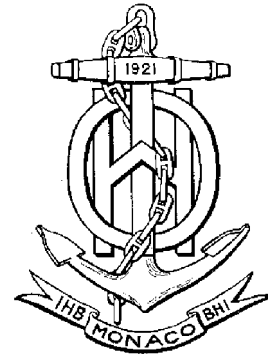


**INTERGOVERNMENTAL OCEANOGRAPHIC
COMMISSION
(of Unesco)**



**INTERNATIONAL HYDROGRAPHIC
ORGANIZATION**



Eighteenth Meeting of the GEBCO Guiding Committee

Covering also

The Eighteenth Meeting of the Sub-Committee on Digital Bathymetry

Japanese Hydrographic Department, Tokyo, Japan

18-20 April, 2001-11-30

and

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In addition to recording the business of GEBCO Guiding Committee XVIII, these minutes also contain a précis of the substantive discussions and decisions, which arose during the preceding Eighteenth Meeting of the GEBCO Sub-Committee on Digital Bathymetry (SCDB). For recording purposes, some of the contents of the two meetings have been merged.

1. OPENINGS OF THE MEETINGS OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY AND THE GUIDING COMMITTEE

- 1 The Eighteenth Meeting of the joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO) Guiding Committee (GC XVIII) and the Eighteenth Meeting of the Sub-Committee on Digital Bathymetry (SCDB XVIII) were held at the Meriken Park Oriental Hotel, Kobe and in the offices of the Hydrographic Department of Japan (JHD), Tokyo, respectively. GC XVIII met on 23-25 April, 2001 and SCDB XVIII on 18-20 April, 2001.
- 2 At the opening of the meeting of the SCDB, members were welcomed to Tokyo by Dr Yasuhiro Ganeko, the Director General of the JHD. He reminded the Committee that JHD was founded in 1871 shortly after Japan opened its doors to the outside world after 300 years. Originally part of the Navy it was transferred to the Coastguard after WW II. The Activities of JHD include chart survey, volcanoes, earthquakes, astronomical observations, and a National Oceanographic Data Centre. JHD is also responsible for Japanese EEZ and UNCLOS work.
- 3 The Chairman of SCDB, Dr Meirion Jones, warmly thanked Dr Ganeko. He referred to previous meetings of SCDB at centres of excellence in many different countries in an effort to encourage contributions of data to GEBCO. He mentioned that the Pacific poses a particular problem in this regard; little new data have found their way into GEBCO in recent years. However an earlier meeting held in New Zealand was very fruitful. He had high hopes that the visit to Japan would enable new data to be obtained from the region in which GEBCO's current holdings date from about the 1980's. Finally Dr Jones presented Dr Ganeko with a copy of the latest GDA on CD-ROM.
- 4 Dr Jones was pleased to note that the SCDB continued to attract a high attendance with 20 participants from 11 countries.
- 5 Dr Jones introduced Dr Bob Whitmarsh who had taken over as Permanent Secretary of GEBCO from Mr Brian Harper. A vote of thanks was proposed by Dr Jones for the work put in by Mr Harper and this was carried unanimously.
- 6 The Agenda for the SCDB was adopted (Annex II).
- 7 A full list of participants is given in Annex I.
- 8 Apologies were received from Dr Agapova, Mr Allsup, Mr Andreasen, Dr Carrera, Mr Carvalho, Dr Cramer, Dr Garcia, Dr Giermann, Mr Hadjiantoniou, Dr Holcombe, Mr Jakobssen, Lic. Ma. Lopez, Mr Macnab, Dr Mayer, Professor Morelli, Dr Naryshkin, Mr Newton, Dr Nielsen, Dr Robinson, Ing. gen. Roubertou, Mr Scott, Mr Simpson, Dr Smith, Dr Summerhayes, Dr Travin, Mrs Varnado, Mr Woodward, and Dr Wright.

2. CONDUCT OF THE MEETING OF THE GUIDING COMMITTEE

2.1 Adoption of the Agenda

- 9 After some modifications the Agenda for the Guiding Committee was adopted (Annex II). The Chairman of the GC said that it had been decided to continue the pattern of previous meetings and consolidate the Minutes of the 2001 SCDB XVIII and the GC XVIII. See Agenda at Annex II.

2.2 Documentation

- 10 Dr Whitmarsh, the GEBCO Permanent Secretary, introduced the documentation for the meeting. This included a revised Personality List (Annex III), 12 documents and papers (Annex IV), 74 charts (Annex V) and a report on sales of the GDA (Annex VI).

3. COMPOSITION OF THE GUIDING COMMITTEE

3.1 Guiding Committee

- 11 No changes. The balance of 5 representatives each from IHO and IOC remained.

3.2 Sub-Committee on Digital Bathymetry

- 12 Dr Jones wished to nominate a new member, Dr George Sharman, and this proposal was carried unanimously.

3.3 Sub-Committee on Undersea Feature Names

- 13 Dr Fisher reported that Mr Marco Antonio de Carvalho Oliveira from Brazil had resigned; his expertise would be sorely missed. Dr Falconer regretted he had been unable to be as active as he would have wished and offered to resign but Dr Fisher said he welcomed his expertise. There were now few active members and the GC should consider what to do. One solution was to meet annually instead of biannually. There was a need for regional expertise in certain areas e.g. the South Atlantic.

3.4 Centenary Organising Committee

- 14 The Chairman confirmed that membership comprised himself as Chairman, Dr Loughridge, Mr Monahan, Rear Admiral Guy, Mr Scott and Dr Whitmarsh as Secretary.

3.5 Scientific Advisers

- 15 A discussion ensued about the difference, if any, between Scientific Advisors and Other Personalities. It was agreed to replace these categories by two new categories of Advisers and Corresponding Members more in keeping with the actual functions performed. It was agreed that the Secretary of the UN Commission on the Limits of the Continental Shelf should replace Dr Galo Carrera. Some other re-arrangements of names resulted. The revised list of Advisers and Corresponding Members is in Annex III.

3.6 GEBCO reviewers

- 16 No changes were suggested. It was noted that Mr Marco Antonio de Carvalho Oliveira was no longer a reviewer for the South Atlantic Ocean. Rear Admiral Guy agreed to ask Dr Travin for an update on the list of Chief Editors of the regional bathymetric charts. [Action Rear Admiral Guy]

3.7 General review of the GEBCO list

- 17 No further changes to the Personality List were required.

4. MATTERS ARISING FROM REPORTS OF PREVIOUS MEETINGS

- 18 There were no matters arising not already covered by the Agenda.

5. THE FUTURE OF GEBCO

5.1 Presentation to IOC Executive Council, 23 June 2000 (Document GC XVIII/1, Annex IV)

19 The Chairman reported that he had made a presentation to the IOC Executive Committee at their meeting in Paris in June 2000 at which he presented the options for the future development of GEBCO (Document XVIII/1; Annex IV). Among the range of possible solutions were 1) set up a commercial operation, 2) obtain patronage or sponsorship from individuals or companies, 3) obtain more support from programmes that use GEBCO products, 4) increase awareness of GEBCO by producing an educational GDA, 5) create GEBCO Centenary Fellowships and 6) convince IOC to increase its funding of GEBCO. While objecting to the first option the Executive Committee were much in favour of GEBCO and resolved to support GEBCO in three specific areas by the addition of a further \$20,000 in 2002. (IOC Executive Council Resolution XXXIII/7; Annex VII). There is a possibility of a further \$20,000 being made available by IOC in the following biennium (2003-2004).

5.2 Commercial sponsorship

20 The Chairman reported that, through a personal contact, he had been in contact with the company called Global Crossing Ltd. in the USA. This company and its associated companies are in the business of fibre optic telecommunications world-wide. He had met the Vice-Chairman of Global Crossing, Mr Lodwick Cook. Mr Cook had been very impressed with what GEBCO had achieved and asked the Chairman to prepare proposals under four headings. These four proposals (Document GC XVIII/2, Annex IV) which were prepared in August 2000 and discussed with Mr Bill Dietel, an adviser to Mr Cook, at a meeting in London in October 2000, are discussed below as Agenda Items 5.3-5.6.

21 One potential funding route had resulted from a meeting in London with Mr Mike Downey of the UK company Global Marine Systems (GMS), a subsidiary of Global Crossing, based in Chelmsford, Essex. Mr Downey suggested that funding could proceed via a grant 'with no strings attached' or via a contract with GMS's R&D Department.

22 The Chairman was delighted to report that 10 days before leaving for Japan he had received notification that GMS would support GEBCO to the tune of \$50,000 over 3 years and that he had received a cheque for one third of the total made out to Southampton University. He proposed that he and the Permanent Secretary should be the signatories for cheques drawn on an account to be set up within Southampton University. The GC supported this proposal, subject to the Vice-Chairman (in a non-signatory capacity) being informed of payments made and the Committee being advised in due course. [A GEBCO Account was opened within the University, a charitable organisation, immediately after the meetings in Japan and the cheque deposited there].

23 The Chairman sought the approval of the GC for his activities in seeking sponsorship. A lengthy discussion followed on the issues of involving commercial companies and copyright restrictions (cf. also discussion of copyright in Section 7).

24 In answer to a question from Dr Fisher the Chairman confirmed that the donation from GMS came without strings attached. The letter from GMS described it as an outright 'donation ... towards the GEBCO Ocean Mapping initiative' '... to support [GEBCO's] drive to enable young scientists to become involved in ocean mapping and to improve the contents of the GEBCO Digital Atlas'.

- 25 Dr Falconer queried the copyright status of GEBCO's digital files and maps with respect to commercial involvement. Dr Jones replied that copyright of the published sheets of the 5th Edition had been held by the Canadian Hydrographic Office on behalf of GEBCO. Now the UK Natural Environment Research Council held a similar copyright for the digital files, again on behalf of GEBCO.
- 26 Dr Hall asked whether Southampton University was listed by the Internal Revenue Service of the USA as a company to which tax deductible contributions could be made. Dr Loughridge confirmed that US companies might be encouraged to donate funds if the relationship of Southampton University with GEBCO was established correctly. The Secretary agreed to look into this. [Action Secretary]
- 27 Dr Tani presented the viewpoint of the JHD concerning the involvement of commercial organisations. Japan would prefer to see commercial funds handled through a Trust Fund rather than being given directly. Personally he was happy with the Global Crossing donation but he foresaw the need to establish rules for future donations.
- 28 The Chairman asked how VHOs would regard GEBCO accepting donations from commercial companies. Dr Loughridge's view was that there would be no problem as long as GEBCO works on the basis of donations whereby the donor company reaps no direct benefit. Dr Jones asked whether a company logo or a mention in GEBCO's literature was a benefit. Dr Loughridge thought it was, but he thought it could be circumvented if GEBCO received a non-exclusive licence fee from the company who in turn might print and distribute the GEBCO data free to their clients under agreed terms and conditions.
- 29 The Chairman enquired what the Japanese position would be on licence agreements. Dr Tani thought that it might be acceptable if GEBCO data were used non-exclusively and the licence income were controlled. It was important that no one was excluded from accessing GEBCO.
- 30 The Chairman took the view that we had to be careful in using the word 'commercialisation'. There is a spectrum of commercial involvement from full commercial activity to sponsorship. In some sense GEBCO was already involved in commercialisation.
- 31 Rear Admiral Guy said that IHO had a similar problem in discussions with industry two years ago. We need to make a fundamental distinction between scientific products, where all information is freely available, and commercial products which have to be paid for. Dr Hall agreed GEBCO must avoid conflicts of interest. Contracts should be with charitable donors and not with commercial 'for-profit' companies.
- 32 Dr Loughridge thought that the key issue was cost recovery; cost recovery could equal profit. For example, he thought the Canadian Hydrographic Service may have lost money over its involvement with the GEBCO 5th Edition.
- 33 The Chairman concluded that, given proper safeguards with regard to copyright and data exchange, the GC accepted the principle of seeking sponsorship funds.

5.3 Headquarters organisation (Proposal #1; Document GC XVIII/2)

- 34 This proposal represents far more than the Permanent Secretary can achieve at present on a part-time basis and hence includes a full-time Director. Discussion of this item was postponed to a future occasion. At present GEBCO has insufficient funds to support a Headquarters organisation.

5.4 Educational GDA (Proposal #2; Document GC XVIII/2)

- 35 The letter accompanying the cheque from Global Marine Systems Ltd specifically mentioned that GMS was ‘... happy to support [GEBCO’s] drive to enable young scientists to become involved in ocean mapping ...’ and therefore implicitly can be regarded as endorsement of the E-GDA.
- 36 Although a small working group had been set up at the GEBCO Officers meeting in Copenhagen in May 2000 there had been no progress since then. The Chairman thought the working group should be more active.
- 37 Rear Admiral Guy asked if there was any objection to commercial organisations offering to market the Educational GDA (E-GDA)? The Chairman replied that he thought such a spin-off commercial product was possible but that he would want to protect and not compromise the GEBCO operation.
- 38 Rear Admiral Guy responded that the VHOs would be concerned about conflicting interests and the protection of copyrighted material. He understood that a sample of the E-GDA would be sent to the VHOs for approval. He realised there was no intent to circumvent the interests of contributors but the commercial organisations among them would want to make money. Dr Jones replied that already some information in the GDA was not copyrighted by GEBCO, for example the SCAR coastline, the IBCM and other sheets produced by the various IOC International Bathymetric Chart programmes.
- 39 The Chairman asked whether the E-GDA could be hived off to the commercial world. Dr Hall said he would like to see the E-GDA incorporated in Microsoft’s Encarta package.
- 40 The Chairman reminded members that the idea of an E-GDA was conceived in Halifax in 1999 to spread knowledge of GEBCO. The question is how to do so without commercial involvement. Dr Fisher agreed that GEBCO needs well intentioned sponsors rather than commercial companies. Once started, the donation process might build on itself.
- 41 Dr Loughridge reminded members that the GC lacked any ‘high-school’ level expertise. It was too early to discuss commercialisation of the E-GDA without tapping into such expertise. He recalled that at the Copenhagen meeting he had mentioned Dr Kim Kastens as potentially a very suitable candidate expert in this area. She worked at Lamont Doherty Earth Observatory and had already produced CD-ROMs on New York’s Central Park and ODP for high-school students. The Chairman agreed that Dr Sharman should telephone Dr Kastens to gauge her interest in this project. She responded that indeed she had a ‘conceptual interest’ in the project. The Chairman also proposed, and it was agreed, that Dr Sharman should become Chairman of the E-GDA Working Group, and follow up the approach to Dr Kastens. [Action Dr Sharman]
- 42 In discussing the costs of the E-GDA Dr Hall said his experience was that distribution (by mail) was more costly than printing charts. Hence he proposed that distribution should be via the Internet just as National Geographic magazine distributed charts using ArcInfo. Dr Sharman preferred distribution by CD-ROMs to the Internet. Rear Admiral Guy enquired whether GEBCO should have to find all the costs. Dr Falconer proposed that in view of the limited cash available now the GC could put aside \$20,000 for a position paper from Dr Kastens. Dr Loughridge mentioned that NSF also have funds for such projects.
- 43 The Chairman decided that \$5000 would also be made available to the E-GDA WG to enable them to meet.

5.5 GEBCO Fellowship (Proposal #3; Document GC XVIII/2)

- 44 Discussion of this item was postponed to a future occasion. At present GEBCO had insufficient funds to support a Fellowship.

5.6 Centenary Conference (Proposal #4; Document GC XVIII/2)

- 45 This proposal was discussed later under Agenda Item 12.

5.7 Conclusion

- 46 The Chairman concluded a long and very useful discussion by saying that many broader issues with respect to sponsorship remained. The urgent question now was how to progress strategic thinking. He suggested that the GEBCO Officers' Meeting in 2002 should consider this issue alone.
- 47 Rear Admiral Guy cautioned that the IHO had failed to get user input before carrying out its own strategic planning and suggested that GEBCO should produce a questionnaire. Dr Jones agreed and recalled that such a questionnaire had been prepared and distributed to users of the first release of the GDA. The results of this questionnaire (Summary report SCDB XV, Wellington) were being used in the design of the forthcoming release of the GDA, for example the introduction of a Windows interface, plotting of polar projections and the global grid. Dr Jones said that although he had a database of 'users' he thought GEBCO should approach others as well who had not yet bought GEBCO products. For example, users of the digital GDA product responding to the questionnaire had not yet seen the need for paper products and yet he was convinced that there was a clear need from other parties for a new printed version of the updated GEBCO.
- 48 Dr Carron reminded members of the impact of the Smith & Sandwell 1' grid of predicted bathymetry to be available shortly. It is important to know what users want and what other scientists want. The Secretary offered to produce a draft questionnaire designed to be sent to organisations and individuals and to be advertised widely. [Action Secretary]
- 49 In conclusion the Chairman announced the setting up of a Strategic Planning Committee to be chaired by Mr Monahan and consisting of himself, Dr Loughridge, Dr Jones, Dr Falconer, Rear Admiral Guy, Dr Carron and Dr Whitmarsh as Secretary. The Committee met in Kobe, immediately following the GC, and will subsequently meet about every six months. The second meeting is to be held in Southampton, UK on 14-15 November 2001.

