)
- Israel: Dead Sea - Bathymetric map showing 1 and 10m contours @ 1: 100,000 (2000)
- Israel: Sea of Galilee - Bathymetric map showing 1 contours @ 1: 50,000 (2000)
- Syria: UTM Landsat mosiac @ 1: 1,004,000
- Arctic Ocean: North of 64°- Shaded relief model and contour map produced from IBCAO Beta Grid @ 1: 8.795,800 - IBCAO Editorial Board
- Arctic Ocean: 3D Shaded Relief @ 1: 5,000,000 - Jakobsson (2000)
- New Zealand: Contour plot of NZ Regional Bathymetry @ 1: 4,000,000. 24°S-57°30'S, 157°E-167°W - NIWA (1999)

ANNEX III

LIST OF REVIEWERS

Southern Ocean 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 Yashima	Accepted
South-west Pacific Ocean	Alfred Simpson & Russell Howorth	Accepted 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

ANNEX IV

Report of the GEBCO Bathymetric Editor

July 1999 to May 2000

BATHYMETRY COMPILATIONS:

1. SOC Bathymetry of the Northeast Atlantic.

New bathymetry has been compiled for the seafloor in the region 25°-35°N x 25°-40°W. This fills in a gap in the previous compilation in this area.

A review of the contours to the north of this area, 35°-50°N x 15°-35°W showed that there would not be any advantage to re-compiling the bathymetry. It is unlikely that the region to the south of 20°N will be addressed before the next edition of the GDA, apart from the work of the IBCEA project in the east and studies on the Mid-Atlantic Ridge by Russian and other workers.

2. Bay of Biscay

There has been no progress on deriving intermediate contours at the 500m intervals.

3. International Bathymetric Chart of the Eastern Atlantic (IBCEA).

The GBE is responsible for compiling the contours for sheets 1.04 and 1.05 of the IBCEA. The contours for sheet 1.05 have been finalised and will be sent to BODC for digitizing after this meeting.

A meeting in Paris last year resolved a problem with the common overlap between sheets 1.01 and 1.04. It was decided to use the contours on sheet 1.01 as these had already been digitized and used on preliminary maps. The contours for sheet 1.04 have been adjusted accordingly.

At the above meeting, SHOM agreed to look into the possibility of GEBCO using its MNT gridded bathymetry model at a resolution of 1' x 1' to derive coverage for the continental shelf between the Equator and 60°N. Permission has been granted.

4. North Atlantic Grid

A grid has been produced at the 2.5' x 2.5' resolution. At present, it does not contain any information for regions above the 200 metre isobath. It is hoped to use the SHOM MNT grid and a grid by BODC to provide these data. The BODC grid would be an interim solution while the continental shelf around the UK is worked up as described below.

5. The Continental Shelf around the United Kingdom

Permission has been granted by UK Hydrographic Office for GEBCO to digitise contours and depth information from British Admiralty charts around the United Kingdom. These data can be used to create a 2.5' grid in the region for GEBCO use.

In a separate undertaking outside GEBCO, a group of national Hydrographic Offices and EuroGOOS agencies has been formed to put forward a proposal to produce a gridded bathymetry of the North West Shelf Seas of Europe. The proposal known as EHYGRID is being led by the UK Hydrographic Office and follows on from an earlier proposal by EuroGOOS and SOC. EHYGRID will go out to a depth of 2,500m down the slope, with a resolution varying from 2.5 minutes at the outer edge to 50m close to shore. It will be generated from existing fair chart data holdings.

6. Shoals of Capricorn

Work has recently begun on producing a bathymetric map of the Mascarene Ridge for the Shoals of Capricorn Programme run by the Royal Geographical Society. It will concentrate on shallow water regions not previously covered by other compilations, in particular some of the sill areas in the breaks of the Ridge and shoal areas on the banks. At present, work is being done on identifying and gathering all available data; this includes historical data collected during the nineteenth and twentieth centuries.

7. Continental Slope of the United Kingdom

A compilation of bathymetry collected during recent TOBI (an instrument package towed near the seafloor) work carried out by the SOC for a consortium of oil companies on the slope west of the Shetland Islands has been carried out. The purpose is to produce a series of improved bathymetric maps of the area.

INTERESTING WEB-SITES:

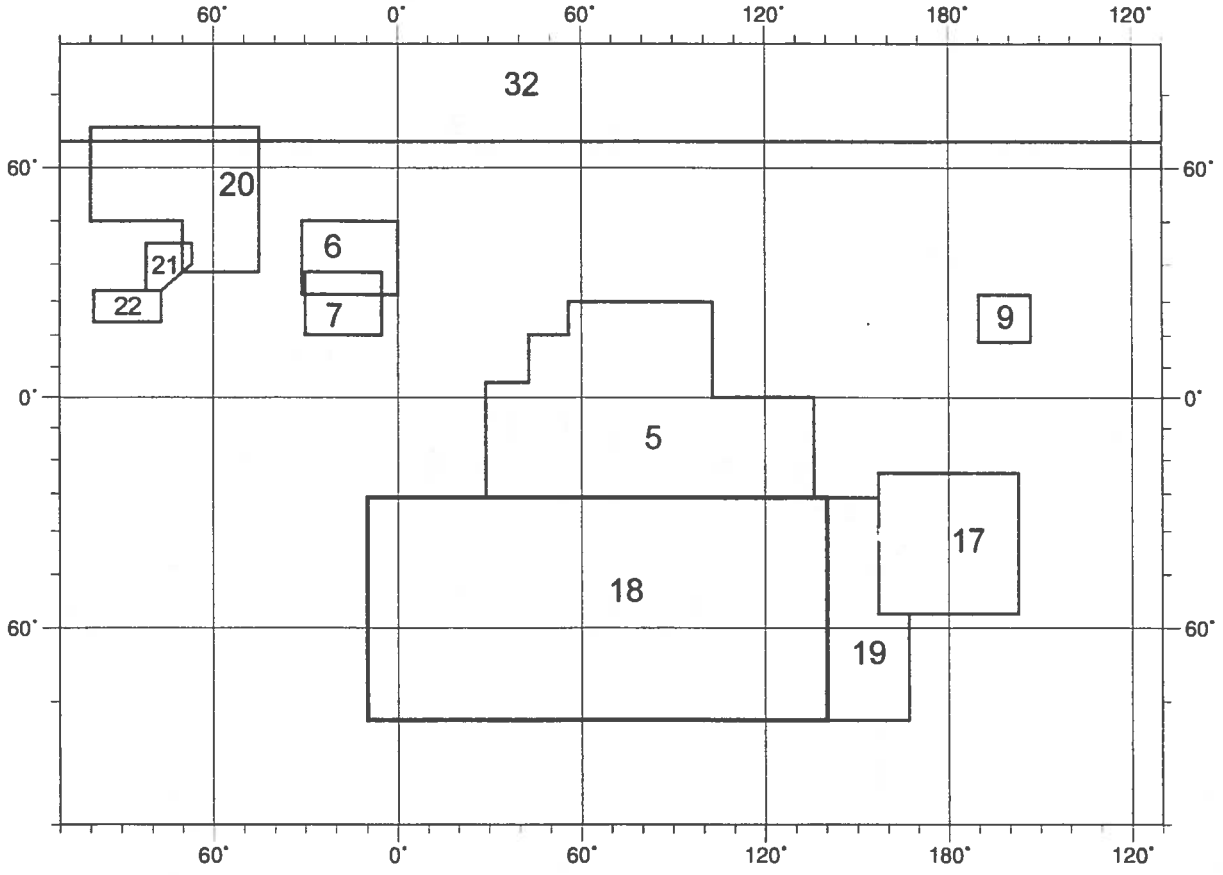
At http://dusk.geo.orst.edu/djl/links.html, Dawn Wright, Department of Geosciences, Oregon State University, has a web page, "Davey Jones' Locker". It has a comprehensive list of links to other sites which have Seafloor Mapping and Marine/Coastal GIS as one of the main themes.

