Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

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IOC Consultative Group on Ocean Mapping (CGOM)

Ninth Session

Monaco
12-13 April 2003

UNESCO

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1. OPENING OF THE SESSION

Chairman Gunther Giermann opened the Ninth Session of the IOC Consultative Group on Ocean Mapping (CGOM) on Saturday 12 April 2003 at the International Hydrographic Bureau (IHB) in Monaco. In the name of the IOC Executive Secretary, Patricio Bernal, he welcomed members of CGOM and wished them success in the deliberations. He then gave the floor to IHB Director Captain Hugo Gorziglia who delivered a welcoming address.

Captain Gorziglia stated that it was a great pleasure for the IHB to host several gatherings of Ocean Mapping Groups on the occasion of the GEBCO Centenary Conference. He was confident that this unique event constituted a significant opportunity for an exchange of views among participants, and for conducting within each group a retrospective analysis of existing strengths and weaknesses. He invited participants to identify courses of action with a view to improving effectiveness through a more coordinated and cooperative work among all actors involved in Ocean Mapping, i.e. GEBCO (IHO/IOC joint programme) and IBC Regional Projects (IOC programme). Also, he pointed out that Hydrographic offices have always been very much involved in the collection of bathymetric data, and that Ocean Mapping projects could benefit from close relationships with the appropriate Regional Hydrographic Commissions. In this context, Captain Gorziglia invited participants to consider this issue as a matter of priority.

Finally, Captain Gorziglia informed participants that in October 2001, the International Bathymetric Chart of the South-East Pacific (IBCSEP) was established, and that several actions had been taken since then. A review of the progress will take place on the occasion of the Second Meeting of the Editorial board that is scheduled for November 2003 in Peru. In light of his appointment as IHB Director, he has handed over the responsibilities of Chairman of the Editorial board of the IBCSEP to the Chilean Hydrographer captain Fernanhdo Mingram. Accordingly, he suggested that captain Mingram, Director of the Chilean Hydrographic and Oceanographic Service, would be in a much better position to present a report on progress achieved in that region.

In closing, he wished everyone a pleasant stay in Monaco, and a very productive meeting.

2. ADOPTION OF THE AGENDA AND ELECTION OF THE RAPPORTEUR

Prior to consideration of the Agenda, Chairman Giermann presented a brief outline of CGOM's Terms of reference, followed by an enumeration of the IBC meetings that had occurred since the last CGOM meeting in St. Petersburg in 2001. The Agenda was then adopted with a minor spelling change. Ron Macnab was appointed Rapporteur.

3. CONDUCT OF THE SESSION; DOCUMENTATION

Dmitri Travin, Technical Secretary, introduced three documents: (i) Minutes of the last CGOM Meeting, St. Petersburg, 10-14 May 2001; (ii) draft Biennial Report of CGOM to the 22nd Session of the IOC Assembly, Paris, 24 June – 2 July 2003; (iii) draft Guidelines for GEBCO.

4. PROGRESS MADE AND PLANNED FUTURE DEVELOPMENTS IN OCEAN MAPPING, INCLUDING FINANCING

Chairman Giermann began by announcing a change in the IOC procedure for approving proposed IBC undertakings: the IOC Executive Secretary now has the authority to grant immediate and interim approval for new projects, subject to confirmation by the IOC Assembly. He then invited IBC editors to submit their respective reports, suggesting they also use the occasion to mention financial opportunities and problems.

4.1 GENERAL BATHYMETRIC CHART OF THE OCEANS (GEBCO) (Anthony Laughton)

Sir Anthony Laughton delivered an account in which he outlined GEBCO activities and developments since the last CGOM Meeting: committee meetings were held in Tokyo (2001) and in Durham, New Hampshire (2002); a Strategic Planning Committee was established to review current GEBCO undertakings and to recommend a direction for future activities; the Centenary Edition of the GEBCO Digital Atlas (GDA) was released, containing among other things a global bathymetric grid at one-minute intervals as well as the *IHO Gazettee*r. Presentations on GEBCO were made to the IOC Assembly in 2001, and to the IHO Conference in 2002.

In response to the submission of a growing number of proposals for naming undersea features, the frequency of SCUFN meetings was increased to once per year instead of once every two years. Concern over GEBCO's financial prospects prompted a search for supplementary funding from corporate and private donors to help cover various expenses such as the Centenary Conference scheduled for the following week. As part of the commemoration of the Centenary of GEBCO, Desmond Scott assembled and edited contributions from various members of the GEBCO community to give an account of the organisation's history from 1903 to 2003.

SCOR Working Group 107 released its report on Improved Global Bathymetry, which described the utility of bathymetric mapping; identified priority areas; and made several important recommendations that need to be considered by GEBCO. At the same time, there is concern over the low demand for GEBCO products, suggesting that a more aggressive approach may be necessary to inform potential users of their availability and application. In this context, the success of displays at the AGU Fall Meeting in San Francisco in December 2002, and at the AGU/EGS/EUG Meeting in Nice in April 2003 was noted.

In summing up, Sir Anthony stated that the two main concerns facing GEBCO were (i) the need to update maps that portray the bathymetry of the Pacific Ocean, and (ii) the need to develop efficient techniques for distributing GEBCO products that generated more revenue while respecting data copyrights.

Noting that he had been involved in GEBCO since 1966, Sir Anthony announced his intention to retire from the organisation at the end of the Centenary Conference.

Chairman Giermann thanked Sir Anthony for his wide-ranging review, noting that some of these same concerns had been raised at the 2001 CGOM meeting, and presented to the IOC Assembly the same year. Dmitri Travin pointed out that the IOC had responded positively by providing an increased level of support to offset partially the costs of several activities, namely the

Centenary Conference, the post of the GEBCO Permanent Secretary, and travel for events such as the annual meetings of SCUFN.

In closing this part of the meeting, Chairman Giermann on behalf of all CGOM members thanked Sir Anthony for his many years of service and leadership in Ocean Mapping.

4.2 INTERNATIONAL BATHYMETRIC CHART OF THE MEDITERRANEAN AND ITS GEOLOGICAL/GEOPHYSICAL SERIES (IBCM) (Carlo Morelli)

Under the auspices of IOC-FAO-CIESM, with data contributions from research institutions and private societies, and after 20 years of collaborative work by an ad hoc international group, the IBCM (scale 1:1,000,000, 10 sheets) was published in 1981 by the Head Department of Navigation and Oceanography of the Russian Federation Navy, St. Petersburg. The importance of the physiographic results suggested their completion with the most pertinent geophysical and geological data. The following maps were also published at the same scale: Bouguer Gravity Anomalies (IBCM-G, 1989); Seismicity (IBCM-S, 1991); Plio-Quaternary Thickness (IBCM-P/Q, 1993); Unconsolidated Sediments (IBCM-Sed, 1998); and Magnetic Anomalies (IBCM-M, 1999). Each map is illustrated by an explanatory brochure (IBCM-S also by a catalogue).

The series of data forecasted for the original Project have been progressively improved with the introduction of new technologies and completed with those of complimentary methods suitable for the realization of so-called integrated interpretations.

All the data are deposited in pertinent data bases, properly updated (digitised) when necessary.

The situation of the voluntary contributions, fall-outs, and benefits for each map is synthesized in the following paragraphs.

IBCM

The first phase of the IBCM project is now drawing to a successful conclusion, but the demand for more accurate data is increasing progressively for a variety of scientific, economic, and social purposes. Mindful of the technological changes which have taken place since its inception, it is planned that the second phase of IBCM will incorporate radical new designs in terms of its presentation and resolution. This product will be an experimental prototype and will be based entirely upon a digital database. The nature of the database will be a raster (a Digital Terrain Model or DTM), consisting of gridded seamless data for land and sea on a 0.1' grid (185 m or less depending upon the latitude).

At its meeting in Monaco on 12-14April 1999, CGOM examined the above proposal for the IBCM-II prototype and its guidelines, and saw in it an innovative step which may hold promise for the future. The 11th Mediterranean Black Sea Hydrographic Commission (which met in Split 7-11June 1999) accepted these guidelines, and issued Decision 10 inviting the Volunteering Hydrographic Office (VHOs) concerned to provide releasable data to the compilation.

Within IOC and other interested organisations, the IBCM-II will, like the IBCM-I, be at the disposal of the various programmes now in development in different parts of the world.

IBCM-G (Gravity)

The indetermination in the interpretation of potential fields (gravity and magnetic anomalies) requires constraints which are usually offered by surface geology or drilling (for surficial targets) or seismic data (for deeper ones). So, Deep Seismic Refraction Profiling (DSS) is usually the solution, since it offers in depth the velocity of the seismic waves (from which density can be derived), and the seismic position of the discontinuities which separate the different geological situations. Started in 1956 in the Alps, the DSS profiles are widely used all over the world. In the Mediterranean, 22,000 km of profiles were collected from 1960 to 1982 by the Osservatori Geofysico Sperimentale (OGS) of Trieste with outstanding results on crustal composition and thickness, discontinuities, subduction and delamination, etc.