6. REPORT BY THE CHAIRMAN OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY (Eighteenth meeting, The Hydrographic Office of Japan, Tokyo, 18-20 April 2001)

6.1 Highlights

- 50 Dr Jones, Chairman of SCDB, reported that the SCDB had met the previous week in Tokyo. Members had attended from 15 organisations in 11 countries. There had been two major issues related to production of the new GDA, 1) Completion of the global grid and 2) The production of revised vector contours. It had been decided to upgrade from a 2.5' to a 1' grid because other non-GEBCO products are to be gridded at 1'. The data will support this reduction in grid size and will better match coastlines and topography.

6.2 Update on the work of the GEBCO Grid Working Group

- 51 Dr Carron provided an update on the work of the GEBCO Grid Working Group. The grid cannot be finished until the vector contours of the GDA are complete. Technically the gridding was only as good as the fitted surfaces and a 'tension' of 0.35 was routinely used with the GMT surface fitting software. Problems arise from poor data distribution, under and overshoots, discontinuities and hand contouring. He would like to fix a schedule for completion of the GDA. There are still some problems in the contouring to be ironed out, e.g. completion of ongoing contour updates and the edge matching of revised contours with the existing GDA.
- 52 The Working Group have decided to increase the resolution of the grids from 2.5' to 1.0', recognising that the Smith & Sandwell predicted bathymetry grid is 1.0', a resolution preferred by modellers. A 1.0' grid also gives a better match with the contours. A long term aim of GEBCO should be a 0.1' grid.
- 53 Dr Sharman interposed that NGDC would issue ETOPO2, i.e. with a 2' grid based on predicted bathymetry, in the next three months. Dr Carron continued that meaningful shelf data were currently excluded from the 5th Edition. The 0-400 m contours had to be added in some areas and this meant the calculation of a new grid e.g. around South America.
- 54 Dr Carron plans to start on the documentation for the grid using the IBCAO web site as an example. Chapters would include gridding procedures, grid properties, sources of data for the GDA 2001 grid, coastal data (e.g. New Zealand, Japan), world vector shorelines and topography. He plans to start drafting these documents in the next few weeks. Once the updated GDA contours and regional grids were available he needed 1-2 months to complete the gridding. In some places, where contours were sparse, different adjacent hand-contoured datasets needed to overlap by as much as 10 degrees to enable merging to be carried out successfully. The choice of viewing software was not a problem but again 1-2 months would be required to produce a final product i.e. 4 months after delivery of the updated source material.
- 55 Dr Carron then showed examples of gridded datasets from around the world to illustrate different display features, the effect of decreasing the grid interval and the problem of registering some oceanic islands with respect to bathymetric contours.
- 56 Dr Jones and Dr Carron agreed to make up a schedule for the completion of the grid and the updated GDA contours during 2001. The Chairman insisted that there must be a cut-off date.
[Action Dr Jones/Dr Carron]

6.3 Report of GEBCO Bathymetric Editor and GEBCO Digital Atlas Manager

- 57 Mr Hunter, Bathymetric Editor, gave his report for 2000-2001 (Annex VIII). Work had been focused on the production of gridded bathymetry for the North Atlantic, specifically the Northwest Atlantic, in collaboration with Mr Macnab, and the continental shelf around the British Isles. In the latter area, with help from the UK HO, it has been possible to improve on the original plan and to create a 0.5' x 0.5' grid in some areas. This had attracted strong interest from the EuroGOOS community. In the Northwest Atlantic a way had had to be devised of importing gridded data instead of contours as prime data. Mr Hunter also reported that he had discovered a new published Portuguese chart of the Mid-Atlantic Ridge crest that included French swath bathymetry (Annex IX).
- 58 Ms Weatherall, Digital Atlas Manager, gave her report for 2000-2001 (Annex X). The main activity had been digitising contours and track lines for the Indian Ocean supplied by Dr Fisher. Other data for the new GDA have been acquired from the Gulf of Mexico, Antarctic coastlines, North Atlantic Ocean, New Zealand, Ross Sea and the Arctic Ocean.

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

59 Dr Carron reported that a grid had already been created for 50% of the world ocean. All areas were included in the current plans. At present some areas had contours and some had grids. There were also problems of data harmonisation at the overlapping edges of work areas. He expected the Indian Ocean work to be completed in a few months and all discontinuities to have been matched during summer 2001. Dr Jones added that Mr Cherkis would visit BODC in June/July 2001 to help with the delivery of the updated Arctic contours and their edge-matching with the surrounding regions.

6.4.1 Arctic Ocean

60 Dr Jones reported that some gridded datasets were available. The activities of the IBCAO were to be reviewed by the Editorial Board on 27-28 May 2001. Mr Cherkis and Dr Jakobssen were not happy with the current grid. Dr Jakobssen was working on the grid part-time. Mr Cherkis hopes to resolve some of these problems in May when he meets Dr Jakobssen. Dr Hall asked if the T3 drifting ice-station data were to be included; Mr Cherkis confirmed that he planned to include it. One problem is areas without tracks e.g. the shelf in the Russian Arctic. Dr Jones enquired about the status of converting data from a 2.5 km stereographic grid to a 1' grid. Dr Sharman said that the Jakobssen dataset was on a 2.5 km Cartesian grid at the pole. NGDC were re-sampling the latitude/longitude grid. Some problems of matching grids remained but Mr Cherkis and Dr Jakobssen promised to deliver a 1' grid to GEBCO. Sir Anthony Laughton queried why a 1' grid would be used in polar regions; Dr Sharman said it was a matter of convenience to use such a grid in latitude/longitude space. Dr Jones remarked that it was important to ensure a uniform global grid otherwise there would be discontinuities.

61 Dr Jones queried whether the contours from the re-gridded Arctic datasets should be peer-reviewed but Sir Anthony Laughton's view was that GEBCO should focus on delivering a quality product. Mr Monahan, as an Arctic reviewer, promised to turn the chart around quickly.

62 Dr Schenke reported on recent German activities in the Arctic. Martin Klenke was currently working on 12 sheets at 1:100,000 scale, gridded at 100 m, for the area east of Fram Straight (Annex V). The charts will become available as downloadable digital files with 20 m contours.

63 A workshop took place in Seattle from 22-24 January 2001 to discuss the use of a GIS to display the IBCAO. The type of GIS had yet to be determined but there is a demand for the IBCAO from many fields. Dr Sharman queried whether the data were gridded and then contoured or vice versa? He created grids from contours using ArcInfo.

64 Dr Anderson reported on preliminary bathymetric maps that had been produced for the Gakkel Ridge using data from the Seafloor Characterization and Mapping Pods (SCAMP) system deployed aboard USS *Hawkbill* as part of SCICEX. At this stage the maps were preliminary awaiting final resolution of positional ambiguities in the data from the submarine's inertial navigation system.

65 Mr Macnab (Chairman IBCAO), in absentia, submitted a paper outlining recent IBCAO activities and future plans, highlighting the Third Meeting of the Editorial Board scheduled for the end of May 2001 at the University of New Hampshire (Paper 13, Annex IV). It is hoped that the Editorial Board meeting will pave the way for the submission of updated contours for the next release of the GDA.

66 Dr Jones asked what shoreline was used in the Arctic for IBCAO. Mr Cherkis replied that the WVS shoreline was used, updated by a geodetic shoreline in NE Greenland. NIMA also have a 'WVS+' product which is now available. Dr Sharman stated that the shoreline had not changed in

WVS+, only political boundaries had been added. Dr Hall asked whether the Canadians had better radar satellite shorelines; Mr Monahan did not know but said he would check. [Action Mr Monahan] Dr. Sharman offered to check on the latest Arctic coastlines in use at NGDC, e.g. in Geodas, to see whether they were better than the current version of the Arctic shoreline in WVS. [Action Dr Sharman]

6.4.2 Southern Ocean

- 67 Dr Falconer reported that the Fred Davey Ross Sea chart (referred to in paragraphs 58-62 of SCDB XVII 2000 in Copenhagen) was not based on all available data; it also included depths from multichannel seismic reflection profiles. The Committee considered that this chart should not be incorporated into GEBCO. Dr Falconer continued that the New Zealand government was using the RV *Tangaroa* to survey areas of Antarctica visited by tourists. These data would become available to GEBCO. There were also plans, presently unfunded, to survey the Ross Sea but no updates would be available from the Ross Sea in time for the 2001 GDA.
- 68 Dr Schenke reported on Sheets 5.33 to 5.35 in the Weddell Sea. In the last 18 months in collaboration with the Vernadsky Institute, Moscow nine sheets had been finished from the south side of the Scotia arc to Antarctica. They had been added to a 2.5' digital terrain model. He planned in the next two years to enlarge the charted area of the Weddell Sea. Also, with the Vernadsky Institute, he planned to complete sheets 5.54 and 5.57. He will deliver his contours to GEBCO in July 2001 for incorporation into the next release of the GDA. [Action Dr Schenke]
- 69 Dr Schenke reported on the work of the SCAR WG on Geodesy and Geographic Information and highlighted their Antarctic Geographic Data Integration initiative which included a Bathymetry Data Library listing known data sources in the region. A CD-ROM of AGSO and NGDC data, plus tracks, had been sent to Dr Schenke by the WG Secretary. All these data could be used to improve all charts around the Antarctic; Dr Schenke thought that someone should integrate all these data and compile new sheets.
- 70 Dr Jones asked why the Australian Antarctic Division data were not in the IHO database or in NGDC. He understood that these data could be made available on request. Dr Sharman did not know but he noted that not all data submitted were in the helpful NGDC format; Dr Falconer will pursue this point when he went to Australia in July 2001. [Action Dr Falconer]
- 71 Dr Schenke added that the IHO Hydrographic Commission on Antarctica had met a few weeks ago in Cape Town. Co-operation between HOs in the area is good. Two nautical charts had been made near the German wintering station.
- 72 Mr Hunter mentioned that the BAS ship RRS *James Clark Ross* collects swath bathymetry on passage but, although the data were available to others outside BAS, the data were not necessarily worked up. Sir Anthony Laughton said he would contact the Director of BAS to ascertain how much processing was required. [Action Sir Anthony Laughton] Dr Falconer commented that the New Zealand Government will pay foreign ships to acquire data off Antarctica.
- 73 Dr Sharman mentioned that NGDC have defined a new class of multibeam data called spec. data., i.e. raw swath bathymetry, that is put into the public domain within two years of acquisition.

6.4.3 Indian Ocean

- 74 In the last 10 years Dr Fisher had produced contours from 10°W to 170°E. Dr Goodwillie reported on the progress made in digitising, by Ms Weatherall at BODC, and gridding, by himself, of Dr Fisher's Indian Ocean contours. GEBCO's standard contour interval is 500 m but some contours had been drawn at 100 or 200 m intervals to assist the gridding process. The goal

is to produce a grid that matches input contours and shorelines. He showed examples to illustrate how a better fit was obtained when the GLOBE topographic database was used as well. He said that if a 2.5' grid was used then, unlike the 1' grid, the pixels had a blocky texture and it was harder to match the input contours and colour changes. 94% of data agreed to within 50 m, and even 10 m. Various artefacts were encountered including overshoot (unless bounded by spot soundings), bad tracks and abyssal plains where contours are far apart (either a big overlap is required or else 100 m contours had to be added). Dr Goodwillie is progressing with a 1.0' grid for the whole Indian Ocean and neighbouring seas, and expects to complete by June 2001, once he has received the full set of digitised contours from BODC.

- 75 Dr Falconer offered to facilitate in New Zealand the harmonisation of contours where there was overlap between Dr Fisher's chart and the SW Pacific charts of Ian Wright. [Action Dr Falconer] In the south-west Indian Ocean the existing sheet 5.12 would be replaced by the new contours where there is overlap except in the Weddell Sea where AWI contours on three new charts would be used subject to the addition of more contours and track control.
- 76 Dr Jones asked about the status of the Red Sea which was not included in Dr Fisher's contouring. Dr Hall confirmed that he will provide a grid of the Red Sea for the GDA using the 5th Edition of GEBCO. [Action Dr Hall]
- 77 Dr Hall reported that in the last year he and Mr Cherkis had inspected and scanned 234 Russian HDNO charts. Soundings had been extracted from 175 charts covering the Eastern Mediterranean, the Gulf of Aden, the Gulf, the Black Sea and the Caspian Sea. He should finish in 3 months. Some new data had been collected by a 17 tonne Israeli ship fitted with a multibeam system and by the Italians in the Tyrrhenian Sea. A *RV Meteor* cruise in 2002 will collect more multibeam data in the Eastern Mediterranean. He expects to have 100 fold more data in the Eastern Mediterranean even excluding the multibeam data.
- 78 Sir Anthony Laughton noted that Dr Fisher had already contoured the Gulf of Aden. Dr Hall said he sent all his gridded data to Dr Fisher. Dr Goodwillie admitted that although there had been no new contouring there he did not know whether Dr Hall's grids fitted the contours.
- 79 Finally Dr Hall noted that he will donate grids of the Sea of Galilee and the Dead Sea to GEBCO. [Action Dr Hall]

6.4.4 Atlantic Ocean

- 80 Mr Meyrat began by reporting that he had sent a shallow-water DTM gridded at 1', that included some Smith & Sandwell predicted bathymetry, to Mr Hunter last year. SHOM now has an improved version that includes DBDB-V data. A DTM collected during EEZ surveys of New Caledonia could also be donated to GEBCO, subject to a copyright agreement.
- 81 Mr Meyrat then described the latest changes to the French BDBS (Base de Données Bathymétriques du SHOM) database (Paper 5, Annex IV). The new database has been operational since January 2001 and has doubled in size (200 million soundings) since last year. The current host server is still a prototype but migration to other servers is planned later in 2001. Plotting sheets were being digitised because they represented a very reliable, if small volume, of data. The BDBS covers some 70% of the coastline of metropolitan France. The greatest detail is available along the English Channel.
- 82 Dr Hall enquired when this data will become available to the IBCM. Mr Meyrat replied that there was almost complete coverage of shallow water data in the Mediterranean but Dr Hall should ask Ing. Souquièrre about availability. Mr Meyrat confirmed that the GEBCO 5th Edition sheets were included as part of the formal BDBS.

- 83 Dr Sharman reported that the Caribbean Sea bathymetry was being done by Dr Frias of Mexico and would be produced on a CD-ROM shortly. Dr Carron intervened that NGDC was communicating with other Mexican colleagues and not with Dr Frias. Dr Frias could not be contacted during the meeting and an enquiry about the publication date and availability of the Caribbean data would be made at the CGOM meeting in St. Petersburg. [Action Sir Anthony Laughton] Dr Jones said that on the basis of a recent email message he understood that there were funding problems in printing the charts and that they would be produced on CD-ROM.
- 84 Dr Jones raised the question of the status of the IBCEA charts. Mr Hunter replied that he had received sheets 1.11 and 1.12 with 100, 200 and 500 m contours from SHOM for comment. Sheets 1.06, 1.09 and 1.10 will follow soon., sheet 1.08 is already published and digitised and sheet 1.01 (from Portugal) was on display. In reply to a question from Mr Meyrat Mr Hunter said he needed early pre-publication access to the SHOM charts. Mr Rankin said he wanted to use contours from these new charts to compute the GEBCO grid. Dr Jones reminded members that some of the IBCEA charts have yet to be peer reviewed. Dr Loughridge suggested that the Chief Editor of IBCEA should be approached to get the pre-publication copies for the GDA. [Action Mr Hunter]
- 85 During the Guiding Committee meeting Ing. Patrick Souquière of SHOM showed proof copies of IBCEA charts 1.06 and 1.09. They differed in style from others in portraying soundings as red dots, swath soundings being indicated by a band of dots.
- 86 In reply to questions Mr Hunter confirmed that his gridded dataset extends only as far west as 50°W and so a gap exists that remains to be filled. [Action Mr Hunter] As far as he knew, only IBCEA sheets 1.04 and 1.08 had been digitised. Dr Jones affirmed that he had been promised Sheet 1.01 by the Portuguese before July 2001. Mr Hunter confirmed that he had yet to interpolate 500 m contours, in addition to the 200 m contours, in the Bay of Biscay and on IBCEA Sheet 1.01. [Action Mr Hunter] Once he had filled the gap east of the Canadian data he expected to be able to finish the gridding quite quickly. The status of other sheets was as follows; sheets 1.02, 1.03 and 1.07 to come from Portugal; sheets 1.04-1.06 and 1.08, edge matching to be done.
- 87 Mr Hunter confirmed that the Arctic/Atlantic edge matching would be done when he had received a copy of the completed adjacent Arctic bathymetry in geographical co-ordinates from Dr Sharman. [Action Dr Sharman]
- 88 Mr Monahan reported that edge matching still had to be done in the South Atlantic. He asked how matching should be done with Dr Fisher's sheet 5.12 contours; in some areas Dr Fisher had more tracks than Mr Monahan and vice versa. The problem was resolved by discussion outside the meeting.