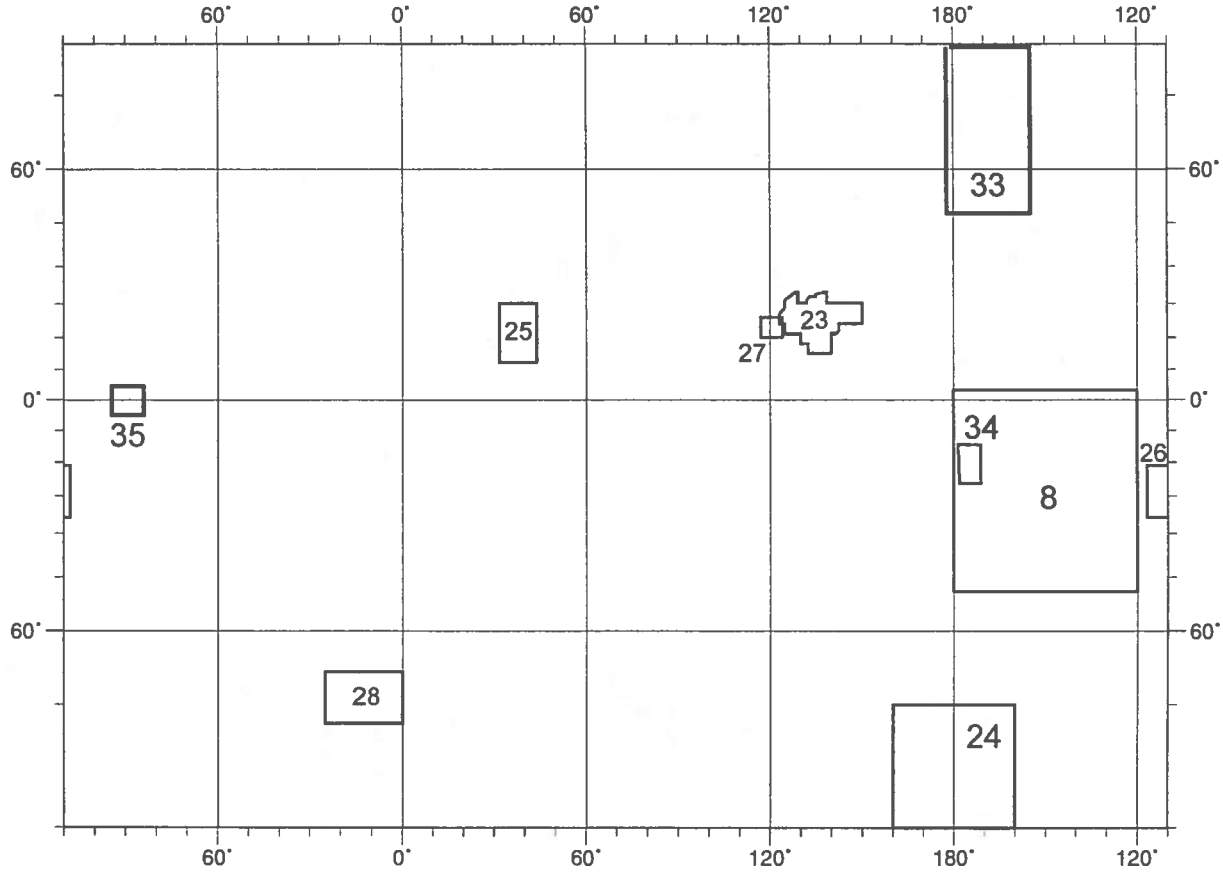
The United States Geological Survey has several web pages, which show bathymetric work. One of these pages at http://kai.er.usgs.gov/images/sigsbee/Sigsbee.html has a concise report on the Sigsbee Escarpment, Gulf of Mexico, with attractive images and a movie.