IBCM-M (Magnetic)

The results of the magnetic studies were particularly pertinent for the indication of volcanic intrusives in the sedimentary upper crust, the extension of sedimentary basins (particularly along all the external front of the Appenines, from Piemonte to Sicily; on the Nile and Rhone deltas); upheaval of the lower crust and upper mantle; crustal openings, etc.

IBCM-P/Q (Plio/Quaterneria)

The base of the P/Q sediments (~7 My) is a very important indicator of vertical movements. The geological data of the IBCM-P/Q obtained very important constraints from the special Flexotir light marine seismic survey (MS; 39,500 km) performed by OGS from 1969 to 1982. Also the origin and nature of the colossal overthrusts covering the Italian Peninsula have a paramount importance for Science and the (oil) industry.

IBCM-S (Seismicity)

The data elaboration of 33,000 earthquakes for the period 1904 – 1998 was performed by the Euro-Mediterranean Seismological Centre in Strasbourg, after necessary and exhaustive studies on the philosophy for handling data of different qualities. The results found innovative application in Plate Tectonics, Neotectonics, and connected problems.

IBCM-US (Unconsolidated Sediments)

After detailed cooperative studies on the basically different western and eastern Sedimentological Scales, a Unified International Scale was adopted, so that the illustrative booklet on IBCM-US represents now a practical treatise of modern sedimentology.

The conclusion is a premise for Inner Space Studies promoted by IOC in the other fields of Oceanography (Physical, Chemical, Biological, etc.).

4.3 INTERNATIONAL BATHYMETRIC CHART OF THE CARIBBEAN SEA AND THE GULF OF MEXICO (IBCCA) (Jose Luis Frias)

The Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA) was hosted by the National Geophysical Data Centre (NGDC), NOAA, in Boulder, Co., USA, 3-5 March 2003. The purpose of the meeting was to make a general review of the project since the previous meeting in 1998: state of the compilation, the IBCCA database, additional products derived from IBCCA, vectorisation of the sheets, editing and printing, geophysical/geological series, sale and distribution of IBCCA products. Some of these are described in the paragraphs that follow.

Status of IBCCA sheets

Sheets 1.01, 1.02, 1.03, 1.04,1.05, 1.06,1.09 and 1.11 have been fully edited, with colour proofs submitted to the Chief Editor for final review by the Editorial Board. Instituto Nacional de Estadistica Geografia e Informatica (INEGI), Mexico is preparing to print them on demand.

Sheets 1.07, 1.08 have been upgraded with new bathymetry, which gas also been incorporated in the digital database. Colour proofs for these sheets will be produced in May 2003.

Sheet 1.12 has been compiled by Costa Rica, as well as 26 sheets at scale 1:250 000. At the same time, INEGI and NGDC have compiled four sheets at scale 1:500 000. All sheets have been scanned and vectorised, with the information to be exchanged between Costa Rica, the USA, and Mexico in order to define the final version.

Sheets 1.14 and 1.15 have been fully digitised and vectorised by the Dirección de Hidrografía y Navigación (DHN) of Venezuela and INEGI working jointly. The DHN representative has recommended updating the contours with new multibeam bathymetry collected in the territorial waters of Venezuela. Following that, the digital files will be sent to the Chief Editor.

Sheets 1.13, and 1.17 have been fully digitised and vectorised by the INEGI and the Centro de Investigaciones Oceanográficas e Hidrográficas (CIOH) of Colombia working jointly. Information will be incorporated in the digital database. Colour proofs will be produced in May 2003.

Sheets 1.10 and 1.16 are the responsibility of France. The representative of the Service Hydrographique et Océanographique de la Marine (SHOM) has advised that no progress has been made on these sheets on account of his organisation's involvement in four IBC projects. Production of the IBCCA sheets must be postponed until the year 2005.

IBCCA Geophysical/Geological Series

The Board agreed that a first step must be to consult with experts in geology and geophysics to determine their possible interest in participating. It may be necessary to have a meeting in order to define particular aspects of each theme, and to identify prospective sources of geological and geophysical information in each participating country. Then with the permission of the authors/publishers of geophysical maps in the IBCCA area, that information will be

digitised and sent to NGDC. Resulting maps will be produced in a digital form, probably at scale between 1:1,000,000 and 1: 3,000 000.

Other matters

An Informal Working IBCCA Meeting was hosted by the Instituto Cubano de Hidrografía (ICH) and GEOCUBA in Havana, Cuba, 13 -14 December 2001. Participants from Cuba (GEOCUBA), Colombia (CIOH), USA (NGDC), Mexico (INEGI), and the IOC Secretary attended. The participants reviewed the status of each sheet and reassigned the compilation of several sheets to facilitate the completion of the project.

Following the Eighth Session of the IOC Editorial Board for IBCCA, a Workshop in Bathymetric Data Management was hosted by the National Geophysical Data Centre (NGDC), NOAA, in Boulder, Co., USA, 6-7 March 2003. In addition to the IBCCA members, participants from Peru (DHN), Instituto Oceanográfico de la Armada (INOCAR),Ecuador, Head Department of Navigation and Oceanography (HDNO), Russian Federation, Secretaría de Marina Armada (SEMAR), Mexico, and Commission for the Geological Map of the World (CGMW) attended the workshop.

Arrangements have been made for the production printing of IBCCA Sheets, with an agreement reached between INEGI and SEMAR of the Mexican Navy, which will print the entire series.

The Chief Editor has sent all proposed undersea feature names for the eight sheets to the Sub-Committee on Undersea Feature Names (SCUFN) for consideration.

The first version of the CD-ROM for IBCCA containing all IBCCA data which is currently available in digital form for sheets 1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.09, and 1.11 was presented by Geographer José Luis Frías, Vice-Chairman of IBCCA. Sheets 1-07, 1-08, 1-13, 1-14, 1-15 1-17 will be added in 2003. Also, a brochure has been produced that describes the IBCCA series.

Ing. Mario Alberto Reyes Ibarra, General Director of Geography at INEGI, was elected as Chairman of the Editorial Board and Mr. José Luis Frías was elected as Vice-Chairman.

The 9th Session of IBCCA has been tentatively planned in the year 2005 at the DHN in Venezuela.

In commenting upon the presentation by Mr. Frias, Dmitri Travin referred to IOC's active role in IBCCA through funding, developing contacts, and facilitating meetings. Chairman Giermann expressed concern over the delay in the sheets that are to be produced by SHOM.

4.4 INTERNATIONAL BATHYMETRIC CHART OF THE CENTRAL EASTEN ATLANTIC (IBCEA) (André Roubertou)

After the last meeting of the group (8th Session, St. Petersburg, May 2001), the following developments have occurred:

Publication by France (SHOM) in 2002 of sheets 11 and 12. This brings to an end the publication of the six sheets (06 and 08 to 12) allotted to France from the beginning of the project. These sheets, except 08, which suffered a long and complex compilation phase, met no criticism from the GEBCO community. A few remarks about undersea feature names were received and filed for a possible new edition.

The present status of the four sheets allotted to Portugal (01 to 03 and 07) is as follows: 01 published in 2002; 03 ready to be published; 02 completed, subject to a few final adjustments and approval of undersea feature names. Both should be published before the end of 2003 or the beginning of 2004. Unfortunately 07 is not yet started, and no time schedule is indicated for this work.

Sheets 04 and 05, primarily allotted to Spain, are being handled by Peter Hunter of SOC and are to be printed by SHOM. 04 has been completely compiled, digitised and introduced in the Centenary edition of GDA. The paper version will be prepared by SHOM from the digitised chart included in the GDA. 05 will be ready in digitised form within a few months and will be prepared in paper form in the same way.

There are small differences in the aspect of the sheets, coming from variations in the specifications and changes in the printing techniques (SHOM presently uses quadrichromy). These differences could be corrected in a second edition, if such is to exist. It may be deemed doubtful. Rather, the likely procedure in the future could be continuous updating of the digitised version, and printing of instant copies on demand.

As previously noted, the Portuguese publisher did not comply with 501.C of the specifications (undersea feature names with nomenclature in English). It is regrettable that a Portuguese version of B-6 document does not exist. Maybe a table with English equivalents should be printed at the back of the charts.

As already decided, there will be no new meeting of the IBCEA editorial board before completion of the 12 bathymetric sheets.

4.5 INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN INDIAN OCEAN (IBCWIO) (Werner Bettac)

Status of the sheets is as follows:

1.10: ready for printing, some concern about portraying certain minor features outside the 200 metre line.

1.03, 1.06: in proof stage, with some questions posed by HDNO concerning contours and symbols.