6.4.5 Pacific Ocean

- 89 Dr Jones noted that the bathymetry of the NW Pacific had not been updated for many years. However, Dr Nagai (Director, JODC) made a generous offer promising the delivery to GEBCO by 2003 of an updated 1:1 million scale bathymetric chart for the region 18°-48°N, 120°-180°E around Japan. The meeting received the offer with great enthusiasm and appreciation..
- 90 Dr Falconer reported the status of mapping around New Zealand. A lot of new bathymetric, seismic and dredge data were being collected in New Zealand in support of UNCLOS issues. New Zealand had to submit a claim by 2006, probably in practice by 2004. The work was managed by the Department of Land Information but was co-ordinated by NIWA. The aim was to produce a geological map or a single ArcInfo file as a source for print-on-demand hard copy.

- 91 Dr Schenke presented 14 charts produced by colleagues in Moscow and Vladivostok and brought to the meeting by Dr Svarichevsky (Annex V). Most charts were available in analogue form, some had been digitised. Although many of the charts included track control Dr Svarichevsky stated that, because the data are stored separately, it was not easy to obtain both bathymetry and navigation for any sheet at the same time. The charts were at various scales and contour intervals, with and without contour and latitude/longitude annotations, track control etc. It was not clear that the original soundings were available to GEBCO. In answer to questions from Sir Anthony Laughton it was revealed that some 1960's Smith & Chase bathymetry had been used to help interpolate the contouring between tracks and that none of the data had been sent to the IHO, the NGDC or WDC(B). There is no single data bank in Russia; data are scattered. Dr Loughridge asked whether the current holders of data could be identified or whether individual laboratories could be approached. The reply was not generally encouraging but the 1:2 million sheets for the Sea of Okhotsk were available and could be sent via Dr Udintsev to AWI or BODC for digitisation. [Action Drs. Svarichevsky/Udintsev]
- 92 Sir Anthony Laughton asked what had happened to Barbara Keating's charts around Hawaii. Dr Sharman offered to find out. [Action Dr Sharman]
- 93 Dr Nagai reviewed work in Japan and showed a chart covering 18°-48°N, 120°-180°W. Re-contouring of the Sea of Japan at 200 m interval and a scale of 1:1 million, where there is a great density of tracks, had begun two years ago. Digital contours would be submitted to the GDA in two years time. A 500 m contour had yet to be added.
- 94 Dr Tani gave a thorough presentation of the plate tectonic context of Japan. In the last 18 years most of the EEZ has been mapped with multibeam and had revealed detailed textural relief, guyots, some with collapse features, and smaller mounds (Paper 16, Annex IV). The JHD ships were the new SV *Shoyo* (1998) and the SV *Tokuyo*. Their equipment included multibeam, single- and multi-channel seismics, sidescan sonar, gravity, and magnetics. They also carry their own GLORIA-type vehicle. The JHD system of producing bathymetric grids from raw data was also described.
- 95 Dr Carron reported that he would attend a meeting in Valparaiso to discuss bathymetry of the SE Pacific on 4-5 October, 2001.

6.5 Reports by NGDC and IHO Data Centres for Digital Bathymetry

- 96 Dr Sharman reported the current status of the NGDC databases (Paper 6, Annex IV). The IHO Centre for Digital Bathymetry now holds over 5.7 million soundings along 730,000 track miles. In the last year significant data from the RV *Nathaniel B. Palmer* Antarctic cruises and from the USNOO LIDAR cruises had been acquired. Multibeam data had also been added to the database but no sidescan or back-scatter data had yet been included.
- 97 The WDC participates in most of the IOC mapping projects and provides Web pages and list servers for most IBC maps. NGDC has produced the new ETOPO2 (2 arc minute) global database and will become the official distributor of the USNOO's DBDB-V in 2001.
- 98 Dr Sharman described how NGDC is pioneering a new paradigm whereby the grid is the new source of data to which new point soundings, vectors and grids can all be added. This approach can also circumvent copyright issues because raw data are not involved but it has the disadvantage that track line control is no longer available to constrain the contours or grids. He sees Web access as part and parcel of the new approach and quoted the dramatic effect on hits on the GEBCO and Ocean Mapping Web sites of Dr Jakobsson being interviewed on TV in Scandinavia.

99 Dr Jones thanked Dr Sharman and enquired which countries contribute to the IHO Data Centre for Digital Bathymetry. Dr Loughridge replied that, over the past year or so, the largest contribution was from France (particularly for the Mediterranean), some data came from Germany but little from UK. Dr Sharman offered to provide a breakdown of numbers. [Action Dr Sharman] Dr Jones asked whether the IHO DC should be proactive in getting data into NGDC. Dr Loughridge replied that often when data are provided to individual US scientists it is assumed, incorrectly, the data will reach the NGDC. Person-to-person exchanges of data do not usually work, institutional exchanges work better. Dr Jones remained concerned about how to maximise the flow of data into NGDC. Dr Sharman said he would report to Dr Jones about this on his return. [Action Dr Sharman]

100 Mr Cherkis tabled the latest version of the list of world-wide seafloor swath mapping systems (Paper 8, Annex IV). It was agreed to post this list on the IHO (see <http://www.iho.shom.fr/publicat/free/free.htm>) and GEBCO Web sites. [Action Secretary]

101 Rear Admiral Guy reported that he had circulated VHOs with a questionnaire requesting information on the status of plotting sheets, the release of continental margin data and the status of IBC projects. There had been a 25% return and analysis of the replies would be completed soon. The main conclusions were that plotting sheets were not in good shape in some areas, some countries would supply continental margin data (and others not) and most were happy to re-align GEBCO responsibilities within chart areas. Dr Jones asked what VHOs were doing about soundings as well as contours and grids. Dr Loughridge suggested that some of the poor level of response might be to do with the problems the VHOs encountered in moving from analogue to digital mode. Rear Admiral Guy agreed there were problems of digital processing and that a lot of plotting sheet metadata were not available.

6.6 Report by IHO to the SCDB

102 The original 'Limits to oceans and seas' was published in 1953 as IHB Special Publication 23. A new draft volume, authored by M. Huet and A. Kerr, existed on CD-ROM and was due to be circulated for final comments in April, 2001 with publication scheduled for early 2002.

103 It was reported that the Undersea Feature Names database now exists as an Excel spreadsheet and is maintained at the IHB by Mr Huet.

6.7 Status of GDA conversion to Windows

104 Dr Jones reported that Dr Cramer had been updating the GDA software over the last year. A Beta version of the new GEBCO Digital Atlas (April 2001) that runs under Windows was demonstrated by Ms Weatherall who presented members of the Committee with personal copies for their own evaluation and feedback to BODC. [Action, members who received copies of the GDA]

6.8 GEBCO Guidelines (IHO Publication B-7)

105 Sir Anthony Laughton said it had been agreed last year that the Guidelines were out of date; technology was moving faster than the Guidelines could be updated. There was also a need to re-visit the organisational structure; should the current structure continue? In a brief discussion members reviewed Part IV of the GEBCO Guidelines. Dr Sharman, an author of the new draft of Part IV, considered they had become too specific and demanded too high a resolution. The draft needed to become more generalised. Rear Admiral Guy proposed that the authors should re-visit the document after feedback from the Strategy Planning Committee. [Action Chairman Strategy Planning Committee/ Guideline authors]

6.9 Technology for Print-on-Demand of 6th Edition (2003)

- 106 The GC has repeatedly discussed the need for a printed paper chart 6th Edition of GEBCO, particularly as a product for display at the GEBCO Centenary. It has been anticipated that it should be produced by print-on-demand. Clear specifications are now needed for the necessary technology.
- 107 Mr Monahan opened the discussion by noting that a definition of print-on-demand was required. Dr Jones drew a parallel with conventional maps that were maintained in digital form but were downloaded by an agent and not from the Internet. He pointed out that the GEBCO 6th Edition needs to be wall-mountable. Dr Carron informed members that two systems existed in the USA. First, objects are stored on a flexible database. Such charts can be printed at any time, usually one copy at a time. Dr Loughridge warned against mixing conventional printing technology with raster plotting which could lead to mix ups. Mr Monahan compared the old lithographic printing process with modern print-on-demand where a copy of the latest image was printed only when it was required. Dr Falconer noted that this depended on access to a high-quality A0 printer; lithographic printing was still used in New Zealand. Dr Sharman remarked that the US National Ocean Service had tried to operate a print-on-demand service for naval charts but it proved too expensive to print charts on a rugged medium one at a time. Mr Monahan said that in Canada print-on-demand was used for small navigation charts but only in small numbers. Dr Goodwillie said that he used print-on-demand based on Adobe Illustrator; the output postscript file was sent to a high quality printer.
- 108 Sir Anthony Laughton reminded members that last year Mr Harper had written a brief specification of print-on-demand which he then quoted. GEBCO is committed to 6th Edition paper charts by 2003. How will this commitment be met and in what quantities? Decisions are needed soon to meet the expected demand at the Centenary Conference.
- 109 During a general discussion it was admitted that a lot of general preparatory work could be done immediately. Dr Loughridge thought it would be too ambitious to get all 18 GEBCO sheets printed by 2003; GEBCO should publish just the most authoritative charts as examples; for example, the Indian Ocean which covers a quarter of the world ocean. Sir Anthony Laughton agreed that for 2003 it was not practical to publish all 18-19 GEBCO paper charts. Only a small number of charts could be published by then. Perhaps the Indian Ocean chart(s) could be published in two styles, one the conventional GEBCO paper chart and the other as a shaded relief dataset. This would enable feedback to be obtained. Dr Carron commented that New Zealand had already done this for their own charts and the 3D relief map was more popular.
- 110 Dr Sharman proposed three categories of print-on-demand. They were 1) Electronic printing, where the preparation and transmission was electronic and a large number of copies was produced, 2) Real print-on-demand, where small batches (even one or two copies), were printed as required in a fixed pre-determined format, and 3) Design on demand where the chart was customised for the user and a subset of the main database was turned into hardcopy. Dr Falconer thought that the first two options differed only in the quantity produced. Dr Hall considered that option 1 corresponded to an electronic printing press, only cheaper. Mr Monahan said he liked the three categories but the Committee had to decide first what product(s) was(were) required. Dr Carron asked whether it was really necessary to have access to dynamic files which a hydrographic office might have for navigational purposes. Dr Tani offered the experience of the JHD. Print-on-demand can mean many different things and a lot of off-the-shelf software exists. If one uses postscript files charts look different on different printers. Cost was an important factor, different papers gave vastly different qualities. Also it could take as long as 15 minutes to print a single chart. JHD would be pleased to assist with print-on-demand technology.

111 The Chairman reminded members that GEBCO was not going to be updated frequently. Again it was important to decide what is required and what hardware/software is available. Dr Loughridge enquired about version control; Dr Tani said copies could be dated. From his experience in a hydrographic office Mr Meyrat agreed that GEBCO charts do not need updating regularly and it was better to continue with different editions as now. Sir Anthony Laughton agreed. He thought that what GEBCO clients wanted was a chart to put on the wall. The question was how the information should be distributed, electronically or as paper. Central printing, especially in large quantities, is clearly much cheaper than distributed printing on users' hardware.

112 Dr Falconer asked what the Committee should do in the next two years. The Chairman replied that he suspected we want to display updated 6th Edition sheets on the wall at the 2003 centenary conference and to be able to distribute paper copies. The discussion then raised the question of the number of copies required and whether a profit should be made e.g. by including advertisements. Sir Anthony Laughton thought that about 100 copies should be printed of each 6th Edition sheet. Dr Jones agreed.

113 Dr Falconer summarised by saying that in effect a 6th Edition was required that would replace and replicate the 5th Edition. Sir Anthony Laughton was of the opinion that a second option was to create a gridded database from which contours could be computed but this implied the use of, probably GMT, software. Dr Anderson emphasised that CD-ROM and paper products are different. If in 2003 the Smith & Sandwell chart looks better it will 'sell' better than the GEBCO charts. Dr Carron agreed that both a gridded dataset and paper charts were needed. The hardcopies had to look nice even though different printers give different products.

114 Sir Anthony Laughton thought it was necessary to clarify the outputs required by a non-computerate user. These might range from classical contours, tracks and colour infill to a gridded dataset and access to a GMT palette of colours. The control afforded by multibeam surveys might also be shown by a swath of scattered dots (as in the latest IBCEA chart). He mentioned that after Dr Jones' retirement early next year Dr Jones would have time, with others, to experiment on a test area with different styles of presentation for the 6th Edition. Dr Sharman said his lab has experience in display options and would be happy to help. Sir Anthony Laughton reminded members that it was important to discover what the public wants and not what members wanted or expected others to want!

115 Dr Loughridge thought that two approaches were possible to data presentation. They were either 1) Different presentations 'different (key)strokes for different folks' or 2) A competitive shoot-out between presentations. He preferred the first which potentially was more flexible. Dr Sharman and Dr Jones drew parallels to what was required with the flexibility afforded by a GIS. Sir Anthony Laughton concluded that the best way forward was to consider a range of different types of paper display for 2003.

116 It was agreed that Dr Jones and Ms Weatherall, with the help of Dr Sharman, should prepare samples of different presentations of 6th Edition paper charts for consideration by the SCDB in 2002. [Action Dr Jones, Ms Weatherall]

6.10 GEBCO Web Site

117 Dr Sharman said the GEBCO Web site recently received 3500 hits/month and use was doubling every 9 months. Dr Loughridge said that he welcomed suggestions for improving the GEBCO Web site and for links to other sites. Suggestions should be sent to Ms Carla Moore, Carla.J.Moore@noaa.gov. [Action All]

6.11 Future directions of SCDB

118 Dr Jones, the Chairman of SCDB, emphasised the importance of delivering the gridded dataset on CD-ROM by the end of 2001. Then, at next year's meeting, the Committee could concentrate on discussions about the future. The future of the GEBCO Guidelines was a related topic.

6.12 Mapping activity of the Japanese Academic Group

119 Professor Kensaku Tomaki gave a presentation of the mapping activities of the Japanese academic community. He is also Chairman of InterRIDGE which has built a global mid-ocean ridge database which includes non-US data. Japanese academics have access to 5 ships capable of acquiring multibeam bathymetry and a range of ROVs and submersibles. The ships are the SV *Hakuko Maru* (operated by ORI, 4600 tonnes, Seabeam 2120), SV *Kairei* (JAMSTEC, 4600 tonnes, Seabeam 2112), SV *Yokosuka* (JAMSTEC, 4400 tonnes, Seabeam 2112), SV *Natsuhima* (JAMSTEC, 1700 tonnes, Seabeam 2000) and SV *Mirai* (JAMSTEC, 8600 tonnes, Seabeam 2112). Recently these ships had operated in the Japan Trench, Gulf of Aden and Fram Strait. Future planned cruises include Hawaiian Islands, Antarctic-Australian Discordance and Okinawa Trough. The community was interested in, and already communicating with, GOMaP. Future plans include ultra-high resolution swath mapping of the Mid-Atlantic and other ridges using deep-tow systems and AUVs.

120 In answer to a question from Sir Anthony Laughton Prof. Tomaki confirmed that the mid-ocean ridge bathymetric data should be available to GEBCO through Dr Phillipe Blondel the Chairman of the InterRIDGE Global Digital Database. Dr Blondel plans to set up a Web-accessible database if approved at the June 2001 InterRIDGE Steering Committee meeting. [Action Mr Hunter]

7. PROMOTION OF GEBCO

121 Dr Jones tabled a document listing the sales of the 2nd Edition (1997) GDA in the past year (Annex VI). 1230 copies had been sold or distributed to 85 countries since 1994. Nearly all orders were submitted via the BODC Web site. Dr Jones said he was working on the marketing strategy for GDA 2001 and he sought input from the GC. The situation regarding Internet access was complex because of the need to be aware of copyright issues and the conditions under which data had been donated. He was unsure how to price the new GDA; previously only marginal costs had been covered.

122 Sir Anthony Laughton commented that there had been separate prices for academic and commercial users. The new GDA contained much more information. Should the price increase therefore?

123 Dr Sharman compared the promotion of the GDA with NGDC procedures. Data were available either on CD or by the Web. The CD products were static but the Web data were fully up-to-date but could only be accessed in small quantities at a time. He suggested that the same could be done for the GDA; NGDC could house the latest grids. Dr Jones responded that the grid and contours are really different representations of the same information and should be maintained and distributed together. He was anxious about data being downloaded at random. Perhaps the solution was to put up the 5' grid on the Web with examples of the 1' grid. The CD is a high quality product with copyright, proper branding and acknowledgements. He did not see that this was easy to duplicate on the Web. Dr Loughridge replied that NGDC only offers grids on the Web. Dr Jones countered that the new GDA is an integrated package of gridded data, contours and tracks; he would be concerned if a site offered only the gridded data. Dr Loughridge thought that gridded data could be used as an enticement to obtain the fully integrated product. Copyright would have to be made enforceable. Rear Admiral Guy said that copyright was one of the thorniest issues in IHO at the moment. We should not forget we are using other people's data and we have to be able to show that the data are protected. Dr Carron pointed out that information can be given away yet remain copyrighted. Rear Admiral Guy agreed there were many varieties of

copyright. In the past 15 years there had been a lot of commercial use of GEBCO charts but VHOs have to justify their existence so GEBCO must not threaten it.

124 Dr Sharman pointed out that grids apparently can represent an interesting circumvention of copyright law. The US Navy will not release raw data yet will donate derived products i.e. gridded datasets. Rear Admiral Guy confirmed that VHOs are generally happy with this approach but some governments e.g. New Zealand, see grids as being more valuable than the raw data. Some countries will release shallow water grids and others will release data on request.