Diagrams and Inventory of Maps considered for inclusion in editions of the GDA

No.	Author	Source	Date	Title	Scale	Status	Released	Reviewed	Digitized	In GDA
5.01 - 5.18	GEBCO	CHS	1975-84	General Bathymetric Chart of the Oceans	1:10,000,000	GDA	yes	yes	yes	yes
IBCM	EB-IBCM	IOC/IHO/HDNO	1981	International Bathymetric Chart of the Mediterranean	1:1,000,000	GDA	yes	yes	yes	yes
5.12 Rev	Hunter PM et al.	CHS	1994	GEBCO Sheet 5.12 (Revised) - South Atlantic	1:10,000,000	GDA	yes	yes	yes	yes
97.1	Fisher RL	SIO		Bathymetry of the Southern Indian Ocean	1:1,000,000	GDA97	yes	yes	yes	yes
97.2	Schenke H-W et al.	AWI	1997	AWI Bathymetric Map of the Weddell Sea	1:250,000	GDA97	yes	yes	yes	yes
97.3	Hunter PM	IOS/SOC		Bathymetry of the Northeast Atlantic off the British Isles	1:1,000,000	GDA97	yes	yes	yes	yes
1	Cherkis NZ	NRL	1991	Bathymetry of the Barents and Kara Seas	1:2,313,000	GDA2000/1	yes		yes	
2	Cherkis NZ & Vogt PR	NRL	1994	Regional Bathymetry of the Northern Norwegian - Greenland Seas	1:3,000,000	GDA2000/1	yes		yes	
3	Matishov GG	MMBI/NRL	1995	Bathymetric Map of the Franz Josef Land Area	1:500,000	GDA2000/1	yes		yes	
4	HDNO	HDNO	1995	GEBCO Plotting Sheet areas 593 & 594	1:1,000,000	GDA2000/1	yes		yes	
5	Fisher RL	SIO		Bathymetry of the Northern Indian Ocean	1:1,000,000	GDA2000/1	yes		in prog	
6	Sibuet J-C	IFREMER		Bathymetry of the Bay of Biscay	1:1,000,000	GDA2000/1	yes		yes	
7	Hunter PM	SOC		Bathymetry of the Northeast Atlantic	1:1,000,000	GDA2000/1	yes		in prog	
8	Mammerickx J	SIO	1992	Bathymetry of the Southcentral Pacific	1:6,442,194	GDA2000/2	no		no	
9	Duennebir T et al.	HIGP	1995	Northwestern Hawaiian Islands	1:4,000,000	GDA2000/1	no		yes	
10	Keeton JA et al.	SOC	1997	Bathymetry of the Reykjanes Ridge	1:200,000	Unassigned	yes		yes	
11	RIDGE	LDEO	1996	Northern Mid-Atlantic Ridge Terrain Model - Multibeam Surv Proj	Grid	Unassigned	yes		yes	
12	EQUARIDGE	Geol Inst RAS		Equatorial Atlantic	Various	Unassigned	yes		yes	
13	Svarichevskiy A	Pac Oc Inst RAS	1995	Bathymetric Map of the Obruchev Rise	1:2,500,000	Unassigned	yes		no	
14	Svarichevskiy A	Pac Oc Inst RAS	1995	Bathymetric Map of the North-west Pacific Basin	1:5,000,000	Unassigned	yes		no	
15	Japan HD	JHD	1995	Continental Shelf Areas of Japan	1:1,000,000	Unassigned	no		yes	
16	Hsu S-K et al.	IFREMER	1996	Bathymetric Map Around Taiwan	1:1,600,000	Unassigned	no		no	
17	CANZ	NIWA	1997	New Zealand Region Bathymetry	1:4,000,000	GDA2000/1	yes		yes	
18	Fisher RL	SIO		Bathymetry of the Southern Indian Ocean (Update ?)	1:1,000,000	GDA2000/1	yes		in prog	
19	Fisher RL	SIO		Bathymetry of the Southeastern Indian Ocean	1:1,000,000	GDA2000/1	yes		in prog	
20	Macnab R	GSC		Bathymetry of Canadian Waters, including Hudson Bay	Grid	GDA2000/1	no		yes	
21	NGDC	NGDC		Bathymetry of the US East Coast	Grid	GDA2000/1	yes		yes	
22	NGDC	NGDC		Bathymetry of the (US) East Coast and Gulf of Mexico	Grid	GDA2000/1	yes		yes	
23	Japan HD	JHD	1998	Continental Shelf Survey Project	Grid	Unassigned	no		yes	
24	Davey F	IGNS		Bathymetry of the Ross Sea		GDA2000/2	yes		yes	
25	Hall JK	GSI		Bathymetry of the Red Sea		GDA2000/2	no		no	
26	Pardee D	HIGP	1999	Bathymetry of the Easter and Juan Fernandez Microplates	Grid 0.005°	Unassigned	yes		yes	
27	Taiwan Littoral Project	ONR/NRL	1999	Bathymetry of the Taiwan Region	1:804,726	Unassigned	no		no	
28	Schenke H-W et al.	AWI	1999	AWI Bm Chart of the Weddell Sea: AWI BCWS 553	1:1,000,000	Unassigned	yes		yes	
29	Schenke H-W et al.	AWI	1998	AWI Bm Chart of the Weddell Sea: Southern Weddell Sea	1:3,000,000	Unassigned	yes		yes	
30	Russian Navy	HDNO/VNIIOk.	1999	Bottom Relief of the Arctic Ocean	1:5,000,000	Unassigned	no		no	
31	Lonsdale P	SIO		Various swath maps on the East Pacific Rise		Unassigned	no		no	
32	IBCAO Ed. Board	IOC/IHO		International Bathymetric Chart of the Arctic Ocean	Grid	GDA2000/1	yes		yes	
33	Robertson DG	USGS	1997	Bering and Chukchi Sea Bathymetry Coverages	Various	Unassigned	no		no	
34	Wright DJ et al.	ORST	2000	Bathymetry of Tonga Trench and Forearc	~1:500,000	Unassigned	no		yes	
35	Chadwick W	PMEL	1999	Galapagos Bathymetry	Grid 1km	Unassigned	no		yes	

Diagrams of Maps considered for inclusion in editions of the GDA





ANNEX VI

Report of the GEBCO Digital Atlas Manager
July 1999 – May 2000

Indian Ocean

Work has continued on the digitisation of bathymetric contour and trackline control charts from Dr. R.L. Fisher for the Indian Ocean area. A further 109 update charts have been received this year, fifteen of these update charts have been digitised for the area: 10°W-10°E; 24°S-72°S. Quality control checks have been carried out on the digital data for 24 charts in the area 70°E-90°E; 23°N-31°S and 20 charts for the area 150°E-160°E; 29°S-72°S.

The attached diagram shows the areas for which update charts have been received and the progress with the digitisation of the bathymetric contour and trackline control data for the Indian Ocean area.

North Atlantic Area

Bathymetric contour data for the area: 48°W-20°W; 20°N-32°N has been digitised from 11 bathymetric charts supplied by Mr. Peter Hunter. The charts range in scale from 1:720,000 to 1:1,200,000 with depths at 1000m, 1500m, 1800m and 100m intervals thereafter to 5800m and then at depths of 6000m and 6500m.

Digital trackline control data for the area: 48°W-20°W; 18°N-32°N has also been received.

Digital bathymetric contour and trackline control data has been received from SHOM for IBCEA sheet 8 covering the area: 21° 47'W-11° 17'W; 5° 11'N-12° 18'N. The bathymetric contours on the original paper chart are at depths of 50m, 100m, 200m and then at intervals of 200m to a depth of 5000m. However, the bathymetric contours at 500m, 1500m, 2500m, 3500m and 4500m have also been included in the digital data set.

New Zealand Region

Digital bathymetric contour and trackline control data have been received from NIWA for the area: 157°E-167°W; 24°S-57° 30'S. The bathymetric contours are at 250m intervals from a depth of 250m to 9750m. In the area: 176° 30'W-173°W; 39° 30'S – 36° 12'S contours are at an interval of 50m between 4550m and 5600m.

Shallower water bathymetric contour data has also been provided for this area from NIWA with contours at 50m intervals between 50m and 200m.