1.01, 1.02: data compiled but no contours developed, completion estimated (by Peter Hunter) in September 2003.

1.16: compilation finished three years ago by South Africa, proof to be prepared by an expert.

1.11, 1.14: in progress, following one year's training of cartographers from Madagascar at SHOM.

1.15: in abeyance, pending resolution of financial problems at SHOM.

1.05: in progress at NGDC, nearly complete but new data sets from HDNO need to be incorporated.

Michel Huet reported that South Africans were said to suffer from diminishing resources, but that they will do their best to complete sheet 1.16.

There has been no follow-up to a recommendation made at the last CGOM meeting, concerning optimum methods for merging soundings with bathymetry derived from altimetry. Lack of agreement between these two classes of information is a source of some concern. The presence of Walter Smith at the concurrent SCDB meeting was noted, and he was invited to address CGOM concerning the use of satellite altimetry in the development of a database of global bathymetry. In his presentation, he spoke of the advantages and disadvantages of deriving bathymetry from altimetric observations, pointing out that the resolution which is currently achievable permits use of the information for a variety of scientific purposes, but that it cannot yet be claimed to be suitable for actual measurements of bathymetry. Improvements are at hand, however, and he expressed confidence that the resolution would improve with the launching of new satellites that are capable of measuring sea surface slopes. Accordingly, it was decided that it would be premature to develop specifications for merging actual bathymetric observations with depths derived from altimetric measurements, however it was agreed that IBC participants would maintain a watching brief on developments.

4.6 INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN PACIFIC (IBCWP) (Shi Suixiang)

As the Chief Editor State, China pays high attention to the implementation of the IBCWP according to the project's objectives and requirements, and has established a cooperative relationship with all Member States. Progress has varied among Member States, as outlined in the following paragraphs.

Current Situation of the IBCWP Project in China

1. Data Collection and Evaluation: Bathymetry has been mapped in most of the inshore and offshore waters of China. In inshore waters, the total reaches 2 million km; in offshore waters, it is 350 thousand km. All these bathymetric data are dense and the data are complemented and updated rapidly. The processing and evaluation of these data have been conducted in accordance with the objectives and time of soundings, sounding apparatus, accuracy of sounding, positioning devices for soundings, etc. A data inventory and digital database have been established.

Most series of charts at different scale have been collected, i.e. 1:250,000 nautical charts; 1:1,000,000 bathymetric charts of the Yellow Sea, the East China Sea and the South China Sea; 1:2,000,000 Geophysical Atlas of the South China Sea and its adjacent waters; and 1:5,000,000 Geological and Geophysical Atlas of the Bohai Sea, the Yellow Sea and the East China Sea. These charts are the fundamental basis for the depth contour maps of sub-regions 2 and 3 in the

IBCWP project. They include side-scanning sonar images and the graphics of sedimentation, gravity, geological structure, magnetic anomaly, etc.

2. Preparation for data and compilation of proof sheet: Over 40 sheets of 1:500,000 bathymetric charts for the Yellow Sea, the East Sea and the South China Sea have been compiled. Depth contours have been digitised to create a database for compilation. Six proof copies of sheets of sub-region 3 (3-6, 3-7, 3-11, 3-12, 3-16, and 3-17) have been compiled at the scale of 1:1,000,000 in accordance with specifications. Contour lines at 500 m intervals were interpolated in the charts in order to meet the requirements of the GEBCO Digital Atlas and Article 76 of UNCLOS.

3. Application of multi-beam soundings and satellite altimetry: several new technologies such as multi-beam sounding, side-scanning sonar, GPS, etc. are having a large influence on the collection, correction, updating, and storage of bathymetric data while decreasing the time necessary to construct charts, yet increasing their accuracy and quality.

China initiated a multi-beam sounding programme in 1998, and has achieved results in some areas. Meanwhile, a great accumulation of satellite altimetry data provides significant information for the recovery of the ocean gravity field. China has started research on deriving seafloor topography from the ocean gravity field by analysing the interrelation between the gravity anomaly and sea depth.

4. Geographical Names and Nomenclature of Undersea Features: China has collected information related to geographical names and the nomenclature of undersea features in its adjacent sea waters, and has created relevant data files in preparation for the examination and determination of disputed names of certain undersea features.

5. Computer-aided Compilation and Publication System for Bathymetric Charts: China has implemented a computer-aided compilation and publication system for bathymetric charts, based on commercial software such as Arc/View, Arc/Info, MapInfo, CorelDraw, etc. This advanced system offers a standard, precise, and rapid means of producing bathymetric charts.

Progress of the IBCWP Project in other Member States

Russia is responsible for subregion 1. Twelve initial 1:500,000 plotting sheets have been prepared for use in constructing three 1:1,000,000 sheets, namely 1-12, 1-13, and 1-14. According to Valeriy Fomchenko, these sheets have been conveyed to the Chief Editor for review. Four 1:500,000 plotting sheets are currently in preparation for sheet 1-11. Technical targets are being developed for the preparation of 1:500,000 sheets for the construction of sheet 1-10.

Japan is responsible for subregion 2. Eight 1:1,000,000 bathymetric charts in the Japanese EEZ have been compiled and published. Sheet 2-11 is currently being compiled.
The Republic of Korea is a participant in the subregion 2, using data collected from 1998 to 2003 to construct maps that cover the west coast of Korea.

The Philippines and Vietnam are participants in the subregion 3. The Philippines is currently undertaking multi-beam surveys of its eastern and western EEZs. Vietnam is continuing to compile information for sheet 3-6, with new bathymetric data from the Bacbo Gulf

and in the northern area of the Bien Dong Sea. Twenty different bathymetric data sources collected to date in Vietnamese waters covered by sheet 3.6 have been evaluated. Six draft 1:500,000 sheets for sheet 3-6 have been compiled and plotted. Work on sheet 3-6 is continuing in 2003.

Australia is responsible for subregion 4, and has made progress. A gridded data set of bathymetry and onshore topography covering all of subregion 4 was released last year. From this data set, all the 1:1,000,000 contour maps of the subregion can be generated easily, with the requisite contour levels and colour schemes.

It is understood that Malaysia is compiling sheets 3-16 and 3-17 in accordance with the IBCWP specifications.

A lack of funds is preventing the active participation of New Zealand in the project for the present and the foreseeable future. New Zealand data is available for inclusion in IBCWP, but any special compilation would have to carry by others in the IBCWP project team.

Future Development Plan of the IBCWP project

1. To guarantee the accuracy and quality of the compilation sheets, the Responsible Countries and the Member States should strengthen their cooperation. Comprehensive analysis and data exchange should be conducted in bathymetric data, depth contour data, graphic shapes, and trends, etc., so that the Member States have a common understanding on the seafloor topography expressed by depth contours.

2. In order to speed up progress, the Responsible Countries and Member States should promote exchanges of data and information by means of the Internet.

3. Systems for collecting and processing multi-beam data should be mobilized throughout the project region.

4. Coastline and terrestrial contour data should be extracted and updated from information shown on 1:250,000 to 1:500,000 maps in subregions 2 and 3.

The following statements were made in response to several direct questions:

1. The publication date of the first IBCWP sheet is not known, however it has been submitted to the Chief Editor for review.

2. The IOC Assembly could reach no consensus concerning the proposal to divide the project area into two parts. The matter was referred to the next session of the Editorial Board (EB) for resolution.

3. The report of the last EB meeting was published about two months ago.

4. There is at present no Chairman of the Editorial Board. The Chief Editor is Hou Wenfeng.

5. Indonesia is not at present a member of the EB, however the country should be invited to join.

4.7 INTERNATIONAL BATHYMETRIC CHART OF THE ARCTIC OCEAN (IBCAO) (Ron Macnab)

The project to develop IBCAO (International Bathymetric Chart of the Arctic Ocean) was initiated in late 1997, when an international team began to assemble and merge all available bathymetric information from the polar region in order to create an improved representation of the Arctic seabed. About 1.7 million original data points were gathered in digital form, along with 2 million node points that defined selected isobaths extracted from existing contour maps and navigational charts.

By early 2000, a preliminary map and digital grid were placed in public circulation for review and comment; this resulted in several corrections to the map, as well as improvements to the data base through the incorporation of new observations in areas where coverage was sparse or of poor quality. Following these refinements, the revised map and grid were posted on the project website from where they could be easily downloaded; both products have received widespread acceptance from a broad cross- section of users who apply the information in a variety of mapmaking and research activities.

Two meetings of the Editorial Board have been held since the last CGOM meeting in St. Petersburg. The first meeting was held in Durham NH, and among other topics, it considered how best to package and distribute IBCAO; it was decided to print a map with the same cartographic parameters as GEBCO Sheet 5.17, which was published in 1979 by the Canadian Hydrographic Service. Accordingly, this map was constructed in 2002 from an updated grid, and presented to the Editorial Board at its second meeting in October 2002 in Honolulu, HI, USA. This new map is more detailed and accurate than the GEBCO map - which is hardly surprising in view of the paucity of information that was available to the builders of the earlier product.