125 Dr Loughridge continued that NGDC is trying to promote the sale of the GDA on CD-ROM but also to provide the current grids on the Web site. He noted that (in the USA) 'soundings' cannot be copyrighted because they are 'facts' but products from 'facts' can be copyrighted. Contours are interpretations but grids are products. The legal interpretation of these issues varies! Dr Jones countered that the GEBCO grid was more or less directly derived from, and was meant to replicate, the GEBCO contours and therefore had a similar intellectual property content as the contours.

126 Dr Tani said that from the Japanese perspective one needs permission to sell data collected by other countries e.g. UK 19th century soundings collected off Japan. High resolution grids were only made available commercially.

127 Dr Loughridge summarised that different communities treat observations in different ways with respect to copyright and the free exchange of data among scientists. The GC should try to promote the free availability of data. Sir Anthony Laughton noted that this was a fundamental debate which ultimately lawyers and judges would have to decide. Copyright of charts can be enforced as demonstrated by a recent case in the UK.

128 Sir Anthony Laughton invited Dr Jones to have the final word. Dr Jones said he was more concerned about the rights of the suppliers of data than about the recipients. He wondered how GEBCO could control the currency of the data via its peer review system. He accepted the NGDC offer to promote GEBCO in the way described, subject to agreement on how data downloading over the Internet could be limited. Dr Jones confirmed that production of the CD-ROM would precede availability of data over the Web.

8. REPORT BY CHAIRMAN OF SUB-COMMITTEE ON UNDERSEA FEATURE NAMES (Fourteenth meeting, The Hydrographic Office of Japan, Tokyo, 17-20 April 2001)

129 Dr Fisher reported on the Fourteenth meeting of the Sub-Committee on Undersea Feature Names (SCUFN). Three voting members had attended plus a number of visitors from other committees and local scientists. A particular reason for meeting in Japan had been for the sub-committee to address the naming of features that appeared, or would soon appear, on Japanese charts. Dr Fisher said the meeting had been very productive and especially assisted by the preparatory work of Dr Yashima and other Japanese hydrographers (see Papers 14 and 15, Annex IV).

130 The sub-committee had reviewed 493 new names in the area of the IBCWIO. Names had also been reviewed that fell within the areas of the IBCEA and IBCWP. The sub-committee had examined 5 Japanese charts and Romanised versions of the Japanese names, using the English method of transliteration, would now appear on these new charts. The meanings of these names had been recorded. An unusual aspect was the wish to name features after living Japanese scientists; for example Professor Seiya Uyeda had been honoured in this way.

131 Features on the shelf were generally excluded from consideration. Some features had been submitted on 1:15 million charts; larger scales were required. The sub-committee also reviewed

the output of six ACUF meetings over the last two years. In only one instance did the sub-committee disagree with ACUF's decisions on names.

132 The Chairman responded that the work of SCUFN was greatly appreciated. The consistent naming of features was very helpful. Finally, Dr Yashima described the history of naming undersea features in Japan since the Chief Hydrographer had set up a committee to advise him in 1996.

133 Mr Hunter asked when the new names would appear in the Gazetteer. The UKHO would like rapid access to the new names for their INT charts. Dr Fisher stated that the new names would be loaded into the IHB database within 6 months; earlier information would be available by phone. Rear Admiral Guy said that it was easy to update the Web-based information but paper copies would be updated less frequently. The Chairman said he would report the availability of the new names at the CGOM meeting in St Petersburg so that they could be incorporated in the relevant IBC chart series. [Action Chairman] Dr Schenke asked about using new names in publications; he pointed out that it can take two years for a name to be put forward and approved by SCUFN. Dr Fisher said authors should liaise with Mr Huet; it was not necessary to wait for approval before publishing.

134 Dr Fisher predicted a great increase in work in future. The Chairman pointed out that much of this was due to regional mapping programmes under the auspices of CGOM and he would raise this point at the forthcoming CGOM meeting in St Petersburg and recommend that meetings of SCUFN take place annually. [Action Chairman] Dr Loughridge thought that IOC should give more support to SCUFN. Rear Admiral Guy said that IHB had only limited resources with which to support the involvement of Mr Huet in SCUFN. He suggested that IHB could play a greater role if the annual meetings were held in Monaco in alternate years and this proposal was accepted unanimously. IHB might be able to help with travel to Monaco too. Dr Yashima said that Japan was happy to host SCUFN working meetings in future.

9. GOMaP: GLOBAL OCEAN-FLOOR MAPPING PROJECT

135 Dr Carron reported on the current status of the GOMaP project. He referred members to a paper to be presented to the International Hydrographic Conference in May, 2001 and to publications in EOS (Vogt, P. R., Jung, W.-Y. & Nagel, D. J. GOMaP: a matchless resolution to start the new millennium. *Eos*, 257-258 (2000) and Vogt, P. R. Endorsement of Global Ocean Mapping Project. *Eos*, 498 (2000)). A Panel had been established to research future funding at the \$500-1000 million p.a. level required to fund the projected 274 deep-water ship.years and 714 shallow-water ship.years.

136 Dr Loughridge enquired what was the purpose of the meeting held in Bay St. Louis. Was there any conflict with GEBSCO? Dr Carron replied that there was no perceived conflict, GOMaP offered the opportunity for high precision surveys. The Chairman pointed out the potential complementary relationship between GOMaP, as data collector, and GEBSCO, as data compiler. He enquired whether there had been any non-US participants at the meeting (N.H. Kenyon, SOC and D. Monahan, CHS had attended) and what was the expected data access. Mr Cherkis replied that access, for most areas, would be unreservedly open. Dr Carron added that 200 m precision was expected, better in shallow water. Data processing had not been discussed.

137 Dr Falconer asked what was the next step; Dr Carron replied he was unsure, it would probably mean going international. He had volunteered to install a Terabyte server with on-line access but he recognised it could take years to plan the acquisition. Dr Falconer thought GOMaP was likely to start slowly but even so GEBSCO had to take a view soon if it was to be involved. The Chairman thought that if acquisition was far away then the GC should form an opinion at least on how to handle the data. Dr Loughridge responded that the technical capability already existed.

The problems were likely to be in timing, money, survey platforms and other resources unless a big effort was made. Presently people were trying to find non-scientific reasons to argue for GOMaP.

10. SCOR WG 107 IMPROVED GLOBAL BATHYMETRY – REPORT ON ACTIVITIES

138 The Committee noted with concern the fact that SCOR WG 107 had yet to produce its final report. The Chairman reported that the previous Secretary of SCOR, who was present at the June 2000 IOC Executive Committee meeting, was embarrassed by the lack of action. The Chairman said he would write to Dr Bernal of IOC. (Action Chairman)

11. IHO REPORTS ON GEBCO-RELATED ACTIVITIES

11.1 Continental Margin Data

139 A circular letter had been sent to all states concerning their release of continental margin data. Seventeen had replied and of these only Korea, Spain, Monaco and Thailand refused outright to release their data. The rest will release data under different conditions. Some of these data may therefore be available for the GDA 2001 and Dr Jones is already aware of this. [Action Mr Hunter/Dr Jones] Dr Loughridge commented that the letter was sent, at least in part, to obtain bathymetric data that would constrain grids in shallow water. It would have been sufficient to have requested just a few contours instead of whole datasets.

140 Rear Admiral Guy had also requested shallow water bathymetry in the circular letter sent to VHOs and responses from Netherlands, Germany, France and South Africa had been sent to Ms. Weatherall. Dr Carron stated that he could contribute some high resolution bathymetry with 20, 50 and 100 m contours. Dr Loughridge had previously offered to ask Mr Andreasen (NIMA) about shallow bathymetry in the Gulf from the NRL database. Dr Carron agreed to follow up these matters. [Action Dr Carron]

11.2 IHO 10-Year Strategic Plan – Update

141 Rear Admiral Guy reported that most member states are aware of IHO's strategic plans. With regard to GEBCO one should remember that states were data managers and not just data suppliers.

142 Rear Admiral Guy announced that it had been decided that Dr Travin should be re-located from IOC, Paris to the IHB in Monaco but he would still be on the IOC staff and visit IOC regularly. This should assist communication between IOC and IHB.

11.3 Access to Gazetteer

143 Rear Admiral Guy told members that the Gazetteer will be available from the 'free publications' section of the IHO Website, as an Excel file (see <http://www.iho.shom.fr/publicat/free/free.htm>). Dr Sharman offered to mirror the Gazetteer on the NGDC Web site. [Action Dr Sharman]

144 Dr Fisher confirmed that most names in the Gazetteer are in English; Russian names are not listed in cyrillic. Rear Admiral Guy stated that the official languages of IHO are English and French. It was hoped to agree on a language publications policy soon in which case French and Spanish publications might become available but a lot of work would be involved.

11.4 IHO-IOC MOU relative to GEBCO support (Document GC XVIII/3 Annex IV)

145 Rear Admiral Guy said he had nothing to report. The new Memorandum of Understanding had been signed; it contained very little new, other than referring to EEZs and the continental shelf.

11.5 AWI swath bathymetry problem

146 Dr Schenke tabled a paper outlining problems that had arisen for German ships wishing to acquire swath bathymetry south of 60°S. Under a new German law of 14th January 1998 the German Environmental Agency gives or withholds permission for acoustic work solely on the basis of the peak acoustic output (without regard to pulse duration or bandwidth; the actual average intensity of swath bathymetry sonars is very low). In effect this law has prevented multibeam surveys and some biological work. Dr Schenke asked the Chairman to send a letter to the Director of AWI referring to the need to acquire more sounding data around Antarctica for navigational purposes. Rear Admiral Guy also offered to write to AWI stating IHB's concern that tens of tourist ships visit the Antarctic each year without good bathymetric charts. [Action Rear Admiral Guy] Dr Falconer cited an example of a recently discovered bathymetric hazard in New Zealand waters of the Ross Sea. It was agreed that the argument would not be won using technical arguments. Dr Schenke confirmed that there was no perceived acoustic hazard to cetaceans or other marine life; it was better to stress the importance of continuing to acquire data for science. Dr Loughridge agreed and suggested referring to the possibly adverse ecological consequences of a ship going aground, the need to support ocean circulation models, tidal models, fisheries etc. The Chairman was supportive; a worrying precedent would be set if the same approach was applied elsewhere. He invited Dr Schenke to prepare a draft letter for his signature. [Action Dr Schenke]

12. GEBCO CENTENARY PLANS

147 The Chairman reported on the Third meeting of the Centenary Organising Committee (COC) which had taken place in Kobe. Detailed information is available in the Minutes of COC III.

148 In summary, the conference would run from a.m. 14 April until midday 16 April, 2003 with two days beforehand available for setting up. The GEBCO GC and sub-committees would meet during the previous week. It was noted that a joint AGU/EGS meeting would take place in Nice from 7-11 April, 2003.

149 Dr Loughridge is chairing the Conference Committee and is planning talks to reflect the past and future of GEBCO. Dr Loughridge welcomes suggestions for a snappy Conference title (by mid-June, 2001) and also for invited talks. [Action All] There would not be a call-for-papers. \$20,000 has been allocated to help the speakers with their travel and subsistence. Free use of a 300-seat lecture theatre had been obtained.

150 The Conference would open with a welcoming address by Princes Rainier or Albert.

151 It was hoped to hold a commercial exhibition, to have simultaneous translation of the talks, to hold receptions hosted by IHB and IOC and to offer a dinner hosted by the Palace. Visits by a number of survey and research ships were also being planned.

152 The costs of the Conference would be met from various sources. The IHB were graciously offering a lot of the infrastructure. The Registration Fee (to be determined) would cover some costs. Other funds were expected from the IOC, IHO, the Principality and commercial sponsorship. Members were invited to suggest the names of such sponsors. [Action All]

153 Displays could include the 6th Edition paper chart, the GEBCO history of a selected area and an active display of the GDA 2001.

154 Publications would include a history of GEBCO, edited by Madame Jacqueline Carpine-Lancre, to be available at the Conference and a popular book, the author of which was still being sought, to be published later.

155 Publicity would include leaflets with Conference details but in addition members were encouraged to submit articles to suitable journals that would appear before the conference and to come up with other ideas e.g. a competition for the best use of the GDA. [Action All]

156 The Chairman concluded that IHB would make block hotel bookings. [Action Rear Admiral Guy]

13. UNITED NATIONS INTERACTIVE ATLAS OF THE OCEANS

157 In early March 2001 Dr Travin had received a draft copy (Volume N-I of the Antarctic Ocean) of the UN Atlas on a CD-ROM from the Head Department of Navigation and Oceanography of the Russian Navy. However because it is a draft he did not yet have permission to forward it to the GEBCO GC.

14. DATES AND PLACES FOR THE NEXT MEETINGS

14.1 Year 2002: To confirm location of Thirteenth Meeting of GEBCO Officers

158 The Chairman reported that many people had expressed great concern at the cost of travelling to Rio de Janeiro for the GEBCO meetings in 2002 and at the consequent difficulty some members would have in attending if the meetings were held in Brazil. Dr Loughridge offered to host the meetings in Boulder, Colorado in the third week of May. Rear Admiral Guy pointed out that late May was preferred because it fell after the Hydrographic Conference in Monaco. The University of New Hampshire was suggested as an alternative venue; Dr Loughridge said he would ask Dr Mayer. The Chairman thanked Dr Loughridge and asked him to make the necessary arrangements. [Action Dr Loughridge]

14.2 Year 2003: Centenary Sessions of GEBCO Guiding Committee and Sub-Committees - IHO, MONACO

159 The time and place of the Centenary sessions had already been discussed under Agenda Item 12.

15. ANY OTHER BUSINESS

160 The Chairman expressed the Committee's profound thanks to Mr Brian Harper, lately Permanent Secretary, for his work on behalf of GEBCO for six years from 1995 to 2000.

161 He also thanked NOAA for \$5000 that was used to assist the attendance of several members who otherwise would have been unable to come to Japan. He also thanked the Japanese Hydrographic Association and the Japanese Government for financial support.

16. CLOSURE OF THE MEETING

162 The Chairman thanked the meetings' host, Dr Ganeko. He particularly thanked Dr Tani, Mr Ito and their team, for their organisation of the meetings, for making arrangements for participants' travel, for the tour of Kyoto and for the splendid receptions in Tokyo and Kobe. The GEBCO members and their partners had greatly enjoyed their visit to Japan. The Chairman closed the meeting closed at 1701 on 25th April, 2001.

ANNEX I

Members present were,

Sir Anthony Laughton, Chairman

Dr Robert Anderson

Lt Cmdr Carrasco

Dr Michael Carron

Mr Norman Z. Cherkis

Dr Robin K.H. Falconer

Dr Robert L. Fisher

Dr Andrew Goodwillie

Rear Admiral Neil Guy

Dr John K. Hall

Ing. en Chef Michel Huet

Mr Peter Hunter

Dr Meirion T. Jones

Dr Michael S. Loughridge

Ing. de l'Armement Jean Meyrat

Mr David Monahan

Mr William Rankin

Dr Hans-Werner Schenke

Dr George Sharman

Ingénieur général de l'Armement Patrick Souquière

Dr Alexander Svarichevskiy

Mr Shin Tani

Ms Pauline Weatherall

Dr Bob Whitmarsh, Secretary

Dr Kunio Yashima.