Other data sets held in digital form include:

Arctic Area

1. Bathymetric contour data for the area 0°-80°E; 68°N-82°N from the chart: 'Bathymetry of the Barents and Kara Seas' by N.Z. Cherkis, H.S. Fleming, M.D. Max, P.R. Vogt and M.F. Czarnecki

2. Bathymetric contour data for the area 43°E-67°E; 79° 15'N- 82° 15'N from the chart: 'Bathymetric Map of the Franz Josef Land Area', compiled by G.G. Matishov, N.Z. Cherkis, M.S. Vermillion and S.L. Forman

3. Bathymetric contour data for the area 25°W-5°E; 69°N-84°N from the chart: 'Regional Bathymetry of the Norwegian – Greenland Sea' by N.Z. Cherkis and P.R. Vogt.

4. Bathymetry data supplied by HDNO for the area 78°E-128°E;72°N-78°N

Ross Sea Area

Digital bathymetric contour and trackline control and coastline data for the area 160°W-160°E; 70°S-80°S. The data is taken from the ANSTOSTRAT Project Seismic Stratigraphic Atlas of the Ross Sea.

North Atlantic Area

Digital Bathymetric contour data for the following areas (charts supplied by Mr. Peter Hunter)

1. 15°W-5°W; 32°N-38°N - data digitised from 12 original charts at scales of between 1:275,000 and 1:520,000

2. 28°W-21°W; 26°N-34°N - digitised from original chart at a scale of 1:1,000,000 at 33°N

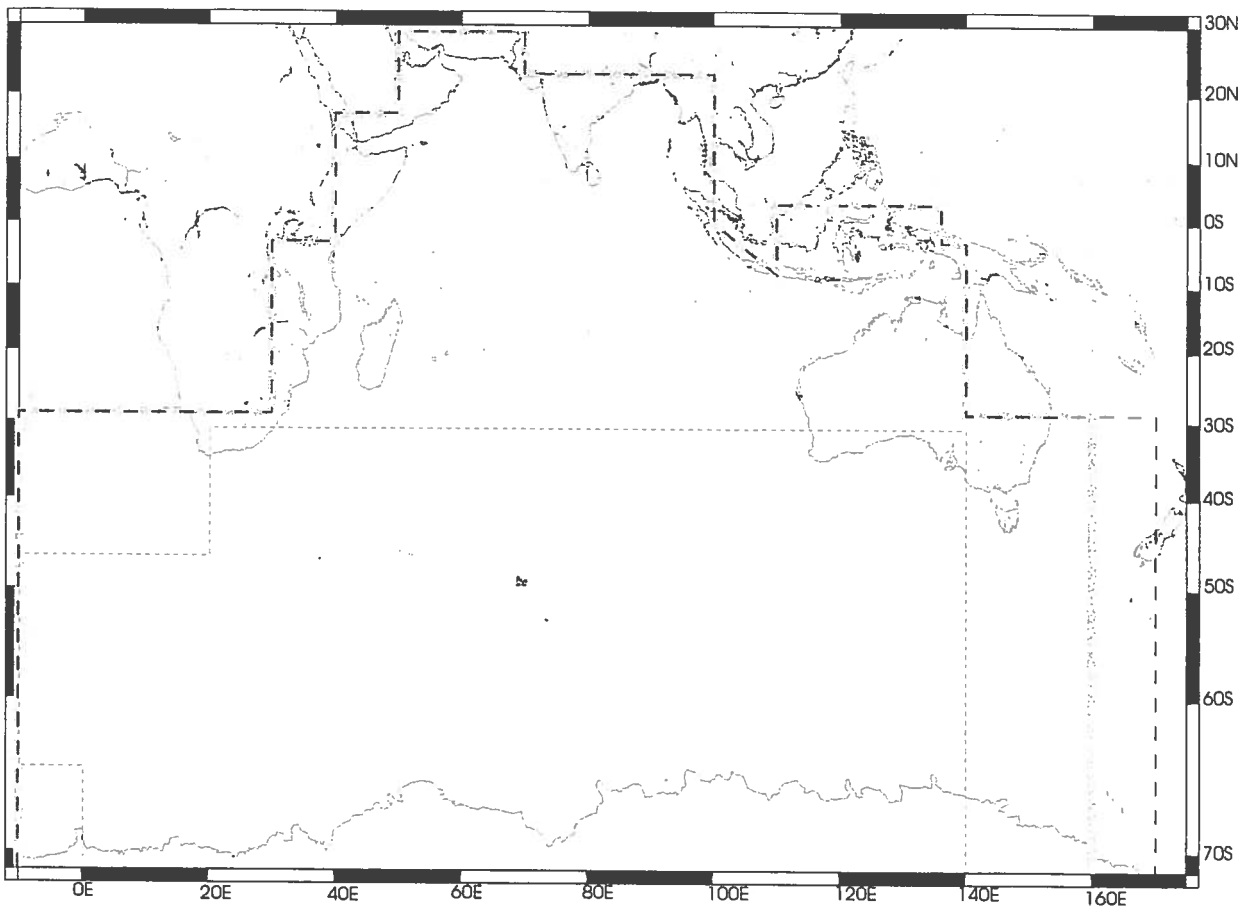
3. 18°W-14°W; 31°N-33°N – data supplied in digital form

Digital Bathymetric contour and trackline control data for the Bay of Biscay Area 16°W-0°;42°N-50°N – chart supplied by Dr. Jean-Claude Sibuet of IFREMER.

P. Weatherall

28 April 2000

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

Area for which update charts have been received

ANNEX VII

DISTRIBUTION/SALES OF GEBCO DIGITAL ATLAS (1 APRIL 2000)