Data control for the new map is available as a set of colour-coded plots that show the locations and sources of data points. Other parameters such as gravity and magnetic anomalies, physiographic provinces of the seafloor, and limits of regional seas, have been overlaid on the basic bathymetry.

The draft IBCAO map is scheduled for printing later this year. In the meantime, it is being offered as a prototype for the next generation of world bathymetric maps issued by GEBCO.

For more information, visit the IBCAO Homepage at:

http://www.ngdc.noaa.gov/mgg/bathymetry/arctic/

4.8 INTERNATIONAL BATHYMETRIC CHART OF THE SOUTH-EAST PACIFIC (IBCSEP) (Emilio Boassi)

The first meeting of IBCSEP took place 4-5October 2001 in Valparaiso, Chile. It was recognized that the current sheet scheme covers only part of the Southeast Pacific, however for

the time being it was considered preferable not to change the layout that had been agreed to, and which would be presented to CGOM for consideration of the project's western limit.

Chile, Colombia, Ecuador, and Peru are working to a timetable that has a two-year horizon, with the objective of showing results at the second IBCSEP meeting (4-5 November 2003, Lima, Peru).

As agreed at the first meeting in 2002, Ms Pilar Ortiz of Chile attended a training course at NGDC in Boulder CO, USA, to learn about the construction of bathymetric charts. Financial support was provided by the cooperating institutions and IOC. It was agreed that at least one person would be so trained every year.

At present, Chile can show a preliminary version of IBCSEP sheet number 6.

4.9 INTERNATIONAL GEOLOGICAL/GEOPHYSICAL ATALSES OF THE ATLANTIC AND PACIFIC OCEANS (GAPA) (Desmond Scott in the absence of Gleb Udintsev)

GAPA has been in production for about 20 years, the delay caused mainly by a lack of funding in Rubles. External funding has been obtained recently from various foundations, i.e. the Margaret Kendrick Blodgett Foundation, NIED (Japan), Tokai University, and the Alfred Wegener Institute. Many draft maps are now out of date, and will need extensive revision. Ninety-five percent of the material has been submitted to HDNO, which has agreed to print 250 copies of the atlas. One problem that remains to be resolved is the identification of funding to pay for distribution.

4.10 INTERNATIONAL BATHYMETRIC CHART OF THE SOUTH OCEAN (IBCSO) (Hans Werner Schenke)

At the last GEBCO meeting in Durham NH, an informal proposal was tabled for the development of an Antarctic bathymetric map along lines similar to IBCAO. This was immediately accepted by several participants, who formed an interim working group and held a short discussion where it was decided to seek endorsement for the proposed activity from IHO, IOC, and SCAR.

Accordingly, a proposal document was prepared and presented at a subsequent meeting of SCAR, where it was warmly received with offers of assistance in providing information, particularly the Antarctic coastline. At the same time, Alfred Wegener Institute for Polar and Marine Research (AWI), Germany proved to be very supportive, assigning one research associate and one student to assist with the development of a database.

Dr Schenke reviewed previous work in the area, and listed potential sources of data. He also reported on the favourable outcome of an Antarctic discussion session that followed the last IBCAO meeting in Honolulu. A website is now under construction to serve as a central point of communication for participants who wish to contribute data and to obtain information concerning the status of the project. He acknowledged Chile's stated readiness to provide data, and the offer from HDNO to provide 16 charts.

5. HARMONIZATION OF TERMS OF REFERENCE AND SPECIFICATIONS OF IBCS

Michel Huet introduced this item by providing a short history. Following the meeting in St. Petersburg, proposed specifications were distributed to all IBC chairmen, however only one response was received. As it was intended to release a new edition of the GEBCO Guidelines (IHO B-7) in the very near future, feedback from CGOM was necessary to ensure that there was agreement concerning the contents of Annex II. David Divins pointed out that the specifications were largely a reflection of cartographic considerations, and suggested that the specifications include reference to the digital techniques that are becoming more widespread. He also recommended that contour lines are needed on the continental shelf in order to better portray shallow water features.

After some discussion, it was agreed that Michel Huet and David Divins together would draft a set of revisions, which was duly presented at a later time: new contour intervals were specified in Paragraphs A, B, and C of Section 403, and a new Section 600 was written to cover the handling of digital data. The revised specifications were then adopted.

6. DIGITIZATION OF IBCS AND INCLUSION IN THE GEBCO DIGITAL ATLAS (GDA)

After brief discussion, it was agreed that Editors would be asked to ensure that individual sheets be digitised for inclusion in future editions of the GDA.

7. PRIORITIES IMPOSED BY SCOR WORKING GROUP 107

The priorities listed at the conclusion of the SCOR WG report were reviewed and received unanimous approval. A recommendation to that effect was drafted.

8. TEMA AND CAPACITY BUILDING IN OCEAN MAPPING

The Group discussed the necessity to increase training activities in bathymetry in developing countries using facilities of Hydrographic Offices Member States of IOC and also National Geophysical Data Centre NOAA USA, following the example of France which had offered one-month training in the “Etablissement Principal” of PSHOM for two cartographers in from Madagascar and NGDC offered training in marine cartography for members of Editorial Boards of IBCCA and IBCESP in 2002 and 2003 respectively.

9. SALES AND PUBLICITY

Desmond Scott described his role as an agent for the marketing of GEBCO and IBC printed material. In light of his imminent retirement, he has examined alternative arrangements for the marketing and distribution of these products. To this end, he has been corresponding with a prospective commercial organisation that has expressed a willingness to take over this function. He tabled an exchange of correspondence to that effect, and stated his intention to continue negotiations with this particular organisation.

On the subject of publicity, Sir Anthony Laughton pointed to the very positive impact of the GEBCO displays at last year’s Fall Meeting of the AGU in San Francisco, and at this year’s

joint AGU/EUG/EGS Conference in Nice, stating that the SCDB will seek additional avenues for promoting the GDA.

10. THE BIENNIAL REPORT OF CGOM TO THE 22ND SESSION OF THE IOC ASSEMBLY (COVERING THE PERIOD FROM APRIL 2001 TO APRIL 2003)

Dmitri Travin circulated a draft report, asking members to review it and to supply corrections and insertions as needed.

It was noted that the 22nd Assembly had a reduced agenda, and that Ocean Mapping was not specifically mentioned: Ocean Mapping will be considered as a service and not a scientific component of IOC's programme. It was also pointed out that new projects may be initiated with the interim approval of the IOC Executive Secretary, contingent upon full approval from the. Assembly

11. OTHER MATTERS

No other matters.

12. DATE AND PLACE OF NEXT SESSION

Two options were mentioned: (i) explore the possibility of convening again in Monaco in two years; (ii) investigate the feasibility of holding the meeting in Bremerhaven, Germany, as an alternative to Monaco. Hans Werner Schenke indicated that AWI would probably look with favour upon the latter option.

13. ADOPTION OF THE SUMMARY REPORT AND RECOMMENDATIONS

The Group adopted the Recommendations included as Annex II.

14. CLOSURE OF THE SESSION

The Chairman closed the Session at 17:30 on 13 April 2003. He tanked the President of IHB and his staff for hosting the 9th session of CGOM.

ANNEX I

AGENDA

1. OPENING OF THE SESSION

2. ADOPTION OF THE AGENDA AND ELECTION OF THE RAPPORTEUR

3. CONDUCT OF THE SESSION; DOCUMENTATION

4. PROGRESS MADE AND PLANNED FUTURE DEVELOPMENTS IN OCEAN MAPPING, INCLUDING FINANCING

4.1	GEBCO	Anthony LAUGHTON
4.2	IBCM	Carlo MORELLI
4.3	IBCCA	Joe FRIAS
4.4	IBCEA	André ROUBERTOU
4.5	IBCWIO	Werner BETTAC
4.6	IBCWP	SHI Suixiang
4.7	IBCAO	Ron MACNAB
4.8	IBCSEP	Emilio BOASSI
4.9	GAPA	Desmond SCOTT
4.10	IBCSO	Hans Werner SCHENKE

5. HARMONIZATION OF TERMS OF REFERENCE AND SPECIFICATIONS OF IBCS

6. DIGITIZATION OF IBCS AND INCLUSION IN THE GEBCO DIGITAL ATLAS (GDA)

7. PRIORITIES IMPOSED BY SCOR WORKING GROUP 107

8. TEMA AND CAPACITY BUILDING IN OCEAN MAPPING

9. SALES AND PUBLICITY

10. THE BIENNIAL REPORT OF CGOM TO THE 22ND SESSION OF THE IOC ASSEMBLY (COVERING THE PERIOD FROM APRIL 01 TO APRIL 03)

11. OTHER MATTERS

12. DATE AND PLACE OF NEXT SESSION

13. ADOPTION OF THE SUMMARY REPORT AND RECOMMENDATIONS

14. CLOSURE OF THE SESSION

ANNEX II

RECOMMENDATIONS

The Consultative Group on Ocean Mapping (CGOM), at its 9th Session,

Recommends:

1. because of an increased demand, to continue paying high attention to the construction of marine geological/geophysical overlay sheets not only for the Mediterranean Sea, but also the Caribbean where first discussions on this subject have taken place. The other IBC Editorial Boards are encouraged to also consider this matter at their forthcoming meetings

2. to invite Indonesia to appoint an expert to the International Bathymetric Chart of the Western Pacific (IBCWP) Editorial Board who should pay attention to Sub-region 3;

3. to hold a Planning Meeting in mid-2004 to prepare for the establishment of an Editorial Board for an IBC of the Southern Ocean (Terms of Reference, membership, other):

4. that all IBC projects: (i) produce a digital grid, with grid spacing appreciably finer than the GEBCO one-minute grid, from the original compilation materials (soundings and contours); (ii) digitise all contours generated by the project as well as the 500 metre contour intervals; (iii) preserve the original digital soundings in an appropriate database, such as the IHO DCDB(Data Centre for Digital Bathymetry).