ANNEX II

18th Meeting of the GEBCO Guiding Committee

Kobe Meriken Park Oriental Hotel, Kobe, Japan
09.00 - 17. 30, Monday 23-25 April 2001

AGENDA

1. OPENING OF THE MEETING
2. CONDUCT OF THE MEETING
 - Adoption of the Agenda
 - 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 Centenary Committee (see Agenda Item 12)
 - 3.5 Scientific Advisers
 - 3.6 GEBCO Reviewers
 - 3.7 General Review of the GEBCO Personality List
4. MATTERS ARISING FROM REPORTS OF PREVIOUS MEETINGS:
 - 4.1 Summary Report of the Twelfth Meeting of the GEBCO Officers covering also the Seventeenth Meeting of the Sub-Committee on Digital Bathymetry
5. THE FUTURE OF GEBCO
 - 5.1 Presentation to IOC Executive Council, 23 June 2000
 - 5.2 Commercial sponsorship
 - 5.3 Proposed GEBCO Fellowship
 - 5.4 Educational GDA

6. REPORT BY THE CHAIRMAN OF THE SUB-COMMITTEE ON DIGITAL BATHYMETRY (EIGHTEENTH MEETING, The Hydrographic Office of Japan, Tokyo, 18-20 April 2001)
 - 6.1 Update on the work of the GEBCO Grid Working Group
 - 6.2 New Mapping and Technical Changes for inclusion in the Third Release of the GDA
 - Atlantic Ocean
 - Pacific Ocean
 - Arctic Ocean
 - Southern Ocean
 - Indian
 - 6.3 Status of GDA conversion to Windows
 - 6.4 GEBCO Guidelines
 - 6.5 Technology for Print-on-Demand of 6th Edition (2003)
 - 6.6 GEBCO Web Site
7. REPORT BY CHAIRMAN OF SUB-COMMITTEE ON UNDERSEA FEATURE NAMES (FOURTEENTH MEETING, The Hydrographic Office of Japan, Tokyo, 17-20 April 2001)
8. PROMOTION OF GEBCO
9. GOMaP: GLOBAL OCEAN-FLOOR MAPPING PROJECT
10. SCOR WG 107 IMPROVED GLOBAL BATHYMETRY - REPORT ON ACTIVITIES
11. IHO REPORTS ON GEBCO-RELATED ACTIVITIES
 - 11.1 Continental Margin Data
 - 11.2 IHO 10-Year Strategic Plan – Update
 - 11.3 Access to Gazetteer
 - 11.4 IHO-IOC MOU relative to GEBCO support

12. GEBCO CENTENARY PLANS

13. UNITED NATIONS INTERACTIVE ATLAS OF THE OCEANS

14. DATES AND PLACES FOR THE NEXT MEETINGS

14.1 Year 2002: To confirm location of Thirteenth Meeting of GEBCO Officers

14.2 Year 2003: Centenary Sessions of GEBCO Guiding Committee and Sub-Committees – IHO, MONACO

15. ANY OTHER BUSINESS

16. CLOSURE OF THE MEETING

Eighteenth Meeting of the GEBCO Sub-Committee on Digital Bathymetry

The Hydrographic Office of Japan, Tokyo
09.30, 18 April, 09.00, 19-20 April
2001

AGENDA

1. OPENING OF THE MEETING
2. CONDUCT OF THE MEETING
 - 2.1 Adoption of the Agenda
 - 2.2 Local Arrangements
 - 2.3 Tabling of Documents
3. DEVELOPMENT OF GEBCO GRIDDED DATA SET
 - 3.1 Progress Report from the Gridding Group
 - 3.2 Delivery of Data Sets for GEBCO Digital Atlas (Third Edition)
 - 3.3 Future Perspectives
4. REVIEW OF BATHYMETRIC MAPPING WORLDWIDE
 - 4.1 Reports of GEBCO Bathymetric Editor & GEBCO Digital Atlas Manager
 - 4.2 Arctic Ocean
 - 4.3 Southern Ocean
 - 4.4 Atlantic Ocean and adjacent seas
 - 4.5 Indian Ocean
 - 4.6 Pacific Ocean
5. RELATED ACTIVITIES
 - 5.1 IHO Data Centre for Digital Bathymetry and NGDC
 - 5.2 Undersea Feature Names Database
 - 5.3 Shorelines
 - 5.4 Shallow Water Bathymetry
 - 5.5 Limits of Oceans and Seas
6. PUBLICATION OF GEBCO DIGITAL ATLAS (THIRD EDITION)
7. FUTURE PERSPECTIVES
 - 7.1 Print-on-Demand Technology
 - 7.2 GEBCO Guidelines
 - 7.3 Where do we go from here?
8. ANY OTHER BUSINESS
9. CLOSURE OF THE MEETING

ANNEX III

GEBCO PERSONALITY LIST

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Sir Anthony Laughton PhD FRSsee page 1

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ANNEX IV

LIST OF DOCUMENTS AND PAPERS

Documents *

IOC-IHO/GEBCO Guiding Committee-XVIII/1	Extract from IOC Executive Council Minutes XXXIII-3
IOC-IHO/GEBCO Guiding Committee-XVIII/2	Outline proposals Numbers 1-4
IOC-IHO/GEBCO Guiding Committee-XVIII/3	Memorandum of Understanding between IHO and IOC
IOC-IHO/GEBCO Guiding Committee-XVIII/4	Provisional Agenda
IOC-IHO/GEBCO Guiding Committee-XVIII/5	Annotated Agenda (Chairman only)
IOC-IHO/GEBCO Guiding Committee-XVIII/6	Summary Report of the Session (this document)
IOC-IHO/GEBCO-XII/3	Summary Report of the Twelfth Session of the GEBCO Officers, Royal Danish Administration of Navigation and Hydrography, Copenhagen, Denmark, 3-8 May 2000.
B-7	Guidelines for the GEBCO (excepting Part 4)
GEBCO Personality List	Revised 27 March 2001

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

Papers

1. The GEBCO Bathymetric Editor - Annual Report 2000/2001 (see Annex VIII)
2. Diagrams and Inventory of Maps considered for inclusion in the GEBCO Digital Atlas (See Annex IX)
3. The GEBCO Digital Atlas Manager - Annual Report 2000/2001 (see Annex X)
4. GEBCO Digital Atlas - Distribution/Sales 2000/2001 (see Annex VI)
5. La Base de Données Bathymétriques du SHOM - Summary report by Ing. de l'Arm. Jean Meyrat

6. National Geophysical Data Center & IHO/DCDB - 3-part report to GEBCO by Dr G. Sharman (see Annex XI)
7. Presentation to IOC Executive Council, 23 June 2000 by Sir Anthony Laughton
8. World-wide seafloor swath mapping systems by Mr Norman Cherkis
9. Antarctic Bathymetry Projects by Dr H-W. Schenke
10. Indian Ocean Gridding Project by Dr Andrew Goodwillie
11. Error estimation of bathymetric grid models derived from historic and contemporary datasets by Dr Martin Jakobsson et al.
12. The National Bathymetric Survey (NBS) Project by Dr John Hall
13. Notes on IBCAO and related topics by Mr Ron Macnab
14. Sea bottom topography around the submarine volcano Myojin-Sho by Dr Kunio Yashima et al.
15. Naming of undersea features in Japan by Dr Kunio Yashima
16. High spatial-resolution bathymetric survey carried out by Hydrographic Department of Japan by Dr Tsuyoshi Yoshida and Mr Shin Tani
17. Preliminary Bathymetric maps of the Gakkel Ridge (Arctic Ocean) from submarine-acquired swath bathymetry by Dr Robert Anderson

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
<http://www.ngdc.noaa.gov/mgg/gebco/swathmapping.html>

ANNEX V

List of Charts

The following bathymetric and other charts were tabled for the consideration of the meeting.

1. Antarctic Peninsular/Bransfield Strait (2001), 1;1,000,000 – AWI/Vernadsky Institute, Moscow [Schenke]
2. South Orkney Islands (2001), 1;1,000,000 – AWI/Vernadsky Institute, Moscow [Schenke]
3. Northern Weddell Sea (2001), 1;1,000,000 – AWI/Vernadsky Institute, Moscow [Schenke]
4. Larsen Basin (2000), 1;1,000,000 – AWI [Schenke]
5. Gakkel Ridge, Arctic Ocean (2001), location map – Hawaiian Mapping Research Group [Anderson]
6. Western Gakkel Ridge, Arctic Ocean (2001), 1:1,187,500 - Hawaiian Mapping Research Group [Anderson]
7. Central Gakkel Ridge, Arctic Ocean (2001), 1:1,187,500 - Hawaiian Mapping Research Group [Anderson]
8. Eastern Gakkel Ridge, Arctic Ocean (2001), 1:1,187,500 - Hawaiian Mapping Research Group [Anderson]
9. North-east Atlantic Ocean (IBCEA 1.10; 1999), 1:1,000,000 – Portuguese Institute of Hydrography [Hunter]
10. North Atlantic Ocean (2.5' grid; 2000), A4 size, Southampton Oceanography Centre, UK [Hunter]
11. British Isles (1.0' grid; 2001), A4 size, Southampton Oceanography Centre, UK [Hunter]
12. British Isles (2001), A4 size, Southampton Oceanography Centre, UK [Hunter]
13. North Sea (0.5' grid; 2001), A4 size, Southampton Oceanography Centre, UK [Hunter]
14. North-west Atlantic Ocean (grid; 2000), A4 size, Southampton Oceanography Centre, UK [Hunter]
15. North Atlantic Ocean (digital bathymetric contour datasets; 2001), A4 size, Southampton Oceanography Centre, UK [Hunter]
16. Indian Ocean, 1:1,120,000, RL Fisher's digitised contours and tracks [Weatherall]
17. Pacific Ocean, 1:4,000,000, NIWA's digitised contours and tracks for GDA [Weatherall]
18. North Atlantic Ocean, 1:8,000,000, Hunter/Sibuet/SHOM digitised contours and tracks for GDA [Weatherall]
19. Parece-Vela mid-basin rise, Pacific Ocean, A4 size, [Svarichevsky]

20. Sea of Okhotsk, North-west Pacific Ocean, A4 size [Svarichevsky]
21. North-west Pacific Ocean (35-43°N, 127-137°E), A4 size [Svarichevsky]
22. North-west Pacific Ocean (0-35°N, 122-146°E), A4 size [Svarichevsky]
23. North-west Pacific Ocean, Japan and Okhotsk Seas (34-62°N, 128-160°E); A4 size.
[Svarichevsky]
24. North-west Pacific Ocean, key to 16 regional maps, A4 size [Svarichevsky]
25. North-west Pacific Ocean, Sea of Okhotsk/Derugin Basin (52-55.5°N, 142.5-149.5°E), A4 size [Svarichevsky]
26. North-west Pacific Ocean, Sharimkotan Island to Shimshy Island (49-51.5°N, 154-157°E), A4 size [Svarichevsky]
27. North-west Pacific Ocean, track chart (2-4°N, 138-144°E), A4 size [Svarichevsky]
28. North-west Pacific Ocean, Kurile Trench (39.5-56°N, 1401-77°E), A4 size [Svarichevsky]
29. North-west Pacific Ocean, Sea of Okhotsk/Derugin Basin (52-55.5°N, 142.5-149.5°E) with location arrow, A4 size [Svarichevsky]
30. North-west Pacific Ocean, Tuscarora FZ, with tracks (40-47.5°N, 146-152°E), A4 size [Svarichevsky]
31. South-west Pacific Ocean, Tonga Trench (13.9-15.4°S, 172-174.5°W), A4 size [Svarichevsky]
32. North-west Pacific Ocean, east coast of Taiwan (21.5-25.5°N, 121-124°E), A4 size [Svarichevsky]
33. North-west Pacific Ocean, Sea of Okhotsk (43-61°N, 138-160°E), A4 size [Svarichevsky]
34. North-west Pacific Ocean, Necker Ridge (20-24°N, 164-169°W), A4 size [Svarichevsky]
35. No co-ordinates given, A4 size [Svarichevsky]
36. No co-ordinates given, A4 size [Svarichevsky]
37. North-west Pacific Ocean, tracks, A4 size (18-48°N, 120-180°E) [Svarichevsky]
38. ETOPO2 data, Arctic-Pacific Oceans (2001), Global Orthographic projection, NGDC [Sharman]
39. ETOPO2 data, Arctic-Pacific Oceans (2001), Mercator projection, NGDC [Sharman]
40. Gulf of Mexico (24-33°N, 69-99°W; 2000), 1:2,116,805, NGDC [Sharman]
41. Gulf of Mexico (24-37°N, 78-107°W; 2001), 28 mm/degree longitude, NGDC [Sharman]
42. World, (1.0' grid; 2001), 120 mm/50 degrees longitude, NGDC [Sharman]
43. Mediterranean Ridge, Eastern Mediterranean (2001), 1:1,500,000, Ifremer [Hall]

44. Mediterranean Ridge, Eastern Mediterranean (2001), 1:1,500,000, acoustic image, Ifremer [Hall]
45. South-west-Central Indian Ocean (2001), 0.33"/degree longitude, RL Fisher's digitised contours [Goodwillie]
46. South-west-Central Indian Ocean (2001), 0.33"/degree longitude, RL Fisher's digitised tracks [Goodwillie]
47. Central-South-east Indian Ocean (2001), 0.33"/degree longitude, RL Fisher's digitised contours [Goodwillie]
48. Central-South-east Indian Ocean (2001), 0.33"/degree longitude, RL Fisher's digitised tracks [Goodwillie]
49. New Zealand (1997), 1:4,000,000, NIWA [Falconer]
50. Cook Strait and land, New Zealand (2001), 1:250,000, geology, IGNS [Falconer]
51. SE Levantine Sea/Sea of Galilee/Dead Sea/northern Gulf of Eilat (2000), 1:500,000, geological shaded relief [Hall]
52. Sea of Japan (18-48°N, 120-180°E), ship tracks, JHD [Nagai]
53. Antarctic Canyon/OPS 552 (2000), 1:1,000,000, AWI [Schenke]
54. Explora Escarpment/OPS 553 (2000), 1:1,000,000, AWI [Schenke]
55. Ronne Trough/OPS 556 (1999), 1:1,000,000, AWI [Schenke]
56. Filchner Trough/OPS 557 (1999), 1:1,000,000, AWI [Schenke]
57. Lyddan/OPS 558 (1999), 1:1,000,000, AWI [Schenke]
58. Southern Weddell Sea (1998), 1:3,000,000, AWI [Schenke]
59. Fram Strait, Arctic Ocean (2001), 1:100,000, AWI [Schenke]
60. Porcupine Basin, North Atlantic Ocean (2001), 1:150,000, AWI [Schenke]
61. Svalbard shelf, Arctic Ocean (2001), 1:100,000, AWI [Schenke]
62. Northern Japan, North-west Pacific Ocean, 38.25-41.25°N, 143.00-145.25°E, University of Tokyo [Tani]
63. Toyama Deep sea channel, Japan Sea, 36.5-40.0°N, 138.5-136.5°E, University of Tokyo [Tani]
64. Sagami deep-sea channel, North-west Pacific Ocean, 38.25-41.25°N, 143.00-145.25°E, University of Tokyo [Tani]
65. Northwestern Phillipine Sea, North-west Pacific Ocean, 21.0-25.5°N, 122.5-132.5°E, JHD [Tani]
66. Okino-Torishima, North Pacific Ocean, 15.0-21.0°N, 132.5-140.0°E, JHD [Tani]

67. Minami-Torishima, North Pacific Ocean, 21-30°N, 150-160°E, University of Tokyo/JAMSTEC [Tani]
68. Western Phillipine Sea, North-west Pacific Ocean, 14-20°N, 126-134.5°E, University of Tokyo/JAMSTEC [Tani]
69. Yap Trench, North-west Pacific Ocean, 7-12°N, 135.5-139.5°E, JAMSTEC [Tani]
70. Nankai Trough, North-west Pacific Ocean, 30-35°N, 132-140°E [Tani]
71. Nankai Trough, North-west Pacific Ocean, 30-35.5°N, 131-139°E, JHD [Tani]
72. North-west Pacific Ocean, 0-60°N, 100-150°E, JHD [Tani]
73. Global seafloor (2001), JHD [Tani]
74. Adjacent seas of Nippon (1971; #6901), North-west Pacific Ocean, 1:8,000,000, MSAJ, [Tani]

ANNEX VI

DISTRIBUTION/SALES OF GEBCO DIGITAL ATLAS (1 APRIL 2001)

Country	SECTOR					Total (sold)	Country	SECTOR					Total (sold)
	Gov	Univ	Comm	Other	Gov			Univ	Comm	Other			
Albania	1	-	-	-	1	(0)	Madagascar	1	-	-	-	1	(0)
Algeria	2	-	-	-	2	(1)	Malaysia	1	-	-	-	1	(0)
Argentina	1	-	-	-	1	(0)	Malta	-	1	-	-	1	(1)
Australia	28	13	12	-	53	(47)	Mauritania	1	-	-	-	1	(0)
Austria	1	-	-	1	2	(2)	Mauritius	1	1	-	-	2	(1)
Barbados	-	-	1	-	1	(1)	Mexico	1	1	-	-	2	(1)
Belgium	5	7	1	2	15	(12)	Monaco	-	-	-	10	10	(7)
Bermuda	-	-	1	-	1	(1)	Morocco	2	-	-	-	2	(1)
Brazil	5	12	1	-	18	(16)	Mozambique	2	-	-	-	2	(0)
Bulgaria	1	-	-	-	1	(0)	Netherlands	6	3	9	2	20	(19)
Canada	28	17	6	5	56	(43)	New Caledonia	-	-	-	1	1	(1)
Chile	2	2	-	-	4	(4)	New Zealand	6	1	3	1	11	(9)
China	2	2	1	-	5	(2)	Nigeria	1	-	-	-	1	(0)
Colombia	2	1	-	-	3	(0)	Norway	16	4	14	3	37	(32)
Costa Rica	-	1	-	-	1	(1)	Papua N.Guinea	1	1	-	-	2	(1)
Cote d'Ivoire	2	-	-	-	2	(1)	Peru	1	-	-	-	1	(1)
Croatia	4	-	-	-	4	(2)	Philippines	-	2	-	2	4	(3)
Cuba	1	-	-	-	1	(0)	Poland	2	-	-	-	2	(2)
Denmark	8	3	1	1	13	(11)	Polynesia (Fr.)	-	1	-	-	1	(1)
Ecuador	2	-	-	-	2	(0)	Puerto Rico	-	1	-	-	1	(1)
Egypt	2	-	-	-	2	(0)	Portugal	2	3	-	-	5	(4)
Falkland Is.	2	-	2	-	4	(4)	Reunion	1	-	-	-	1	(1)
Faeroes	2	-	1	-	3	(3)	Romania	1	-	-	-	1	(0)
Fiji	-	-	-	1	1	(0)	Russia	16	1	-	1	18	(1)
Finland	1	-	-	-	1	(1)	Seychelles	1	-	-	-	1	(0)
France	24	9	11	12	56	(44)	Singapore	1	-	-	-	1	(1)
Gabon	-	-	1	-	1	(1)	Slovenia	1	-	-	-	1	(1)
Germany	27	28	9	2	66	(62)	South Africa	6	-	2	-	8	(6)
Greece	4	1	-	1	6	(4)	Spain	8	12	11	3	34	(32)
Guinea	1	-	-	-	1	(0)	Sri Lanka	-	-	-	1	1	(1)
Hong Kong	-	1	-	-	1	(1)	St. Vincent	1	-	-	-	1	(1)
Hungary	-	1	-	-	1	(1)	Sweden	1	2	-	-	3	(2)
Iceland	6	2	1	-	9	(9)	Switzerland	-	1	1	-	2	(2)
India	5	1	-	-	6	(3)	Taiwan	1	3	-	-	4	(4)
Indonesia	-	-	1	-	1	(1)	Tanzania	2	-	-	-	2	(0)
Iran	1	-	-	-	1	(0)	Thailand	1	-	-	1	2	(2)
Ireland	4	4	4	-	12	(10)	Tunisia	1	-	-	-	1	(0)
Israel	1	1	-	-	2	(1)	Turkey	3	2	1	-	6	(4)
Italy	14	9	3	13	39	(36)	Ukraine	4	-	-	-	4	(0)
Jamaica	-	-	-	1	1	(1)	UK	107	70	68	20	265	(159)
Japan	8	14	36	2	60	(58)	USA	58	86	139	10	293	(254)
Kenya	4	-	-	-	4	(0)	Vietnam	2	-	-	-	2	(1)
Korea	6	1	1	-	8	(6)	TOTAL	467	326	341	96	1230	(947)