Country	SECTOR Gov	Univ	Comm	Other	Total	(sold)
Albania	1	-	-	-	1	(0)
Algeria	2	-	-	-	2	(1)
Argentina	1	-	-	-	1	(0)
Australia	28	13	12	-	53	(47)
Austria	1	-	-	1	2	(2)
Barbados	-	-	1	-	1	(1)
Belgium	5	7	1	2	15	(12)
Bermuda	-	-	1	-	1	(1)
Brazil	5	12	-	-	17	(15)
Bulgaria	1	-	-	-	1	(0)
Canada	26	16	6	5	53	(40)
C'ile	2	2	-	-	4	(4)
China	2	2	1	-	5	(2)
Colombia	2	1	-	-	3	(0)
Costa Rica	-	1	-	-	1	(1)
Côte d'Ivoire	2	-	-	-	2	(1)
Croatia	3	-	-	-	3	(1)
Cuba	1	-	-	-	1	(0)
Denmark	8	3	1	1	13	(11)
Ecuador	2	-	-	-	2	(0)
Egypt	2	-	-	-	2	(0)
Falkland Is. (Is. Malvines)	2	-	2	-	4	(4)
Faeroes	2	-	1	-	3	(3)
Fiji	-	-	-	1	1	(0)
Finland	1	-	-	-	1	(1)
France	22	9	11	12	54	(42)
Gabon	-	-	1	-	1	(1)
Germany	27	28	9	2	66	(62)
Greece	4	1	-	1	6	(4)
Guinea	1	-	-	-	1	(0)
Hungary	-	1	-	-	1	(1)
Iceland	6	2	1	-	9	(9)
India	5	1	-	-	6	(3)
Indonesia	-	-	1	-	1	(1)
Iran	1	-	-	-	1	(0)
Ireland	4	4	4	-	12	(10)
Israel	1	1	-	-	2	(1)
Italy	13	7	3	8	31	(28)
Jamaica	-	-	-	1	1	(1)
Japan	8	14	34	2	58	(56)
Kenya	4	-	-	-	4	(0)
Korea	6	1	1	-	8	(6)
Madagascar	1	-	-	-	1	(0)

Country	SECTOR Gov	Univ	Comm	Other	Total	(sold)
Malaysia	1	-	-	-	1	(0)
Malta	-	1	-	-	1	(1)
Mauritania	1	-	-	-	1	(0)
Mauritius	1	1	-	-	2	(1)
Mexico	1	1	-	-	2	(1)
Monaco	-	-	-	10	10	(7)
Morocco	2	-	-	-	2	(1)
Mozambique	2	-	-	-	2	(0)
Netherlands	5	3	7	2	17	(16)
New Caledonia	-	-	-	1	1	(1)
New Zealand	6	1	3	1	11	(9)
Nigeria	1	-	-	-	1	(0)
Norway	16	4	14	3	37	(32)
Papua-N.Guinea	1	1	-	-	2	(1)
Peru	1	-	-	-	1	(1)
Philippines	-	2	-	2	4	(3)
Poland	2	-	-	-	2	(2)
Polynesia (Fr.)	-	1	-	-	1	(1)
Puerto Rico	-	1	-	-	1	(1)
Portugal	2	2	-	-	4	(3)
Reunion	1	-	-	-	1	(1)
Romania	1	-	-	-	1	(0)
Russia	16	1	-	1	18	(1)
Seychelles	1	-	-	-	1	(0)
Singapore	1	-	-	-	1	(1)
South Africa	6	-	2	-	8	(6)
Spain	7	11	10	3	31	(29)
Sri Lanka	-	-	-	1	1	(1)
St. Vincent	1	-	-	-	1	(1)
Sweden	1	2	-	-	3	(2)
Switzerland	-	1	1	-	2	(2)
Taiwan	1	3	-	-	4	(4)
Tanzania	2	-	-	-	2	(0)
Thailand	1	-	-	1	2	(2)
Tunisia	1	-	-	-	1	(0)
Turkey	3	2	1	-	6	(4)
Ukraine	4	-	-	-	4	(0)
UK	101	66	60	18	245	(145)
USA	54	81	83	9	227	(189)
Vietnam	2	-	-	-	2	(1)
TOTAL	448	311	271	88	1118	(842)

Figures above refer to total number of copies sold or distributed up to 1 April 2000. GOV = Government/Public funded organisation; UNIV = University; COMM = Commercial organisation. Number in parenthesis refers to total number of copies sold as opposed to complimentary copies.

DISTRIBUTION/SALES OF GEBCO DIGITAL ATLAS – SUMMARY STATISTICS (1 APRIL 2000)

a) Total number sold/distributed = 1118 copies
Total number sold = 842 copies
Number of complementary copies = 276 copies

b) Copies sold/distributed to 83 countries

c) Breakdown of copies sold/distributed by sector:

Government bodies	448 copies
University groups	311 copies
Commercial bodies	271 copies
Other organisations	88 copies

d) Distribution of 276 complimentary copies:

GEBCO community	93 copies
International exchange	94 copies
UK national exchange	89 copies

e) Sales/distribution by month:

	Sold	Gratis	Total
1994			
May	17	18	35
Jun	33	52	85
Jul	20	3	23
Aug	8	9	17
Sep	21	7	28
Oct	16	1	17
Nov	18	2	20
Dec	13	6	19
1995			
Jan	16	1	17
Feb	48	5	53
Mar	31	8	39
Apr	18	5	23
May	28	8	36
Jun	20	3	23
Jul	23	6	29
Aug	16	2	18
Sep	18	4	22
Oct	15	3	18
Nov	20	3	23
Dec	13	2	15
1996			
Jan	10	1	11
Feb	10	23	33
Mar	10	1	11
Apr	9	-	9
May	17	5	22
Jun	6	-	6
Jul	6	2	8
Aug	4	2	6
Sep	3	-	3
Oct	15	2	17
Nov	11	1	12
Dec	5	2	7
1997			
Jan	7	2	9
Feb	13	-	13
Mar	5	3	8
Apr	11	2	13
May	7	-	7
Jun	18	8	26
Jul	11	-	11
Aug	8	1	9
Sep	10	2	12
Oct	8	2	10
Nov	10	2	12
Dec	8	11	19
1998			
Jan	15	3	18
Feb	11	2	13
Mar	8	2	10
Apr	5	3	8
May	7	1	8
Jun	8	4	12
Jul	7	2	9
Aug	1	2	3
Sep	9	3	12
Oct	6	2	8
Nov	1	1	2
Dec	3	0	3
1999			
Jan	12	1	13
Feb	7	4	11
Mar	8	2	10
Apr	10	11	21
May	8	2	10
Jun	2	2	4
Jul	6	3	9
Aug	3	-	3
Sep	9	-	9
Oct	10	1	11
Nov	12	2	14
Dec	12	-	12
2000			
Jan	7	1	8
Feb	11	2	13
Mar	10	-	10
Total	842	276	1118

ANNEX VIII

RESOLUTION EC-XXXIII.7

GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO)

The Executive Council

Recalling that IOC Resolutions XVIII-10 (1995), XIX-3 (1997) and XX-5 (1999) emphasised the high importance of Ocean Mapping to all IOC Member States as well as to global and regional science programmes, such as climate programmes, ICAM, tsunamis and storm surges,

Noting with satisfaction:

i the close co-operation in Ocean Mapping, especially GEBCO, with the International Hydrographic Organization (IHO), the importance of mapping data from the IOC International Bathymetric Chart series and the numerous significant contributions for updated bathymetry throughout the worlds oceans,

ii. the continued success of the second release of the GEBCO Digital Atlas and the plans for the updating and inclusion of gridded contours for the third release of the GDA (planned for 2001),