5. to continue to give high support to financing training activities related to Ocean Mapping.

Adopts:

the Specifications for IBC, produced under IOC regional Ocean Mapping projects, as laid down in Annex 2 of the new Guidelines for the GEBCO (IHO Publication B-7), updated in April 2003, with minor corrections/amendments.

Strongly endorses:

the six principal priorities as proposed by SCOR Working Group 107 in its final report called Improved Global Bathymetry, issued in 2002:

Priority 1: Ships by voluntary means. Turn equipment on to generate data (all too often expensive echo-sounding equipment is not turned on, thus wasting the potential to acquire the data-a penny wise/pound foolish approach to scientific management)

Priority 2: Digitise the data that are presently available, and send new data automatically and in digital form to data centre

Priority 3: Begin serious investment in data rescue (data archaeology)

Priority 4: Encourage cruises to fill the substantial gaps that exist especially in the South Pacific, South Atlantic, Southern and Arctic Oceans, in the Arabian Sea, in the back-arc

basin between China and Kamchatka, and in places in the North Atlantic and the North Pacific (e.g. between Hawaii and North America)

Priority 5: Use new technology (e.g. drifting floats and autonomous marine vehicles) to gather new data from large data gaps

Priority 6: Investigate the possibility of acquiring data from commercial ships by voluntary means

RECOMMANDATIONS

Le Groupe consultatif de la COI sur la cartographie des océans (CGOM), réuni à sa neuvième session,

Recommande :

1. vu l'augmentation de la demande, de continuer à s'occuper activement de l'établissement de cartes géologiques/géophysiques marines superposables non seulement pour la mer Méditerranée mais aussi pour les Caraïbes, là où ont eu lieu les premières discussions sur cette question. Les autres comités de rédaction des IBC sont encouragés à examiner également cette question à leurs prochaines réunions ;

2. d'inviter l'Indonésie à nommer un expert au Comité de rédaction de la Carte bathymétrique internationale du Pacifique occidental (IBCWP), chargé de s'occuper de la sous-région 3 ;

3. de tenir une réunion de planification au milieu de l'année 2004 pour préparer la création d'un comité de rédaction chargé d'élaborer une IBC de l'océan Austral (mandat, composition, etc.) ;

4. que tous les projets d'IBC prévoient : (i) la production, à partir des éléments initialement recueillis (sondages et courbes de niveau) d'un quadrillage numérique à résolution nettement plus fine que la graduation en minutes utilisée par la GEBCO ; (ii) la numérisation de toutes les courbes de niveau produites dans le cadre du projet ainsi que des courbes de niveau équidistantes de 500 mètres ; (iii) la conservation des sondages numériques initiaux dans une base de données appropriée, par exemple le DCDB (Centre de données pour la bathymétrie numérique) de l'OHI ;

5. de continuer à contribuer activement au financement d'activités de formation relatives à la cartographie des océans.

Adopte :

les Spécifications des IBC produites dans le cadre des projets régionaux de cartographie des océans de la COI, telles qu'elles figurent à l'annexe 2 des nouvelles Directives relatives à la GEBCO (publication B-7 de l'OHI), mises à jour en avril 2003, avec des corrections et modifications mineures.

Appuie résolument :

les six priorités principales proposées par le Groupe de travail 107 du SCOR sur l'amélioration de la bathymétrie mondiale dans son rapport final paru en 2002 :

Priorité 1 : Développer l'utilisation de navires d'observation bénévoles. Exploiter le matériel pour produire des données (trop souvent, des matériels coûteux d'échosondage ne sont pas exploités, ce qui nuit à la capacité d'acquérir des données ; cette approche de la gestion scientifique, sous couvert d'économie, se révèle en fait très coûteuse)

Priorité 2 : Numériser les données actuellement disponibles et envoyer automatiquement les nouvelles sous une forme numérique à un centre de données

Priorité 3 : Entreprendre des recherches approfondies sur la sauvegarde des données (archéologie des données)

Priorité 4 : Encourager les campagnes océanographiques à combler les lacunes importantes qui existent notamment dans le Pacifique Sud, l'Atlantique Sud, les océans Austral et Arctique, la mer d'Arabie, le bassin d'arrière-arc entre la Chine et le Kamchatka, et dans certaines parties de l'Atlantique Nord et du Pacifique Nord (par exemple, entre Hawaii et l'Amérique du Nord)

Priorité 5 : Utiliser les nouvelles technologies (balises dérivantes et véhicules marins autonomes, par exemple) pour recueillir de nouvelles données là où celles-ci font grandement défaut

Priorité 6 : Etudier la possibilité d'acquérir des données auprès de navires commerciaux de façon bénévole.

RECOMENDACIONES

El Grupo Asesor sobre Cartografía Oceánica (CGOM), en su novena reunión,

Recomienda:

1. debido al aumento de la demanda, que se siga prestando suma atención a la construcción de las hojas superponibles de geología y geofísica marinas, no sólo del Mar Mediterráneo, sino también del Caribe, donde han tenido lugar los primeros debates al respecto. Se exhorta a los demás Comités Editoriales del IBC a examinar también este asunto en sus próximas reuniones;

2. invitar a Indonesia a que designe un experto para el Comité Editorial del Mapa Batimétrico Internacional del Pacífico Occidental (IBCWP), que debe ocuparse de la Subregión 3;

3. celebrar una reunión de planificación a mediados de 2004, con el fin de preparar la creación del Comité Editorial de un IBC del Océano Austral (mandato, composición y otros aspectos);

4. que todos los proyectos de IBC: i) generen una cuadrícula numérica, con un área de cuadrícula considerablemente más pequeña que las de un minuto usadas en el GEBCO, a partir de los materiales originales compilados (sondeos y contornos); ii) numericen todos los contornos generados por el proyecto, así como los intervalos de 500 metros de los contornos; iii) conserven los sondeos numéricos originales en una base de datos adecuada, como el Centro de Datos para Batimetría Digital (DCDB) de la OHI;

5. sigan prestando el máximo apoyo a la financiación de las actividades de formación vinculadas con la Cartografía Oceánica.

Aprueba:

las especificaciones para el IBC, producidas en el marco de los proyectos de Cartografía Oceánica Regional de la COI, expuestas en el Anexo 2 de las nuevas Directrices del GEBCO (Publicación B-7 de la OHI), actualizadas en abril de 2003, con correcciones y enmiendas menores.

Apoya enérgicamente:

las seis prioridades principales propuestas por el Grupo de Trabajo 107 del SCOR, en su informe final titulado Batimetría Mundial Mejorada, publicado en 2002:

Prioridad 1: Lograr que los barcos, de manera voluntaria, pongan en marcha sus equipos para obtener datos (con harta frecuencia los equipos de sonar, cuya adquisición es costosa, no se ponen en funcionamiento, con lo que se desperdicia la posibilidad de acumular datos; un enfoque erróneo de gestión científica, que ahorra donde no debe);

Prioridad 2: Numerizar los datos disponibles actualmente, y remitir los nuevos datos de manera automática y en forma numérica a los centros de datos;

Prioridad 3: Iniciar inversiones importantes en materia de recuperación de datos (arqueología de datos)

Prioridad 4: Favorecer el envío de expediciones para colmar las lagunas existentes, en particular en el Pacífico Sur, el Atlántico Sur, los Océanos Ártico y Austral, el Mar Arábigo, en la cuenca del arco de isla entre China y Kamchatka y en puntos del Atlántico Norte y el Pacífico Norte (por ejemplo, entre Hawai y América del Norte)

Prioridad 5: Usar la nueva tecnología (por ejemplo, las boyas de deriva y los vehículos marinos autónomos) para compilar nuevos datos y colmar lagunas de la información

Prioridad 6: Investigar la posibilidad de que buques comerciales compilen y ofrezcan voluntariamente los datos.