Figures above refer to total number of copies sold or distributed up to 1 April 2001. 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 2001)**

a) Total number sold/distributed = 1230 copies
 Total number sold = 947 copies
 Number of complimentary copies = 283 copies

b) Copies sold/distributed to 85 countries

c) Breakdown of copies sold/distributed by sector:

Government bodies	467 copies
University groups	326 copies
Commercial bodies	341 copies
Other organisations	96 copies

d) Distribution of 276 complimentary copies:

GEBCO community	97 copies
International exchange	94 copies
UK national exchange	92 copies

e) Sales/distribution by month:

	Sold	Gratis	Total		Sold	Gratis	Total		Sold	Gratis	Total
<i>1994</i>				<i>1997</i>				Sep	9	-	9
May	17	18	35	Jan	7	2	9	Oct	10	1	11
Jun	33	52	85	Feb	13	-	13	Nov	12	2	14
Jul	20	3	23	Mar	5	3	8	Dec	12	-	12
Aug	8	9	17	Apr	11	2	13	<i>2000</i>			
Sep	21	7	28	May	7	-	7	Jan	7	1	8
Oct	16	1	17	Jun	18	8	26	Feb	11	2	13
Nov	18	2	20	Jul	11	-	11	Mar	10	-	10
Dec	13	6	19	Aug	8	1	9	Apr	8	1	9
<i>1995</i>				Sep	10	2	12	May	8	-	8
Jan	16	1	17	Oct	8	2	10	Jun	6	1	7
Feb	48	5	53	Nov	10	2	12	Jul	9	-	9
Mar	31	8	39	Dec	8	11	19	Aug	10	-	10
Apr	18	5	23	<i>1998</i>				Sep	8	1	9
May	28	8	36	Jan	15	3	18	Oct	11	-	11
Jun	20	3	23	Feb	11	2	13	Nov	12	1	13
Jul	23	6	29	Mar	8	2	10	Dec	7	-	7
Aug	16	2	18	Apr	5	3	8	<i>2001</i>			
Sep	18	4	22	May	7	1	8	Jan	11	-	11
Oct	15	3	18	Jun	8	4	12	Feb	6	1	7
Nov	20	3	23	Jul	7	2	9	Mar	9	2	11
Dec	13	2	15	Aug	1	2	3				
<i>1996</i>				Sep	9	3	12	Total	947	283	1230
Jan	10	1	11	Oct	6	2	8				
Feb	10	23	33	Nov	1	1	2				
Mar	10	1	11	Dec	3	0	3				
Apr	9	-	9	<i>1999</i>							
May	17	5	22	Jan	12	1	13				
Jun	6	-	6	Feb	7	4	11				
Jul	6	2	8	Mar	8	2	10				
Aug	4	2	6	Apr	10	11	21				
Sep	3	-	3	May	8	2	10				
Oct	15	2	17	Jun	2	2	4				
Nov	11	1	12	Jul	6	3	9				
Dec	5	2	7	Aug	3	-	3				

ANNEX VII

IOC EXECUTIVE COUNCIL 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 Organisation (IHO), the importance of mapping data from the IHO International Bathymetric Chart series and the numerous significant contributions for updated bathymetry throughout the world's oceans,
- (ii) the continued success of the second release of the GEBCO Digital Atlas (GDA) 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) the need for extensive updating of the world's bathymetry and of the Pacific Ocean and Arctic 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 of the GDA 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 organisations, 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 CD-ROM 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 of the GDA and partial support of a GEBCO Centenary Fellowship.

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

ANNEX VIII**ANNUAL REPORT OF THE GEBCO BATHYMETRIC EDITOR****May 2000 – April 2001****P.M. Hunter**

The work of the GBE has centred on production of gridded bathymetry for the North Atlantic Ocean. Within this, the main work areas have been the continental shelf around the British Isles, in particular the North Sea, and the assimilation of gridded bathymetry in the Northwest Atlantic Ocean produced by the Geological Survey of Canada and the Canadian Hydrographic Service. The main contact for the latter is Dr Ron Macnab (GSC).

Continental shelf around the British Isles and the North Sea

This work used navigational charts produced by the United Kingdom's Hydrographic Office to provide contours and depths as source material. After digitising and re-projecting to geographical coordinates, the vertical datum of the data was re-calculated from lowest astronomical tide (LAT) to mean sea level (MSL) using a tidal model obtained from the Proudman Oceanographic Laboratory. The original work to provide a grid for GEBCO at 2.5-min x 2.5-min resolution is evolving to higher resolutions. In the case of the North Sea region it has been possible to reach a resolution of 0.5' x 0.5'. The problems in getting the grids to resolve smaller features, such as sand ridges in the southern North Sea and in estuary areas, has prompted interest by the UKHO who have offered to help by providing additional data at larger scales than the original 1:500,000 scale charts used.

The above work has also been of interest for the EuroGOOS sponsored proposal EHYGRID. This proposes to create a variety of high-resolution grids of the sea areas around the European Community, starting with the Northwest European shelf.

The incorporation of the GSC/CHS gridded bathymetry of the continental margin around Canada has not been easy. The cell structure of the original grid is very obvious when the data points are re-gridded. This artefact is particularly obvious in the region of abyssal plains. A solution is proposed that uses the original GDA97 bathymetry to provide data in these deeper areas and retains the higher quality GSC/CHS grid for the shallower areas. The 2500-metre contour is proposed as the boundary.

A 2.5' x 2.5' grid has been created for the North Atlantic Ocean east of 50°; the regions to the west of this have been created but not to the same standard. The grids of the eastern margins of the USA have yet to be included.

An interesting result of this work has been that it has suggested ways as to how bathymetric compilations might be carried out in the future, i.e. by using a grid as the primary bathymetric product rather than contours. One major problem with this approach is how to reconcile data that are represented by datasets such as the GEODAS.

The GBE attended the meeting of the GEBCO gridders held at USNOO, Bay St Louis during October.

Compilation of new bathymetric contours

No new bathymetric contours have been added to earlier work (between 20° and 36°N and between 10° and 50°W).

Other Activities

The GBE participates on a course on Sea Surveying and Mapping to University of Southampton students; the lecture given is entitled 'Bathymetric Mapping'.

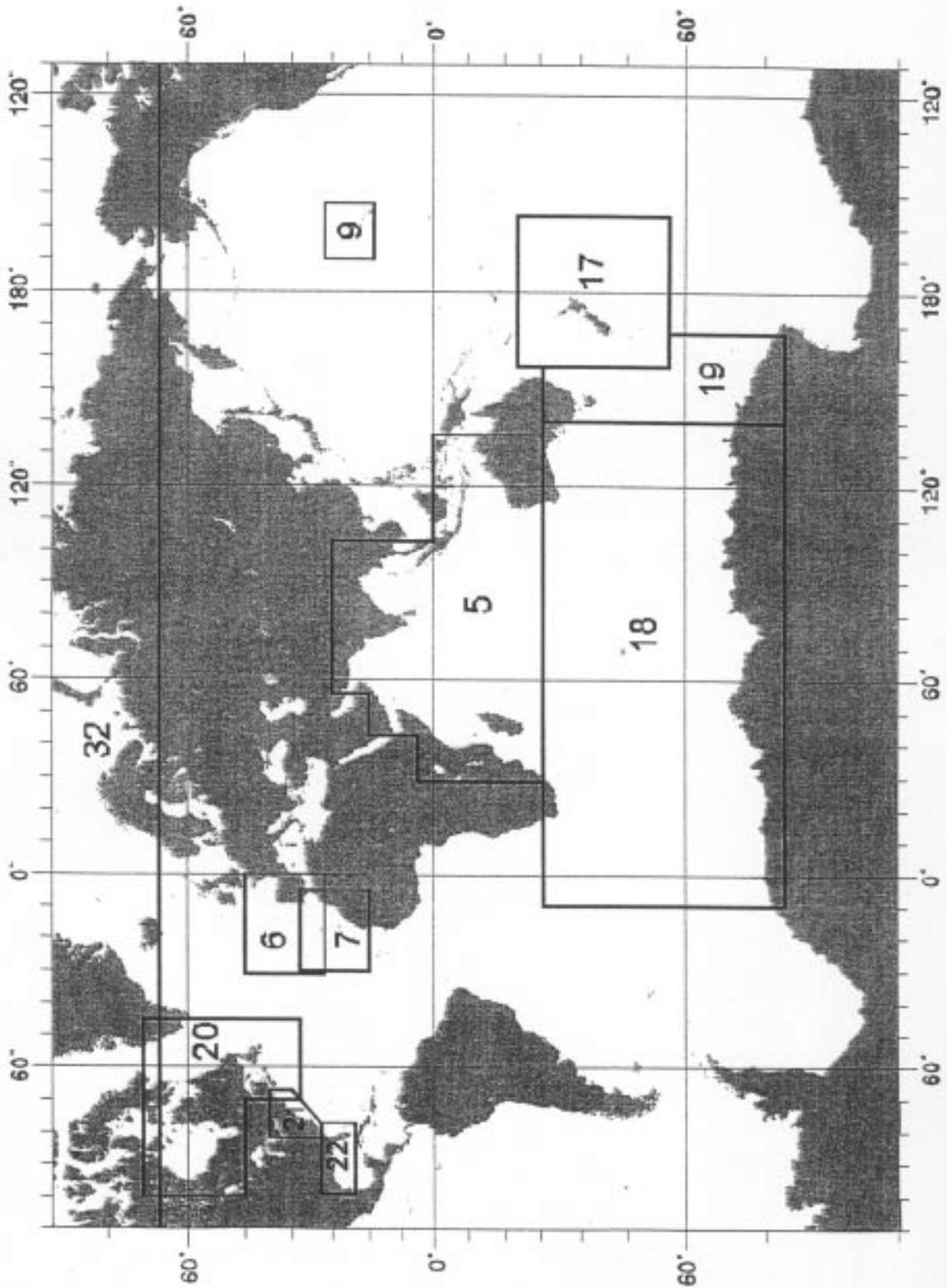
The GBE has been working on a proposal to the cable company GC/GMS to supply 1' x 1' gridded bathymetry containing their own survey data. This proposal includes later release of these grids to GEBCO.

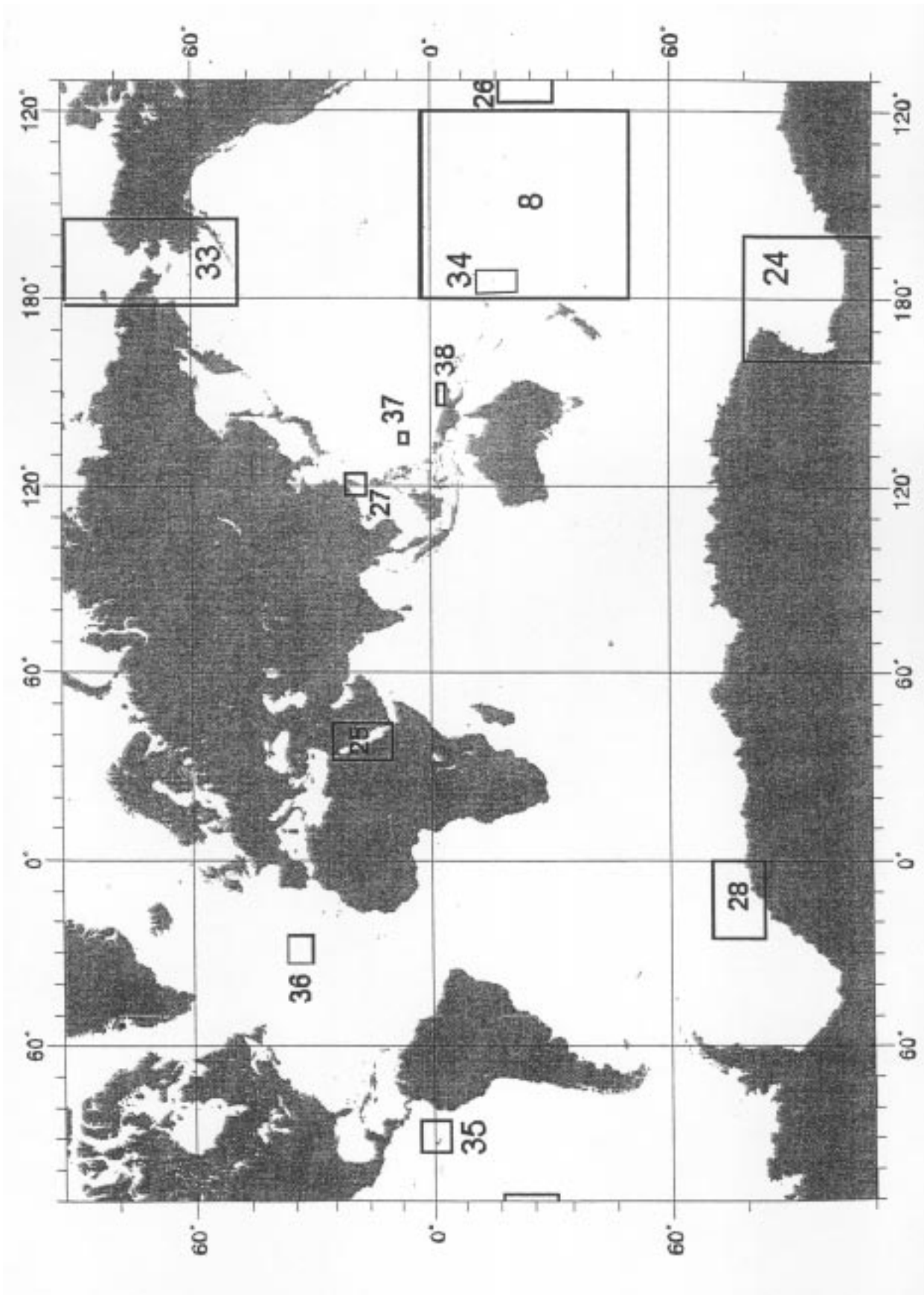
ANNEX IX

Diagrams and inventory of maps considered for inclusion in the GEBCO Digital Atlas