Taking note of:

i. the findings of the SCOR working group 107 and in particular the stated needs of the scientific community for high resolution grids of the bathymetry of the ocean floor,

ii for extensive updating of the world's bathymetry and of the Pacific Ocean in particular,

iii the requirement to develop the technology of the GDA and make optimum use of emerging information technologies,

iv the need to create a new 6th edition by print-on-demand technology,

Considering that at present GEBCO depends on limited IOC funding, UK funding for salaries, IHO (non-financial) sponsorship, part-time participation of numerous organizations, substantial voluntary contributions from the scientific communities and hydrographic offices

Invites Member States:

i to support the determination of the morphology of the ocean floor especially in those areas of scientific and commercial importance as identified by SCOR/IOC,

ii to assemble, collate and contour such areas so as to contribute to the improvement of the global charts of GEBCO,

iii to take into account all other relevant geological, geophysical and satellite data to aid in interpolation and interpretation,

iv to generate and make available to the GEBCO global grid, gridded and/or contoured data of their continental margins if appropriate,

v to support financially the GEBCO Centenary Conference on ocean floor mapping to be held in Monaco in April 2003,

vi to consider and support the GEBCO proposal to prepare an educational of the scientific community for high resolution grids of the bathymetry of the ocean floor,

GEBCO CDROM for wide distribution to schools and Universities,

vii to consider creating and supporting GEBCO Centenary Fellowships to enable well qualified geoscientists to accelerate the updating of global bathymetry,

Instructs the Executive Secretary IOC to provide support towards the GEBCO Centenary Conference, the printing of the 6th edition and partial support of a GEBCO Centenary Fellowship.

Financial implications: US$20,000 (Extra Budgetary Sources)

ANNEX X

LIST OF PARTICIPANTS

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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
ANTOSTRAT	Antarctic Stratigraphy
AWI	Alfred-Wegener-Institut für Polar- und Meeresforschung (Bremerhaven, Germany)
BAS	British Antarctic Survey
BDBS	La Base de Donnees Bathymetriques du SHOM (Database)
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
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
E-GDA	Educational GEBCO Digital Atlas
EHYGRID	European Hydrographic (Bathymetric) Grid
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
EUROGOOS	European Global Ocean Observing System
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
GLOBE	World topographic mapping project
GMT	Generic Mapping Tools (P. Wessel and W.H.F. Smith)
GOMaP	Global Ocean-floor Mapping Project
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	Hyper Text 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)
INT	International (In context of IHO publications or projects)
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOSDL	Institute of Oceanographic Sciences Deacon Laboratory (now part of SOC)
ISO	International Standards Organization
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 Environment 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)
NIWAR	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 (NOAA 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)
PoD	Print on Demand
PSMSL	Permanent Service for Mean Sea Level
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
SCAMP	Seafloor Characterization and Mapping Pod
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)
SHOA	Servicio Hidrográfico y Oceanográfico de la Armada
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
TOBI	Towed Ocean Bottom Instrument
TSMAD	Transfer Standard Maintenance and Application 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 Organization
WVS	World Vector Shoreline (NIMA)
WWW	World Wide Web

ANNEX IX

REPORTS OF IHO DCDB & NGDC ACTIVITIES IN SUPPORT OF IOC & GEBCO

1. REPORT OF THE INTERNATIONAL HYDROGRAPHIC ORGANIZATION DATA CENTER FOR DIGITAL BATHYMETRY (IHO DCDB)

1.1 Bathymetric Data Holdings and Global Database Management

Since the June 1999 Meeting of the GEBCO Sub-Committee on Digital Bathymetry, the National Geophysical Data Center (NGDC) has responded to 144 international requests for data or information from 33 countries of which 22 are IHO Member States. This is a significant decrease from previous years, and is directly related to a change in NOAA's customer tracking management system, which no longer counts requests that don't result in a data sale.

Version 4.0 of the Global Trackline Geophysical Data Base (GEODAS), released in December 1998, contains over 13.4 million nautical miles of bathymetry from 4,111 cruises with 34.9 million digital records. Since the release of version 4.0, 150 cruises containing 576,000 trackline miles of bathymetry , and totalling over 2.2 million soundings have been assimilated into the Global Marine Trackline Geophysics Database. Assimilated data are available for download from NGDC's web pages. This data originates from ten different institutions located in four countries. An updated version of the Marine Trackline Geophysics CD-ROM is scheduled for release in 2000.

A unique data set incorporated since the last meeting includes Arctic Ocean bathymetry from the U.S. Naval Research Laboratory (NRL). Over 200,000 ocean depths collected by nuclear submarine forces of the U.S. Navy and Royal Navy of the United Kingdom during under-ice patrols between 1958 and 1982 were digitized by NRL from original navigation logs and analog echosounding records. The data, which go as far north as 90 degrees north latitude, were released for public dissemination by the respective navies as a result of efforts initiated by the United States Arctic Research Commission on behalf of the international geosciences community.

1.2 International Hydrographic Organization (IHO) Related Activities at NGDC

A review of the latest draft B-7, Part 4, Digital Bathymetric Data (Multibeam Echo Sounders) has been conducted by one of the authors, Dr. George Sharman. Evaluation of the comments gathered at the previous GEBCO meeting suggested that the draft had reached a level of detail and specificity which was not warranted by the nature of the document. A re-write of sections of the document may be needed to ensure document longevity as technology advances, and to allow flexibility in data acquisition accuracies and precisions commensurate with the nature of each survey mission.

1.3 GEODAS Software Development

NGDC is continuing the development of the GEODAS software management system. Originally developed to manage marine geophysical trackline data, GEODAS has evolved into a universal software management tool which can handle a variety of data formats and types including single beam/multibeam, trackline/survey, and gridded bathymetrie/topographic data. Version 4.0, of the Marine GEODAS is now Y2K compliant and 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 color postscript plotting capabilities. Source code is also available for other UNIX operating systems. Data can now be downloaded in the MGD77 format or in a space delineated X, Y, Z, ASCII format.

GEODAS software development in the last year includes enhancements for both the MS Windows and the X windows versions. A major enhancement allows users of the NOS Hydrographic Survey database to export survey data to a common horizontal datum, North American Datum 1927 or North American Datum 1983. GEODAS for X Windows has been improved and now has user-friendly binary installations for Solaris, Irix and PC Linux users, and source code for installation on other X windows systems. GEODAS software developed for use with gridded topographic and bathymetric data in the coastal U.S. (NGDC Coastal Relief Model) has been adapted for use with the GEBCO, global bathymetric grids.