РЕКОМЕНДАЦИИ

Консультативная группа по картированию океана (КГКМ) на своей 9-й сессии

рекомендует:

1. в связи с возросшим спросом продолжать уделять повышенное внимание составлению морских геологических/геофизических наложенных контурных листов не только для Средиземного моря, но также для Карибского бассейна, где впервые возникли дискуссии по этой теме; редакционные советы по другим международным батиметрическим картам (МБК) призваны также рассмотреть этот вопрос на своих предстоящих совещаниях;

2. предложить Индонезии назначить эксперта в Редакционный совет Международной батиметрической карты западной части Тихого океана (МБКЗТО), который должен уделять внимание субрегиону 3;

3. провести в середине 2004 г. совещание по вопросам планирования для подготовки к созданию Редакционного совета МБК Южного океана (включая круг ведения, членский состав и пр.);

4. в рамках всех проектов МБК (i) разрабатывать цифровую сетку с существенно меньшей плотностью, нежели в сетке ГЕБКО с шагом в одну минуту, на основе оригинальных компиляций материалов (эхолотного зондирования и контуров); (ii) проводить оцифровывание всех контуров, разрабатываемых в рамках конкретного проекта, также на основе контурных интервалов в 500 метров; (iii) обеспечивать сохранение оригинальных цифровых эхолотных показателей в надлежащей базе данных, в частности в МГО/ЦДЦБ (Центре данных по цифровой батиметрии);

5. продолжать активно содействовать финансированию мероприятий по подготовке специалистов, связанных с картированием океана;

утверждает:

разработанные в рамках региональных проектов МОК по картированию океанов спецификации для МБК, изложенные в Приложении 2 новых Руководящих принципов для ГЕБКО (публикация B-7) МГО, которые были обновлены в апреле 2003 г., с незначительными корректировками/изменениями;

решительно поддерживает:

шесть нижеперечисленных главных приоритетов, предложенных Рабочей группой СКОР 107 в ее заключительном докладе «Совершенствование глобальной батиметрии», выпущенном в 2002 г.:

приоритет 1: необходимо приводить в действие оборудование на добровольных судах наблюдения для выработки данных (слишком часто дорогостоящее эхолокационное оборудование бездействует, свидетельствуя о нерачительном отношении к потенциалу для сбора данных по принципу экономии на мелочах и расточительства в главном при управлении научной деятельностью);

приоритет 2: следует оцифровывать имеющиеся в настоящее время данные и отправлять новые данные в автоматическом режиме и в цифровой форме в соответствующий центр данных;

приоритет 3: нужно приступить к инвестированию значительных средств для мероприятий по спасению данных (археологии данных);

приоритет 4: надлежит добиваться того, чтобы в ходе экспедиций восполнялись существенные пробелы в данных, которые имеются, в частности, по южной части Тихого океана, Южной Атлантике и Северному Ледовитому океану, Аравийскому морю, дугообразному бассейну между Китаем и Камчаткой и отдельным районам Северной Атлантики и северной части Тихого океана (например, между Гавайями и Северной Америкой);

приоритет 5: необходимо использовать новые технологии (например дрейфующие буи и морские самоходные устройства) для сбора новых данных в районах, по которым ощущается их серьезный дефицит;

приоритет 6: следует изучить возможность получения данных от торговых судов с помощью систем добровольного наблюдения.

ANNEX III

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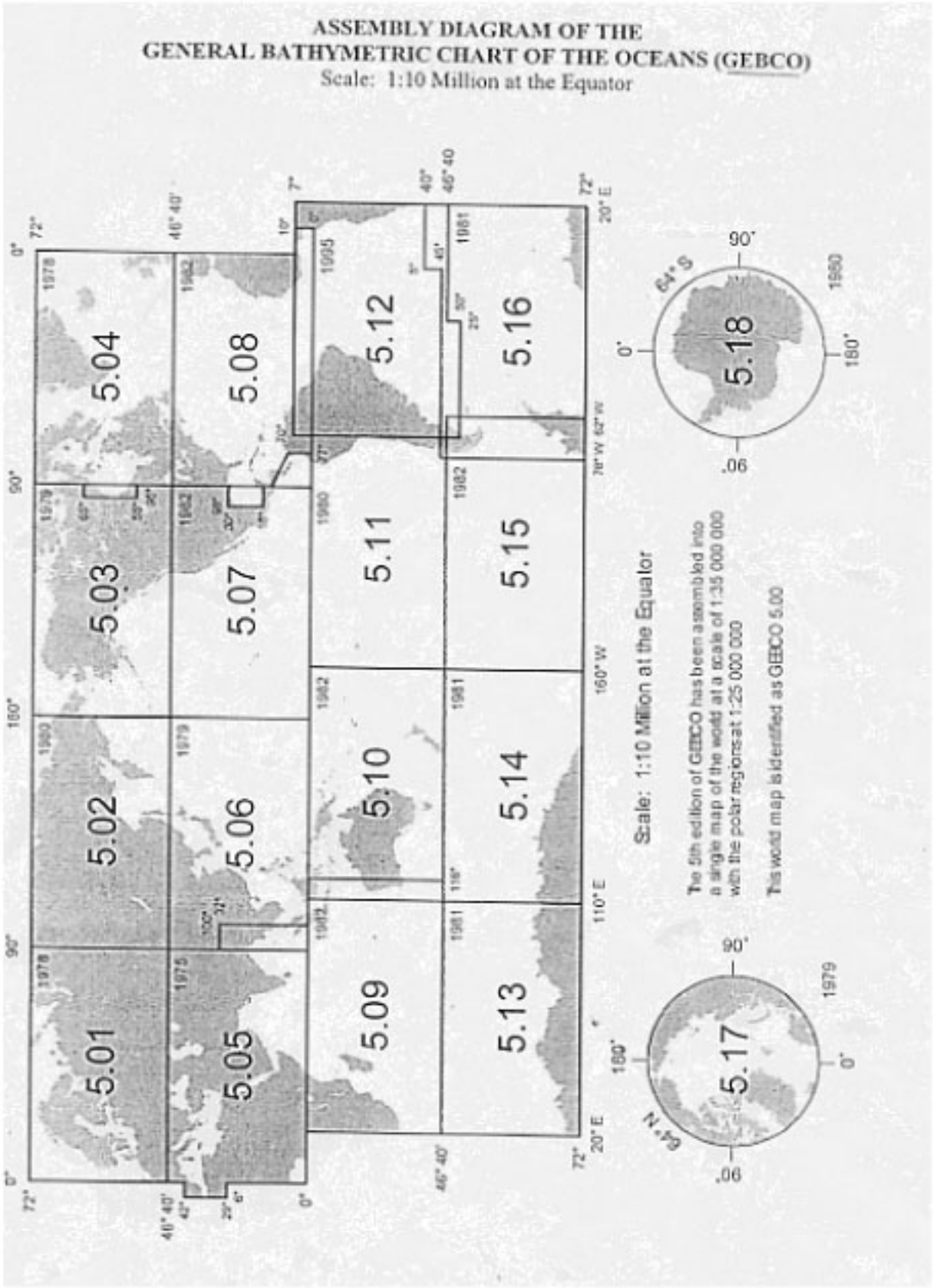
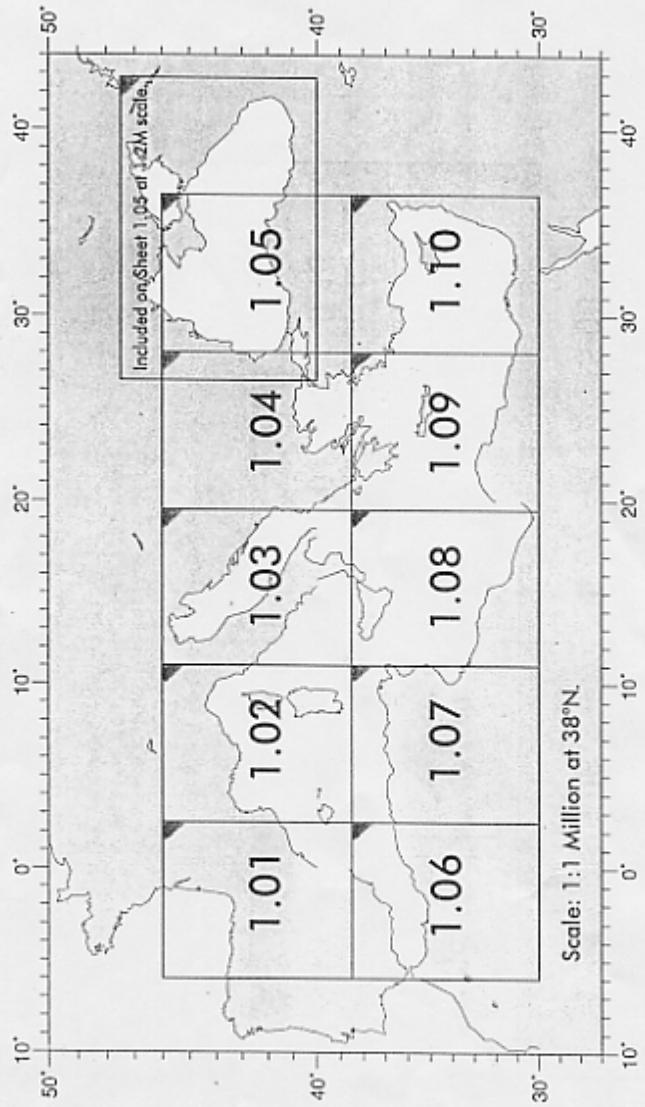
ANNEX IV