No.	Author	Source	Date	Title	Scale	Status	Released	Revised	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	yes	no
2	Cherkis NZ & Vogt PR	NRL	1994	Regional Bathymetry of the Northern Norwegian - Greenland Seas	1:3,000,000	GDA2000/1	yes	yes	yes	no
3	Matishov GG	MMBI/NRL	1995	Bathymetric Map of the Franz Josef Land Area	1:500,000	GDA2000/1	yes	yes	yes	no
4	HDNO	HDNO	1995	GEBCO Plotting Sheet areas 593 & 594	1:1,000,000	GDA2000/1	yes	no	yes	no
5	Fisher RL	SIO		Bathymetry of the Northern Indian Ocean	1:1,000,000	GDA2000/1	yes	no	in prog	no
6	Sibuet J-C	Ifremer		Bathymetry of the Bay of Biscay	1:1,000,000	GDA2000/1	yes	no	yes	no
7	Hunter PM	SOC		Bathymetry of the Northeast Atlantic	1:1,000,000	GDA2000/1	yes	no	in prog	no
8	Mammerickx J	SIO	1992	Bathymetry of the Southcentral Pacific	1:6,442,194	GDA2000/2	no	no	no	no
9	Duenebir T et al.	HIGP	1995	Northwestern Hawaiian Islands	1:4,000,000	GDA2000/1	no	no	yes	no
10	Keeton JA et al.	SOC	1997	Bathymetry of the Reykjanes Ridge	1:200,000	Unassigned	yes	no	yes	no
11	RIDGE	LDEO	1996	Northern Mid-Atlantic Ridge Terrain Model - Multibeam Surv Proj	Grid	Unassigned	yes	no	yes	no
12	EQUARIDGE	Geol Inst RAS		Equatorial Atlantic	Various	Unassigned	yes	no	yes	no
13	Svarichevskiy A	Pac Oc Inst RAS	1995	Bathymetric Map of the Obruchev Rise	1:2,500,000	Unassigned	yes	no	no	no
14	Svarichevskiy A	Pac Oc Inst RAS	1995	Bathymetric Map of the Northwest Pacific Basin	1:5,000,000	Unassigned	yes	no	no	no
16	Hsu S-K et al.	Ifremer	1996	Bathymetric Map Around Taiwan	1:1,600,000	Unassigned	no	no	no	no
17	CANZ	NIWA	1997	New Zealand Region Bathymetry	1:4,000,000	GDA2000/1	yes	no	yes	no
18	Fisher RL	SIO		Bathymetry of the Southern Indian Ocean (Update ?)	1:1,000,000	GDA2000/1	yes	no	in prog	no
19	Fisher RL	SIO		Bathymetry of the Southeastern Indian Ocean	1:1,000,000	GDA2000/1	yes	no	in prog	no
20	Macnab R	GSC		Bathymetry of Canadian Waters, including Hudson Bay	Grid	GDA2000/1	no	no	yes	no
21	NGDC	NGDC		Bathymetry of the US East Coast	Grid	GDA2000/1	yes	no	yes	no
22	NGDC	NGDC		Bathymetry of the (US) East Coast and Gulf of Mexico	Grid	GDA2000/1	yes	no	yes	no
24	Davey F	IGNS		Bathymetry of the Ross Sea		GDA2000/2	yes	no	yes	no
25	Hall JK	GSI		Bathymetry of the Red Sea		GDA2000/2	no	no	no	no
26	Pardee D	HIGP	1999	Bathymetry of the Easter and Juan Fernandez Microplates	Grid 0.005°	Unassigned	yes	no	yes	no

27	Taiwan Littoral Project	ONR/NRL	1999	Bathymetry of the Taiwan Region	1:804,726	Unassigned	no	no	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	no	yes	no
29	Schenke H-W et al.	AWI	1998	AWI Bm Chart of the Weddell Sea: Southern Weddell Sea	1:3,000,000	Unassigned	yes	no	yes	no
30	Russian Navy	HDNO/VNII Ok.	1999	Bottom Relief of the Arctic Ocean	1:5,000,000	Unassigned	no	no	no	no
31	Lonsdale P	SIO		Various swath maps on the East Pacific Rise		Unassigned	no	no	no	no
32	IBCAO Ed. Board	IOC/IHO		International Bathymetric Chart of the Arctic Ocean	Grid	GDA2000/1	yes	no	yes	no
33	Robertson DG	USGS	1997	Bering and Chukchi Sea Bathymetry Coverages	Various		no	no	no	no
34	Wright DJ et al.	ORST	2000	Bathymetry of Tonga Trench and Forearc	~1:500,000		no	no	yes	no
35	Chadwick W	PMEL	1999	Galapagos Bathymetry	Grid 1km		no	no	yes	no
36	Lourenco N et al	UCTRA	1998	Azores Plateau Bathymetry	Grid 400m					
37	Figiwara T et al	JAMSTEC	2000	Morphology of the Yap Trench	Swath map					
38	Auzende J-M et al	Ifremer	2000	Manus Basin	Swath map					





ANNEX X

ANNUAL REPORT OF THE GEBCO DIGITAL ATLAS MANAGER

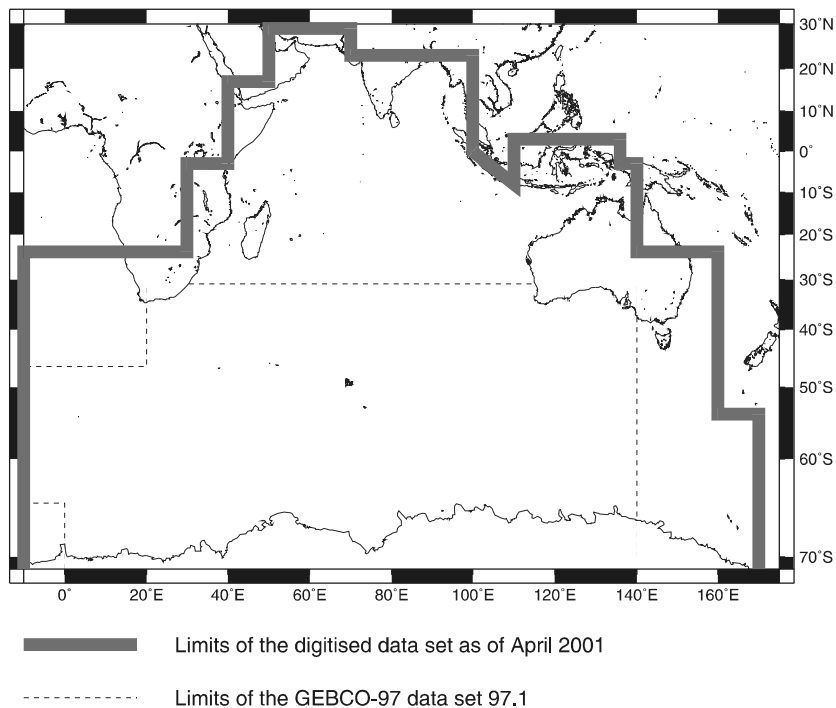
May 2000 – April 2001

P. Weatherall

Indian Ocean Area

Work has continued this year with the digitisation of bathymetric contour and trackline control charts from Dr. R.L. Fisher for the Indian Ocean area, 10°W-170°E; 30°N-72°S. The area for which the charts supplied by Dr. Fisher have been digitised is shown in the attached diagram.

The digital data set has been produced by digitising the four inches per degree of longitude scale charts supplied by Dr. Fisher. The section of the whole data set which was included on the GEBCO-97 CD-ROM (data set 97.1) is shown in the diagram below. Since then work has been done in digitising the charts for the area 140°E-170°E; carrying out quality control checks on the digital data for the area north of 31°S (the northern limit of the GEBCO-97 data set) and digitising update material for the whole area supplied by Dr. Fisher as new sources of bathymetric data have become available to him.



Since May 2000 data has been digitised from 175 update charts and new material has been added from 329 update charts for the area 10°W-100°E; 30°N-72°S. Work is still needed to complete the digitisation and addition of update material for the area: 100°E-150°E.

Atlantic Area

Gulf of Mexico

Bathymetric contour data has been received from the US National Geophysical Data Centre for the area: 24°N – 33°N; 100°W – 69°W for inclusion in the GEBCO Digital Atlas. The bathymetric contours are at 100m intervals from 100m to 5600m. In addition contours are also present at 20m, 40m, 60m, 80m and 150m and at intervals of 20m from 5400m to 5520m and then at 10m intervals to 5660 in some areas.

Coastline Data

A copy of version 3 of the SCAR Antarctic coastline data set has been received from the British Antarctic Survey. This data set covers Antarctica and surrounding islands out to 60°S. The coastline data were supplied at source or ‘capture’ scale (ranging from 1:250,000 to 1:1,000,000). A set of generalised versions of the coastline data set have also been produced at the following scales: 1:1 million, 1: 5 million and 1: 10 million. The data set includes updated information for the positions of the ice fronts for the major ice shelves.

Other Data sets

Other data sets held in digital form include:

North Atlantic Area

1. The Bay of Biscay Region: 42°N-50°N; 16°W-0°E – data digitised from a chart supplied by Dr. Jean-Claude Sibuet of IFREMER.
2. IBCEA sheet 1.08 (5° 11’N-12° 18’N; 21° 47’W-11° 17’W): digital bathymetric contours and trackline control data supplied by SHOM.
3. Data digitised from charts supplied by Mr. Peter Hunter of SOC for the areas:
 - 32°N-38°N; 15°W-5°W (12 charts at scales between 1:275,000 and 1:520,000)
 - 26°N-34°N; 28°W-21°W (chart at a scale of 1:1,000,000 at 33°N)
 - 31°N-33°N; 18°W-14°W (data supplied in digital form)

New Zealand Region

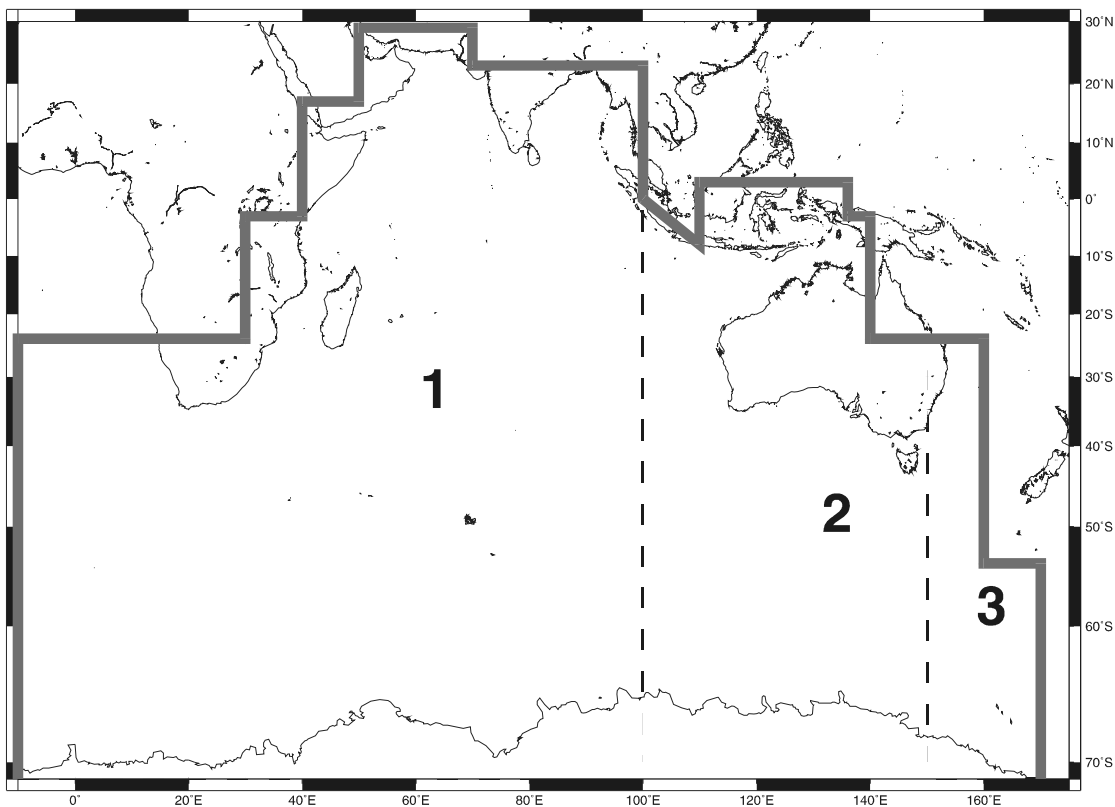
Digital bathymetric contour and trackline control data received from NIWA for the area: 24°S-57° 30’S; 157°E-167°W. The bathymetric contours are at 250m depth intervals from a depth of 250m to 1000m. Shallower water bathymetric contours have also been supplied by NIWA with bathymetric contours at 50m intervals between 50m and 200m.

Arctic Ocean Area

1. It is proposed that digital bathymetric contour and trackline control data will be supplied from the IBCAO project for inclusion in the GDA. At present the digital bathymetric contour data sets held for the Arctic area are as follows:

2. Bathymetric contour data for the area 68°N-82°N; 0°E-80°E 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
3. Bathymetric contour data for the area 79° 15'N-82°;43°E-67°E 15'N from the chart: 'Bathymetric map of the Franz Joself Land Area', compiled by G.G. Matishov, N.Z. Cherkis, M.S. Vermillion and S.L. Forman
4. Bathymetric contour data for the area 69°N-84°N; 25°W-5°E from the chart: 'Regional Bathymetry of the Norwegian – Greenland Sea' by N.Z. Cherkis and P.R. Vogt.
5. Bathymetry data supplied by HDNO for the area 72°N-78°N; 78°E-128°E

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



— Limits of the digitised data set

The regions labelled 1 and 3 show the areas where the digital data set is complete.

The region labelled 2, bounded by the dashed line, shows the area where update charts have still to be digitised.

Ross Sea Area

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

ANNEX XI

**REPORT TO THE GEBCO SUBCOMMITTEE ON DIGITAL
BATHYMETRY (SCDB)**

by

**NATIONAL GEOPHYSICAL DATA CENTER,
WORLD DATA CENTER A FOR MARINE GEOLOGY & GEOPHYSICS,
AND
IHO DATA CENTER FOR DIGITAL BATHYMETRY**

Dr George Sharman

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

I-A. Bathymetric Data Holdings and Global Database Management

Since the May 2000 Meeting of the GEBSCO Sub-Committee on Digital Bathymetry, the National Geophysical Data Center (NGDC) has responded to 216 international requests for data or information from 41 countries of which 29 are IHO Member States. International product sales increased by 53% during this reporting period. This contrasts with over 1059 sales requests from within the U.S. during the same time frame. NOAA's customer tracking management system no longer tracks requests that don't result in a data sale.

An update to Version 4.0 of the Global Trackline Geophysical Data Base (GEODAS), is scheduled for release in 2001. The new release will contain improvements to the GEODAS software, and over 730 thousand nautical miles of new bathymetry obtained from 192 cruises, and containing over 5.7 million digital soundings. Until this new version is released, new data are available for download from NGDC's web pages. A significant contribution assimilated in 2000 includes a set of 36 Antarctic bathymetry cruises acquired onboard the NATHANIEL B. PALMER from 1993 to 2000. These cruises, funded by the National Science Foundation, cover 136,000 nautical trackline miles and include 1.2 million soundings.

Another unique data set includes a contribution of LIDAR bathymetric data received from the U.S. Naval Oceanographic Office (NAVOCEANO). Over 66,000 depth values in the Gulf of Mexico near Panama City, Florida were acquired with both traditional echosounding from the USNS HEEZEN and the Scanning Hydrographic Operational Airborne LIDAR Survey (SHOALS) System. SHOALS is a state-of-the-art advancement in coastal surveying technology which fires a laser into the water and measures the difference in arrival between the surface and bottom reflections to calculate the water depth. Over 26,000 depth values were collected using SHOALS, while the balance of the depths were traditional echosoundings.

NGDC's multibeam database continues to grow as well. During 2000, 19 SeaBeam 2100 multibeam surveys containing 31 gigabytes of data and approximately 194 million soundings were received from the Woods Hole Oceanographic Institution. These data include tracklines from various areas around the U.S., near Greenland, and in the Pacific near South America. NGDC is in the process of migrating more than 60 gigabytes of multibeam bathymetric data into a new 3590 tape library archiving system using Tivoli software.

I-B. International Hydrographic Organization (IHO) Related Activities at NGDC

During 2000, the latest draft B-7, Part 4, Digital Bathymetric Data (Multibeam Echo Sounders) was re-written to remove unnecessary specificity and ensure document longevity against technology advances. Evaluation of the comments gathered at the previous GEBSCO meeting suggested that the draft had reached a level of detail which was not warranted by the nature of the document. The latest re-write is currently under review. Additionally, ISO Technical Committee 211 is drafting sensor data standards under Canadian leadership and these may aid (or impinge) upon the B-7, Part 4 development.

I-C. 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 bathymetric/topographic data. New versions (4.1) of the Marine Trackline Geophysics CD set and the NOS Hydrographic Surveys CD set are near completion. Version 4.1 of the GEODAS software will include new capabilities, including user tools to visually edit data downloaded from the CD sets in a

graphical window (Hydro-Plot). Also included are new versions of the coastline files and new routines for display and for saving coastline subsets as files in several formats. The new coastlines are sub-sampled via a sophisticated routine which efficiently performs on-the-fly generalization to a chosen resolution. These generalized resolutions are built into the GEODAS coastline files in the new GEODAS 2-D Vector Format, allowing easy extraction to a given resolution.

The GEODAS software management system has also been expanded to work with gridded data from multiple source grids at variable grid spacing. This feature allows the user to use data from more detailed files, where the information exists, in combination with successively less detailed files to complete a custom grid for their geographic region of interest. The resulting grid is at the lowest resolution input grid while the samples from the higher resolution grids are included. GEODAS gridding capabilities are being implemented for new worldwide elevation grids such as the new ETOPO2 2-minute Gridded Elevation Data, soon to be released as a CD. The software is also being tested on GEBCO 1-minute worldwide grids.

GEODAS Software runs under Microsoft® Windows™ for PCs and X Windows for UNIX™ platforms. The window driven interfaces simplify data searches, guide users with an on-line Windows-style help system and support color postscript and screen plotting capabilities.

I-D. Creation of a Database of International Non-Standard Bathymetry

NGDC is continuing to develop and conceptualize a new international database of non-standard bathymetry 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 is searching for an appropriate name for this database, and will use 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, ten data sets, from eight institutions, containing a total of over 1.2 million soundings comprise the database. During the reporting period, one data set comprising digital hydrographic surveys of Puerto Rico was assimilated into the National Ocean Service Hydrographic Data Base. The remaining data comprising this database 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.