1.4 Creation of the International Non-Standard Bathymetry Database (INSBD)

NGDC is continuing to develop and conceptualise a new International Non-Standard Bathymetry Database 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. NGDC currently refers to this database as "International Non-Standard Bathymetry Database" for lack of a better name, and uses the database as an NGDC internal tool to maintain an inventory of bathymetric and hydrographic data holdings which do not fit into the GEODAS Marine Trackline Geophysics Database (e.g. digitized charts, gridded data, point data…..). Future direction, development, and timeframe will be influenced by the nature, type, and critical mass of data necessary to spawn independent databases.

To date, eleven data sets, from nine institutions, containing a total of over 1.5 million soundings comprise the INSBD. 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.

2. NGDC ACTIVITIES IN SUPPORT OF IOC & GEBCO

2.1 IOC Regional Mapping Projects

In addition to participation in GEBCO, NGDC staff continue to take an active role in the IOC regional bathymetric mapping projects. Dr. Troy Holcombe serves on the Editorial Board of IBCCA, IBCEA, and IBCWIO, and Dr. George Sharman continues as an active member of the Editorial Board of the IBCWP.

- **Caribbean Sea and Gulf of Mexico (IBCCA)**

  The next editorial board meeting is scheduled to be hosted by the National Geophysical Data Center in October of 2000 in Boulder, Colorado. Although it is still a priority to produce printed sheets of the 17 IBCCA areas, emphasis of the project has shifted to digital products including a CD-ROM containing data and imagery for the area. Bathymetry has been completed for most of the IBCCA areas, and most of the completed bathymetry has been scanned to digital media at the Instituto Nacionale de Estadística, Geografía, y Informática (INEGI) in Mexico.

Editing, printing, and creation of data sets is proceeding. Attention is now also being focused on digital geological and geophysical map products, with early consideration of maps and data sets of seismicity, gravimetry, and earth magnetism.

The IBCCA web site (http:\\www.ngdc.noaa.gov/mgg/ibcca/ibstart.htm) was offered for review to all IBCCA participants and the site was made available to the public after editorial changes were made. NGDC has received much interest in the digital data and color bathymetric poster for sheets 1, 2, 3, and 4 from people visiting the IBCCA web site.

NGDC created a large color poster of the bathymetry of the Northern Gulf of Mexico and Atlantic Ocean east of Florida, using data from four IBCCA areas of U.S. responsibility, areas 1-01 through 1-04. The poster has been printed and is now available from NGDC. A preview of the poster can be viewed on the IBCCA web site. In preparation for creating a CD-ROM that will contain data and imagery of IBCCA areas 1-01 through 1-04, NGDC has completed all editorial changes and updates to the digital vector data for areas 1-01 through 1-04. The digital data are now available from NGDC in ASCII and ARCINFO formats.

- **Mediterranean Sea (IBCM)**

NGDC staff member and Editorial Board member Troy L. Holcombe attended the Eighth Session of the Editorial Board held in Kaliningrad Russia in September of 1999. The complete report of the Eighth Session of the Editorial Board for the IBCM appears on the not-yet-released IBCM web pages at the address: **http:www.ngdc.noaa.gov/mgg/ibcm**

The IBCM web pages have been assembled and finalized to the extent possible. Comments were solicited and received from Carlo Morelli and John Hall, and these were responded to. NGDC is awaiting final approval to release these pages for public viewing.

Based on an Eighth Session action item, an initial inquiry was made regarding the existence and availability of IBCM digital data. NGDC has inventoried the digital data sets currently available.

Another activity requested at the Session was for NGDC to produce a draft version of a bathymetry and circum-Mediterranean land elevation color relief image for the Mediterranean region. NGDC already has a preliminary version of this image, which only needs the digital source bathymetry to be changed from U. S. Navy to IBCM, and for the proper explanatory text, title blocks and logos to be added.

- **Arctic Ocean (IBCAO)**

An editorial board meeting was held in Monaco in November of 1999. A provisional version of the digital database was previewed; the database contained all available contour and sounding information available at that time. It was agreed that the Arctic Ocean project would be a dynamic database, updated on a regular basis, as new information becomes available. In order to maintain the database in this manner the project would need a permanent home; a location is to be decided on in the next six to nine months.

Traditionally the IOC regional bathymetric mapping projects publish paper maps as their final product, the IBCAO editorial board, however agreed that the digital database would be their ultimate product. In addition, five paper maps would also be printed; an updated version of GEBCO sheet 5.17 and four maps at a scale of 1:2.5 million for the IBCAO.

- **Western Indian Ocean (IBCWIO)**

Lisa A. Taylor, a member of the NGDC staff, will attend the IBCWIO Editorial Board Meeting in Port Louis, Mauritius, during the last week in July 2000. She will present the compilation of IBCWIO Sheet 5, which encompasses the Seychelles Islands and is the joint responsibility of the Seychelles and the United States. Ms. Taylor will also consult with the Seychelles participants about adding Seychelles near-shore sounding data to the compilation, and she will attend bathymetric mapping seminars offered to participants of the meeting.

- **Central Eastern Atlantic (IBCEA)**

New bathymetry for several areas within the IBCEA has been received and reviewed, and comments have been sent to the Chief Editor.

- **Baltic (IBCB) (Proposed)**

Initiation of an International Bathymetric Chart of the Baltic (IBCB) Project was discussed at the Eighth Session of the IOC Editorial Board for the IBCM. NGDC and the U.S. ocean mapping community support the formation of an IBCB Project. NGDC has agreed to assist with funding support for an inaugural meeting of the IBCB.

2.2 GEBCO Reviewers Report:

- **North-east Pacific Ocean**

While there are no major mapping programs in the Northeast Pacific, there are numerous local studies and a host of ship activity. All of the major Universities and NOAA have ship's working in the north-east Pacific, including Lamont Doherty Earth Observatory's MAURICE EWING, NOAA's KA'IMIMOANA and RONALD H. BROWN, the University of Washington's THOMAS G. THOMPSON, Woods Hole Oceanographic Institution's ATLANTIS and KNORR, Scripps' MELVILLE and ROGER REVELLE, and Oregon State University's WECOMA. However, small-scale regional mapping is not being done at any institution. Coastal Baja California is being mapped at Scripps along with regions of the central eastern Pacific on a piecemeal basis. NOAA has a continuing interest in the Juan de Fuca Ridge.