ASSEMBLY DIAGRAMS OF BATHYMETRIC CHARTS



ASSEMBLY DIAGRAM OF THE INTERNATIONAL BATHYMETRIC CHART OF THE MEDITERRANEAN (IBCM)

Scale 1:1 Million at 38°N

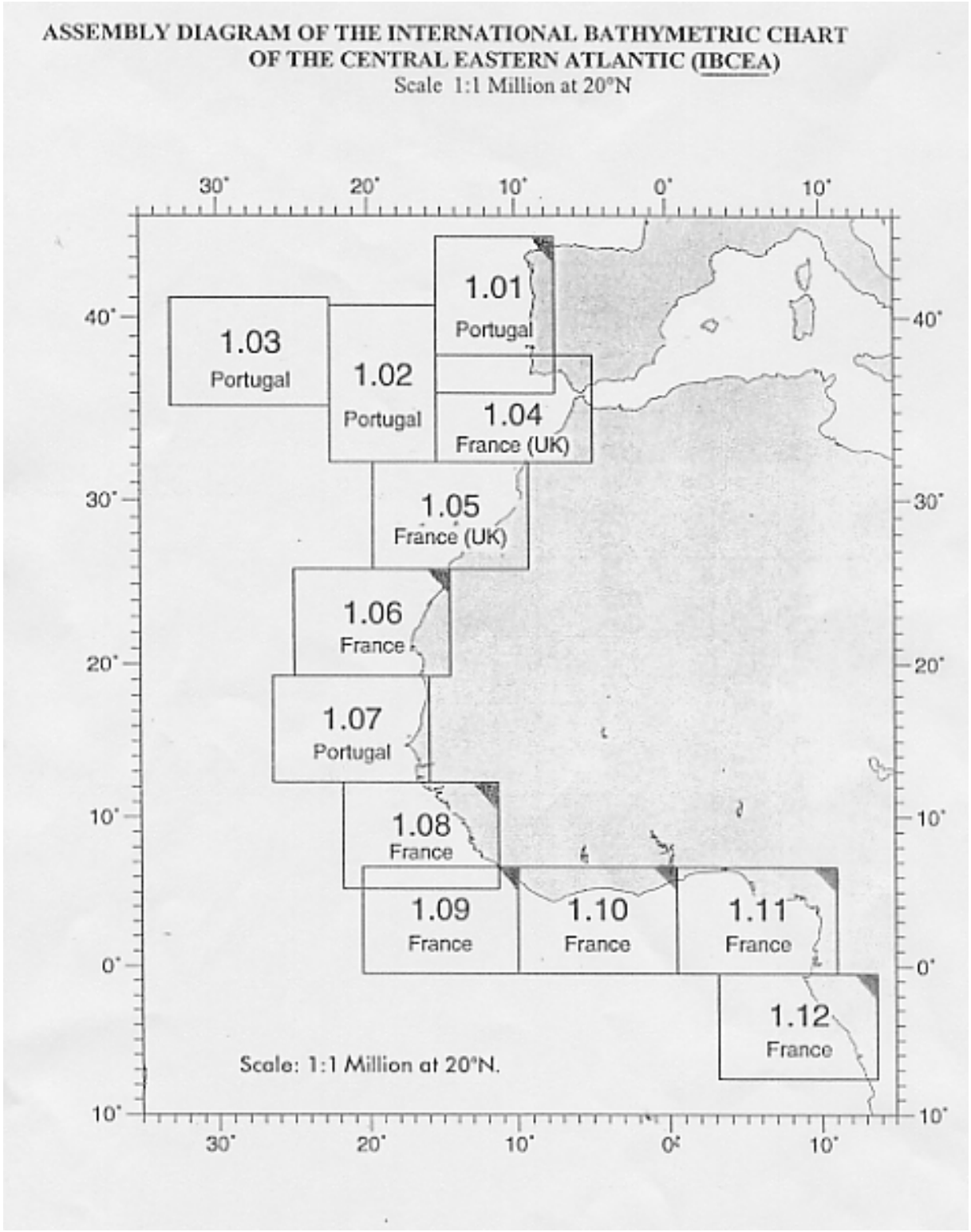


The Geological/Geophysical Series (so-called 'Overlay Sheets') comprises:

Bouguer Gravity Anomalies (IBCM-G), Seismicity (-S), Thickness of Plio-Quaternary Sediments (IBCM-PQ), Unconsolidated Bottom Surface Sediments (IBCM-Sed), Magnetic Anomalies (IBCM-M), all at same scale.

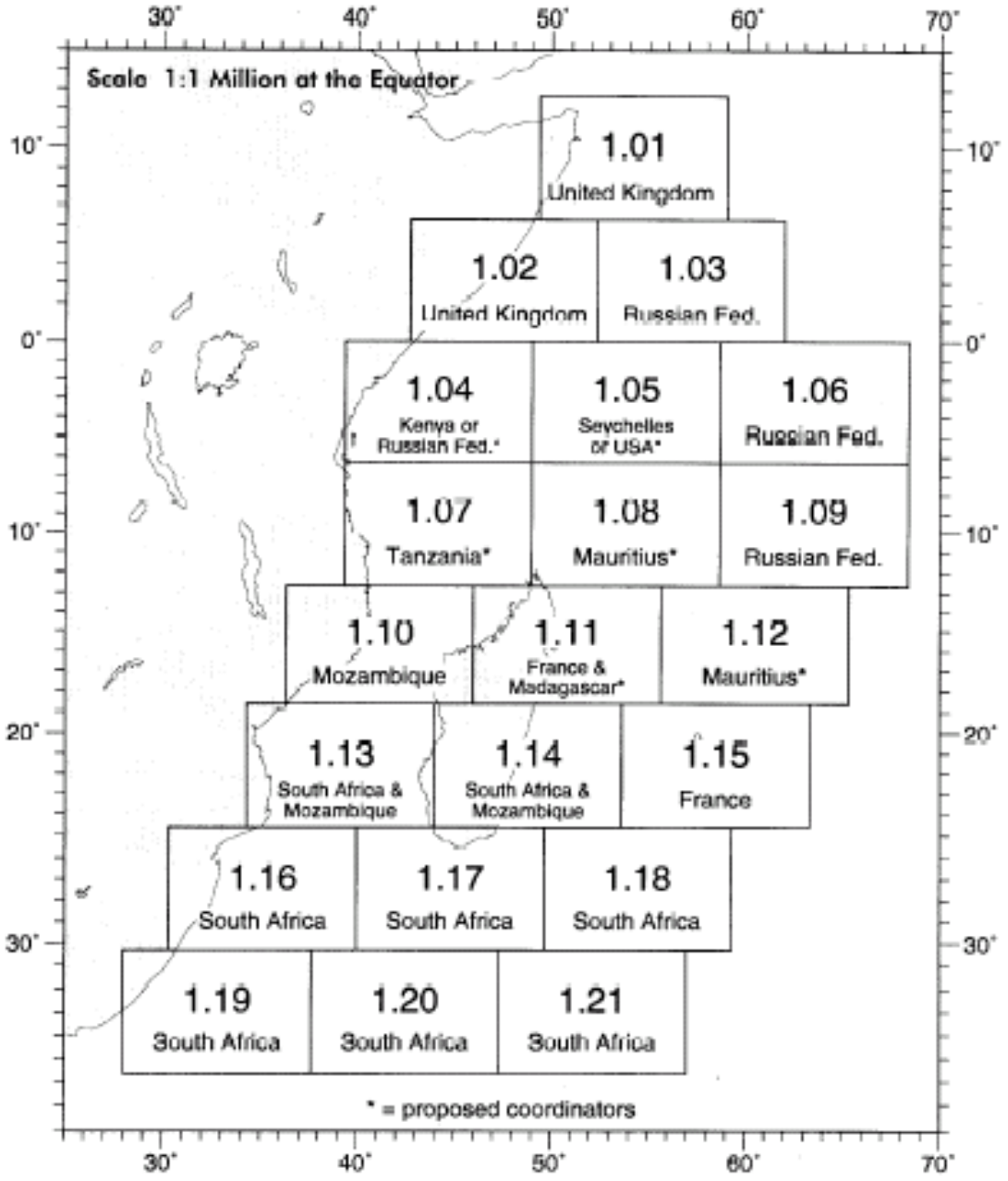
ASSEMBLY DIAGRAM OF THE INTERNATIONAL BATHYMETRIC CHART OF THE CENTRAL EASTERN ATLANTIC (IBCEA)