I-E. Publication of Continental Shelf Limits

Continental Shelf Limits, The Scientific and Legal Interface, was published in 2000. The purpose of this volume, as quoted in the Forward “is to enable systematic and state-of-the-art delineation to be undertaken in a manner that will stand up to the scrutiny not only of the scientific community, but also of the legal fraternity”. Contributors to this volume include many IHO, IOC, and GEBCO personalities. Chapter 15, *Data Sources, Management, and Presentation*, was edited by NGDC’s Dr. Troy L. Holcombe, and Ms. Carla J. Moore.

II. REPORT OF THE WDC FOR MARINE GEOLOGY & GEOPHYSICS, BOULDER

NGDC, in its capacity as the World Data Center for Marine Geology and Geophysics (WDC MGG), Boulder, promotes excellence in archiving, managing, and exchanging data obtained from measurements of the seafloor, and works with national and international groups on many projects outside the scope of the IHO DCDB, GEBCO, and the IOC Regional Mapping Projects.

Although the WDC MGG, Boulder manages all types of data from the ocean floor including descriptions and analyses of seafloor samples, deep drilling data, underway geophysical measurements, and derived gridded data sets, only those areas dealing with bathymetry will be mentioned in this report.

II-A. U. S. – Canada Cooperation on New Bathymetry for the Great Lakes

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

NGDC maintains web pages for Great Lakes bathymetry. These pages provide direct links to the web of related external organizations including NOAA/ GLERL, the Canadian Hydrographic Survey, and the Great Lakes Information Network. During the last 12 months, an average of 2,588 unique users per month visited the Great Lakes web pages at NGDC, a 29% increase over last years per month value of 2,000.

Developments during the period May 2000 - April 2001:

Lake Ontario: The LAKE ONTARIO CD-ROM has been completed, and contains web-based interactive text with images, bathymetric contours in 2 meter intervals, and new 3 arc second gridded data.

Lake Erie: Dr. Troy L. Holcombe and Lisa A. Taylor of NGDC, in cooperation with scientists from the Canadian Hydrographic Service, NOAA's GLERL, the Cooperative Institute for Limnological and Ecosystems Research, and The Ohio State University have written a research paper, entitled Lakefloor Geomorphology of Lake Erie and Lake Saint Clair. The paper, which includes two large color plates containing images and figures, was submitted to the Journal of Great Lakes Research in March 2001.

Lake Huron: Contouring for the main body of Lake Huron has been completed, leaving approximately 35% of Georgian Bay and North Channel to be contoured. The lack of digital data and the number and scale of the analog plotting sheets has slowed the progress for Lake Huron. NGDC has recently undertaken the raster-to-vector processing of the hand-drawn contour sheets. Each sheet is scanned, creating a high-resolution raster image of the sheet, that is then vectorized using Arc/Info software utilities.

Lake Superior: The western third of Lake Superior has been contoured and digitized. Current efforts include the generation of contours at 5 meter intervals for the eastern third of the lake starting in Whitefish Bay. The operational plan is to complete the contours for the U.S. side of the lake, working from east to west, and then to begin work on the Canadian side.

II-B. U. S. – Japan Cooperative Program in Natural Resources (UJNR)

Dr. Michael S. Loughridge and Dr. George F. Sharman participated in the 29th Annual UJNR Sea-Bottom Surveys Panel Meeting of the U.S. - Japan Cooperative Program in Natural Resources, held in Honolulu, Hawaii, October 2000. This panel continues as one of the principal mechanisms by which Japan and NGDC exchange technologies and marine geophysical data, including bathymetry. Discussions have included the latest capabilities of NGDC's GEODAS software, such as the variable resolution coastline applications.

II-C. WDC MGG, On-Line Activities

The web pages of the World Data Center for Marine Geology and Geophysics, Boulder, collocated with those of the US National Geophysical Data Center's Marine Geology and Geophysics Division, averaged 27,725 unique users per month (not counting multiple sessions for some users) over the past year, up from an 25,002 last year. An average of 808,148 files were downloaded from the MGG web site each month during that period. Unique users from within the United States continue to constitute over 50 percent of traffic, with users from 98 other countries accessing the pages. Unique users from Canada, France, Germany, Japan, and the United Kingdom (alphabetically) comprise roughly 10% of the total. Other countries in the top twenty accessing MGG pages include Australia, Spain, Italy, the Netherlands, Norway, Sweden, Mexico, Greece, the Russian Federation, Brazil, Switzerland, Belgium, Denmark, and Finland. Accesses to individual portions of WDC-MGG pages may vary in user origin by subject. Estimates do not include accesses to MGG's FTP area.

II-D. WOCE Data Assembly Center for Bathymetric Data

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

In 2000, 26 trackline surveys were acquired for inclusion in the next release of the Marine Trackline Geophysics CD-ROM data set.

II-E. ETOPO2

NGDC has produced a new, high-resolution data base of global topography and bathymetry. To be named "ETOPO2", this 2 arc minute, latitude-longitude gridded data base will supersede ETOPO5 and TerrainBase, which are 5-minute data bases. The ETOPO2 data are generated from Global Land One-kilometer Base Elevation (GLOBE) project digital data bases of land elevations, combined with Smith and Sandwell (1997) measured and estimated sea floor topography, and IBCAO Arctic bathymetry, re-sampled on a 2-minute latitude/longitude grid. The data base improvement results from accumulated data and pioneering, satellite-based work of Smith and Sandwell. The data are on a CD-ROM in both binary raster format and as subsets compatible with NGDC's GridXlator software. The latter format is accessed through a web browser HTML interface that includes color, shaded-relief imagery derived from the data to aid in area selection.

II-F. Public Distribution of DBDB-V, version 4.1

During 2001, NGDC will become the official public distributor of the U.S. Naval Oceanographic Office's (NAVOCEANO) Digital Bathymetric Data Base – Variable Resolution (DBDB-V), level 0 (unclassified). DBDB-V level 0 is an unclassified digital bathymetric data base that provides ocean depths at various gridded resolutions. DBDB-V was developed by NAVOCEANO to support the generation of bathymetric chart products, and to provide bathymetric data to be integrated with other geophysical and environmental parameters for ocean modeling. NGDC will provide general public access to the entire unclassified global data set available via CD-ROM. Regional extraction of smaller sub-sets of data will continue to be downloadable from the NAVOCEANO web site.

II-G. NOS Bathymetric Fishing Maps

Scanning of the complete collection of National Ocean Service (NOS) Bathymetric Fishing Maps was completed in 2000 under the NOAA Data Rescue Project. NGDC is currently arranging all the digital files into regional collections to be made available to the public as scanned images on CD-ROM. The 208 black and white preliminary maps have been compacted into tiff group 4, and the 246 color maps, are available as Mr. Sid files. Mr. Sid expansion software is available online as free shareware. NGDC anticipates a library collection of 5 CDs total: East Coast, Gulf of Mexico (including all Florida coastline), West Coast, and Alaska in 2 volumes.

Transfer into the digital realm was driven by continued demand and limited remaining stock. These maps are no longer being generated by NOS, and NGDC has already depleted the existing color stock for maps in the more popular fishing regions of Gloucester, Massachusetts, eastern coastal regions of Florida and the Ewing Bank region in the Gulf of Mexico. Commercial and private fishermen can utilize these digital images in onboard computer systems during an expedition, or print the images on a traditional paper copy at a local print shop.

III. REPORT OF NGDC ACTIVITIES IN SUPPORT OF IOC / GEBCO

III-A. 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; Dr. George Sharman continues as an active member of the Editorial Board of the IBCWP; and Dr. David Divins serves on the Editorial Board of the IBCAO.

1. Gulf of Mexico and Caribbean (IBCCA)

The next IBCCA editorial board meeting has been rescheduled for the fall of 2001, and will be hosted by the NGDC in Boulder, Colorado. A CD-ROM series containing vector contours and DEM data with color imagery for the completed areas is scheduled for release by the Instituto Nacionale de Estadistica, Geografia, y Informatica (INEGI) in Mexico this year. Bathymetry has been completed for much of the IBCCA area, and most of the completed bathymetry has been scanned to digital media. The project is proceeding with editing, printing, and creation of data sets.

NGDC is in the process of creating a CD-ROM containing digital data, imagery and undersea feature names for IBCCA sheets 1-01, 1-02, 1-03 and 1-04 that will correspond with the bathymetric poster: *Bathymetry of the Northern Gulf of Mexico and Atlantic Ocean East of Florida* released by NGDC last year. Prior to the CD-ROM release, NGDC is providing the digital data to customers in various formats.

2. Mediterranean Sea (IBCM)

The Ninth Session of the Editorial Board, scheduled for November 2000 in Israel was postponed, and a new meeting date has not been established.

NGDC plans to prepare a proof copy of the color image of Mediterranean bathymetry and topography, together with a provisional title block and marginal information, for presentation at the next IBCM meeting. Additionally, a demonstration CD-ROM, containing assembled data and imagery, and Mediterranean geological and geophysical data held by NGDC, may be prepared for presentation at the next meeting as well. These provisional products could illustrate the data access and visualization capabilities that could be realized if all the data were archived and accessible in a common format and location. Editorial board members could then decide whether to proceed with publication of either product, and, if so, provide guidance concerning scales, content, title block, and marginal information. A substantial amount of data currently resides at NGDC, but much Mediterranean data resides elsewhere. The demonstration could illustrate the efficiencies of assembling all existing Mediterranean ocean mapping data into a common archive.

The IBCM web pages went live in 2000, after receiving final approval to release these pages for public viewing.

3. Arctic Ocean (IBCAO)

An editorial board meeting is scheduled for May 2001 in Durham, New Hampshire. Topics for discussion include potential new Arctic data sets and the compilation of the next version of the IBCAO grid as well as other bathymetry related issues. Significant updates are underway, including the assimilation of 200,000 km of multibeam data from the Norwegian Petroleum Directorate. It is anticipated that a version of the IBCAO grid will be included in the GEBCO gridded product and that the contours derived from the grid will be incorporated into the GDA.

4. Western Indian Ocean (IBCWIO)

The Fifth Editorial Board Meeting of the IBCWIO was held in Port Louis, Mauritius in July 2000. NGDC geophysicist Lisa A. Taylor presented the deep-water compilation of Sheet 1-05. This sheet encompasses the Seychelles Islands and is the joint responsibility of the Seychelles and the United States. A training component of the meeting included an overview of compilation methods, discussions on the appropriate use of the Smith and Sandwell (1997) *Measured and Estimated Sea Floor Topography*, and how to best share the knowledge of experienced participants with those less trained in bathymetric compilation. Post meeting discussions resulted in an agreement that NGDC would finish the near shore bathymetry of Sheet 1-05 using all available digital and analog data from NGDC and the British Hydrographic Office.

5. Eastern Atlantic (IBCEA)

A new bilingual IBCEA website went on-line in 2000. The site, created by NGDC in cooperation with the French Naval Hydrographic and Oceanographic Service (SHOM), is maintained at NGDC along with four other regional mapping program sites. http://www.ngdc.noaa.gov/mgg/ibcea/start_e.htm

6. Baltic (IBCB), (Proposed)

Initiation of an International 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.

7. Eastern South Pacific (IBCESP)

The First Editorial Meeting of the International Chart of the Eastern South Pacific (IBCESP) Project has been scheduled for October 2-4, 2001, in Chile. NGDC and the U.S. ocean mapping community are supporting this effort with funding assistance for the inaugural meeting of the IBCESP.

8. Western Pacific (IBCWP)

Dr. David Divins attended the Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific (EB-IBCWP), held 25-30 September 2000 in the office of the National Marine Data and Information Service (NMDIS) of the State Oceanic Administration (SAO), Tianjin, China. Work has progressed, although slowly, since the last meeting in December 1996. Country responsibility for each of the compilation sheets was identified, however no consensus could be reached for a small number of these sheets. Discussions continue between the concerned parties.

Some of the accomplishments reported at this meeting include:

- Russia has generated 12 plotting sheets in sub-region 1, at a scale 1:500,000, including standard bathymetric data, track maps, and depth contours;
- China has compiled the bathymetric contours for three sheets in sub-region 2;
- Korea is actively collecting new bathymetric data for their coastal area. When their field acquisition program is complete, these data will be used in the compilation of sheets in sub-region 2;
- Thailand has officially agreed to participate in the IBCWP and is actively compiling data for sheet 3-10;
- New Zealand has agreed to take responsibility for sub-region 5 and to provide contour data for the IBCWP;
- The South Pacific Applied Geoscience Commission (SOPAC) has accepted the invitation of the IOC and agreed to contribute to the IBCWP as the responsible country for sub-region 6.

NGDC is collaborating with China to develop a web page for the project and on the development of a database of bathymetric data available for use within the project. The project's goal is to generate over 50 bathymetric contour charts for the region at a scale of 1:1,000,000.

III-B. GEBCO Reviewers Report:

1. 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 ships working in the northeast 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's 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 northeastern Pacific basin.

Although, it may be considered outside the scope of the North-East Pacific, there has been considerable activity in the Hawaii Island region. The Monterey Bay Research Institute (MBARI) is operating their research vessel R/V WESTERN FLYER in the Hawaiian region, while the Scanning Hydrographic Operational Airborne LIDAR Survey (SHOALS) System operated by the U.S. Army Corps of Engineers and the Naval Oceanographic Office, conducted LIDAR surveys in both the Hawaiian Islands and off California.

2. Caribbean Sea and Gulf of Mexico

While there are no major mapping programs in the Caribbean, there is significant ship activity. U.S. institutions, Universities, and NOAA all have vessels that periodically work in the area, and as this data becomes available, it may be incorporated into the bathymetric data bases of the region. The SHOALS LIDAR system has also been utilized to conduct surveys in U.S. coastal areas of the Gulf of Mexico.

ANNEX XII**LIST OF ACRONYMS**

ACUF	Advisory Committee on Undersea Features (of BGN)
AGSO	Australian Geological Survey Organization
AGU	American Geophysical Union
ANTOSTRAT	Antarctic Stratigraphy
AUV	Autonomous Underwater Vehicle
AWI	Alfred-Wegener-Institut für Polar- und Meeresforschung (Bremerhaven, Germany)
BAS	British Antarctic Survey
BDBS	La Base de Donnés Bathymétriques de SHOM
BGN	Board on Geographic Names
BODC	British Oceanographic Data Centre (Bidston Observatory, Birkenhead, UK)
CGOM	IOC Consultative Group on Ocean Mapping
CHS	Canadian Hydrographic Service
COC	GEBCO Centenary Organising Committee
DBDB-5	Gridded Bathymetric Data Set on 5-minute squares, produced by USNOO
DCDB	Data Centre for Digital Bathymetry (IHO - at NGDC, Boulder, Colorado, USA)
DTM	Digital Terrain Map
EEZ	Exclusive Economic Zone
E-GDA	Educational GEBCO Digital Atlas
EGS	European Geophysical Society
ETOPO5	Earth Topography on a 5-minute grid (NGDC)
ETOPO2	Earth Topography on a 2-minute grid (NGDC)
EuroGOOS	European Global Ocean Observing System
GBE	GEBCO Bathymetric Editor
GC	GEBCO Guiding Committee
GDA	GEBCO Digital Atlas
GEBCO	General Bathymetric Chart of the Oceans (IOC/IHO)
GIS	Geographical Information System
GLOBE	Global Land One-kilometer Base Elevation project
GMS	Global Marine Systems
GOMaP	Global Ocean-floor Mapping Project
GOOS	Global Ocean Observing System (IOC, ICSU, UNEP & WMO)
HDNO	Head Department of Navigation & Oceanography (Russian Federation Ministry of Defence, St Petersburg)
IASC	International Arctic Science Committee
IBCAO	International Bathymetric Chart of the Arctic Ocean (IOC/IASC/IHO)
IBCEA	International Bathymetric Chart of the Central Eastern Atlantic (IOC)
IBCM	International Bathymetric Chart of the Mediterranean
IBCWIO	International Bathymetric Chart of the Western Indian Ocean (IOC)
IBCWP	International Bathymetric Chart of the Western Pacific (IOC)
ICSU	International Council of Scientific Unions
IHB	International Hydrographic Bureau (Secretariat of IHO)

IHO	International Hydrographic Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
JHD	Japanese Hydrographic Department
LIDAR	Light Detection and Ranging
NGDC	National Geophysical Data Center (Boulder, Colorado, USA)
NIMA	National Imagery and Mapping Agency (USA)
NIWAR	National Institute of Water and Atmospheric Research (New Zealand)
NOAA	National Oceanic and Atmospheric Administration (USA)
NRL	Naval Research Laboratory (USA)
NSF	National Science Foundation (of USA)
ODP	Ocean Drilling Program
ROV	Remotely Operated Vehicle
RV	Research Vessel
SCAR	Scientific Committee on Antarctic Research (ICSU)
SCDB	Sub-Committee on Digital Bathymetry (GEBSCO)
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 (GEBSCO)
SHOM	Service Hydrographique et Océanographique de la Marine (France)
SOC	Southampton Oceanography Centre (UK)
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
USNOO	US Naval Oceanographic Office
VHO	Volunteering Hydrographic Office (IHO)
WDC	World Data Centre
WG	Working Group
WMO	World Meteorological Organization
WVS	World Vector Shoreline (NIMA)