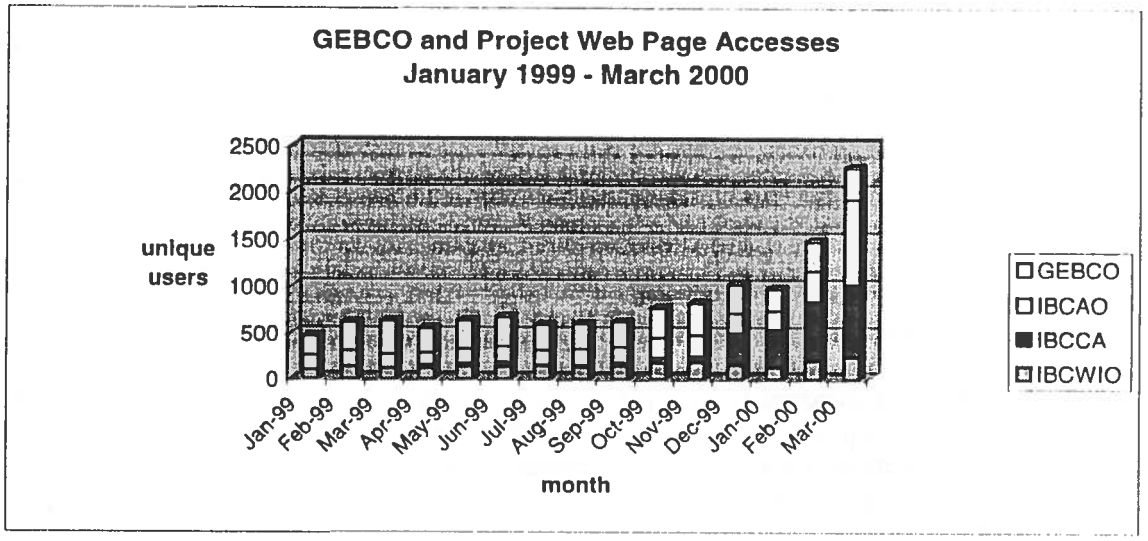
The Naval Oceanographic Office is surveying parts of the Southern California Borderland. As these data become available, they will serve to reinforce a well-populated database of bathymetry for the north-eastern Pacific basin.

- **Caribbean Sea and Gulf of Mexico**

While there are no major mapping programs in the Caribbean, there is significant ship activity. In the past year, NGDC has digitized plotting sheets in the Caribbean region for the Netherlands. These data has been made available to the IBCCA mapping project. U.S. institutions, Universities, and NOAA all have vessels that periodically work in the area, and as these data become available, they may be incorporated into the bathymetric data bases of the region.

2.3 Related Activities Supporting IOC & GEBCO Programs and Projects:

- **GEBCO On-Line Activities**



- **GEBCO Web Pages**

The GEBCO web pages are undergoing major revision and upgrade. A new draft of the pages was posted in April 2000 and is now available to the public, pending final approval of the Permanent Secretary GEBCO. Enhancements include a complete, multi-part GEBCO personality list, additional information on hard copy maps available, a current list of GEBCO reviewers, and a new update on plans for the GEBCO Centenary celebration to be held in 2003. Access to the GEBCO web pages has been steady over the last year, averaging 296 unique users per month, growing to 341 in the last month as the updates became available.

- **IBCWIO Web Pages**

  There have been no new updates of the IBCWIO web pages during the last year. Access to the pages continues to be steady at an average of 153 unique users per month,

- **IBCAO Web Pages**

  The IBCAO web pages underwent major augmentation and revision in February 2000. A provisional map and beta grid were added to the pages, as well as reports from the latest IBCAO meeting. Access to the IBCAO pages jumped substantially during late February and early March, moving from an average of 187 unique users per month to over 900 in March alone, when the

  URL of the IBCAO pages appeared in EOS as part of a cover story on IBCAO. Also in February, a new IBCAO-announcements list server option was added to the IBCAO pages; over 170 people have signed on through mid-April.

- **IBCM Web Pages**

  The IBCM web pages remain as they were this time last year. The pages are ready for public release pending approval from John Hall, but are already visible to the public via links from the IHO, and are receiving minimal traffic.

- **IBCCA Web Pages**

  The IBCCA web pages became public during the fall of 1999 and are being accessed heavily. Portions of the pages are available in Spanish, courtesy of the Instituto Nacional de Estadística, Geografía y Informática (INEGI). An average of 381 unique users per month during December of 1999 through January 2000 has increased to an average of 704 unique users per month for February and March 2000.

- **IBCEA Web Pages**

  The IBCEA pages are still in preparation and not yet ready for public release. A draft site is currently under review by IBCEA participants. They are being prepared in both English and French versions with assistance from Service Hydrographique et Océanographique de la Marine (SHOM).

- **GEBCO Gridders List Server**

  During the past year, there has been continuing traffic on the GEBCO-Gridders list server operated by NGDC. In February, a new IBCAO - announcements list server option was added to the IBCAO pages; over 170 people have signed on through mid-April. NGDC welcomes comments from the GEBCO community on how we can improve or enhance these services.

2.4 Coastal Relief Model Development and Demonstration

During 1999, NGDC continued the development of its Coastal Relief Model (CRM) series. The Coastal Relief Model series, provides a comprehensive view of the US Coastal Zone; extending from the coastal state boundaries to as far offshore as the NOS hydrographic data will support a continuous view of the seafloor. Current efforts are focusing on the development of Coastal

Relief Models for Florida and the Gulf Coast. Progress has been slowed to explore efforts to combine contour data with the hydrographic soundings in areas where the NOS data are sparse. Ongoing efforts are progressing in a clockwise direction, and will eventually include the U.S. West Coast, Alaska, Hawaii, and Puerto Rico.

The techniques and technologies employed in the Coastal Relief Models are readily applicable to any region. In support of the GEBCO effort to produce a global gridded bathymetric database, NGDC has developed a demo CD-ROM to search and extract subsets of these new data. The GEBCO data are first converted to the NGDC CRM format in order to make use of the GEODAS software developed for the CRM project. NGDC adapted the portion of GEODAS that handles the gridded CRM data to work with the 2.5-minute x 2.5-minute gridded GEBCO data. The user interface for the GEBCO grids CD-ROM is under development and will be based on the NGDC CRM interface.

2.5 Electronic Rescue of Bathymetric Maps

NGDC has explored scanning of printed maps as a means of preservation and distribution. National Ocean Service (NOS) black and white fishing map manuscripts have been scanned and quality assured. Full color maps have likewise been scanned. An on-line index of these maps is available on the world wide web at:
http://www.ngdc.noaa.gov/mgglbathymetry/mapslnos-intro.html

Development of co-operative agreements for the on-demand printing of the scanned images is parallel to development of 'ftp' and CD-ROM delivery of the digital files of the same scanned images. These developments, although designed to address the potential loss of paper maps, are equally applicable to other forms of maps and GIS data. During the past year, this process has been used to scan maps for the IBCM and IBCCA Regional Mapping Projects.