Scale 1:1 Million at 20°N

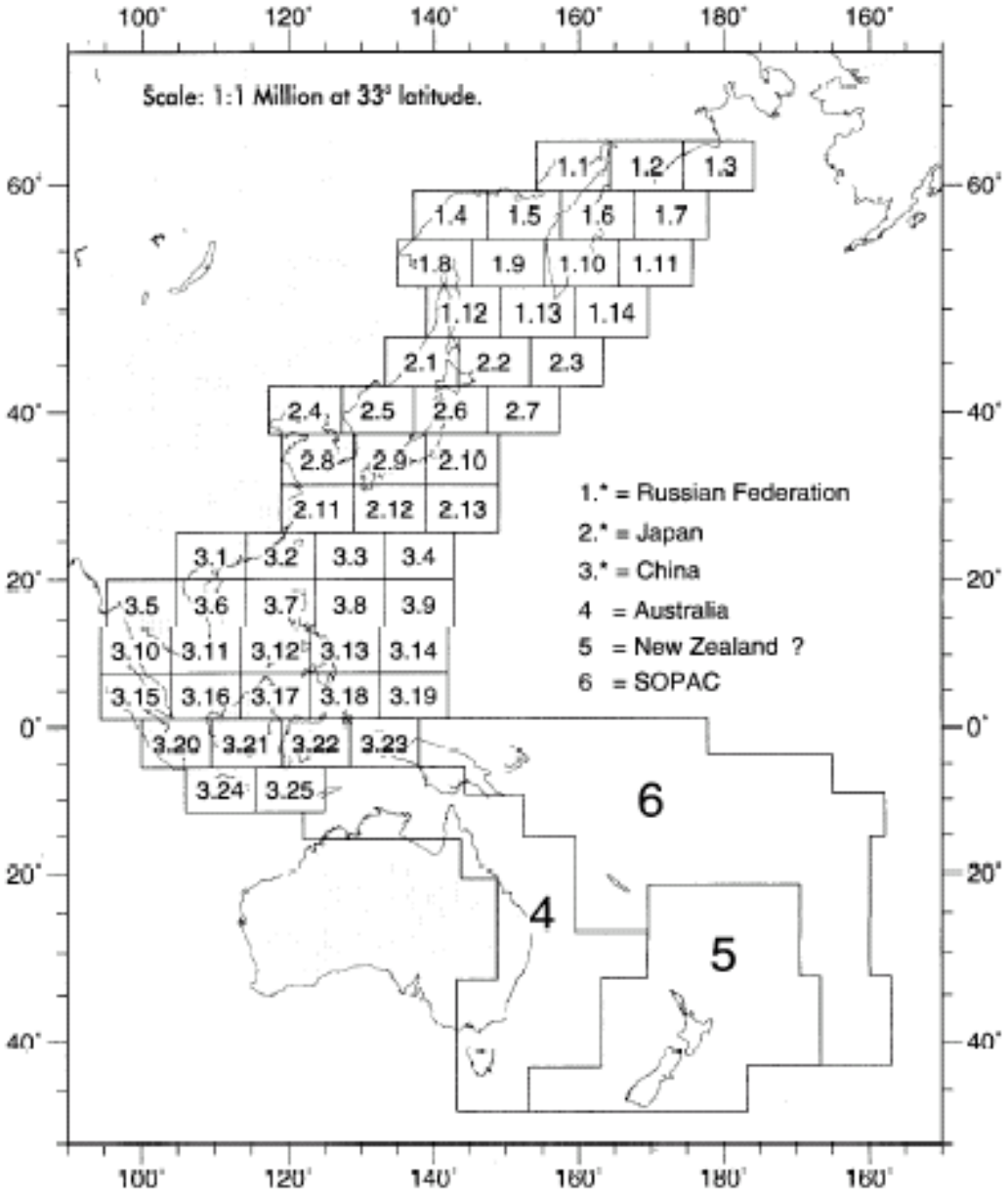


ASSEMBLY DIAGRAM OF THE INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN INDIAN OCEAN

Scale 1:1 Million at the Equator



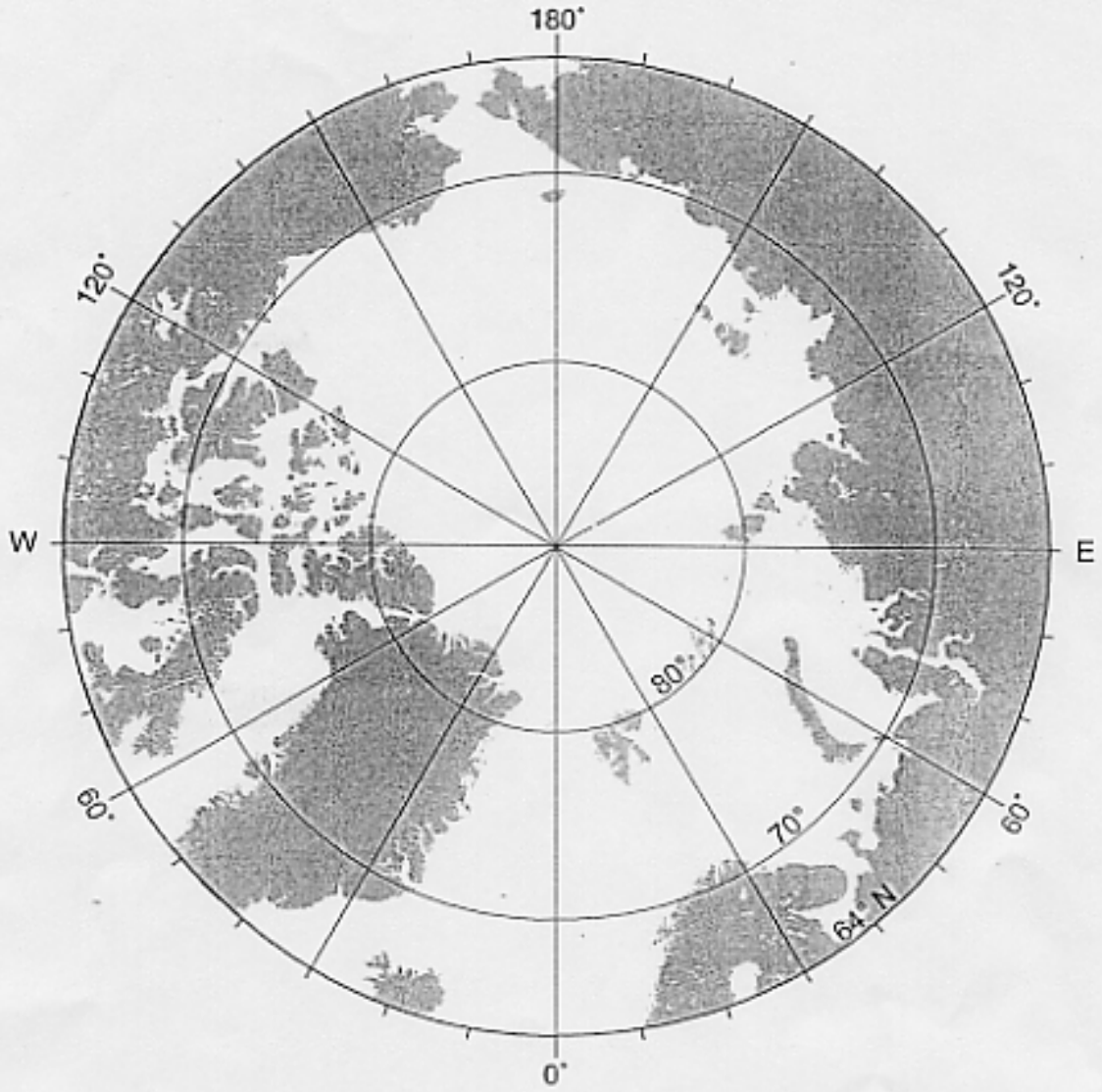
ASSEMBLY DIAGRAM OF THE INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN PACIFIC
Scale 1:1 Million at 33° latitude



THE AREA OF THE INTERNATIONAL BATHYMETRIC CHART
OF THE ARCTIC OCEAN (IBCAO)

covered by 4 sheets at 1 : 2.5 mio scale

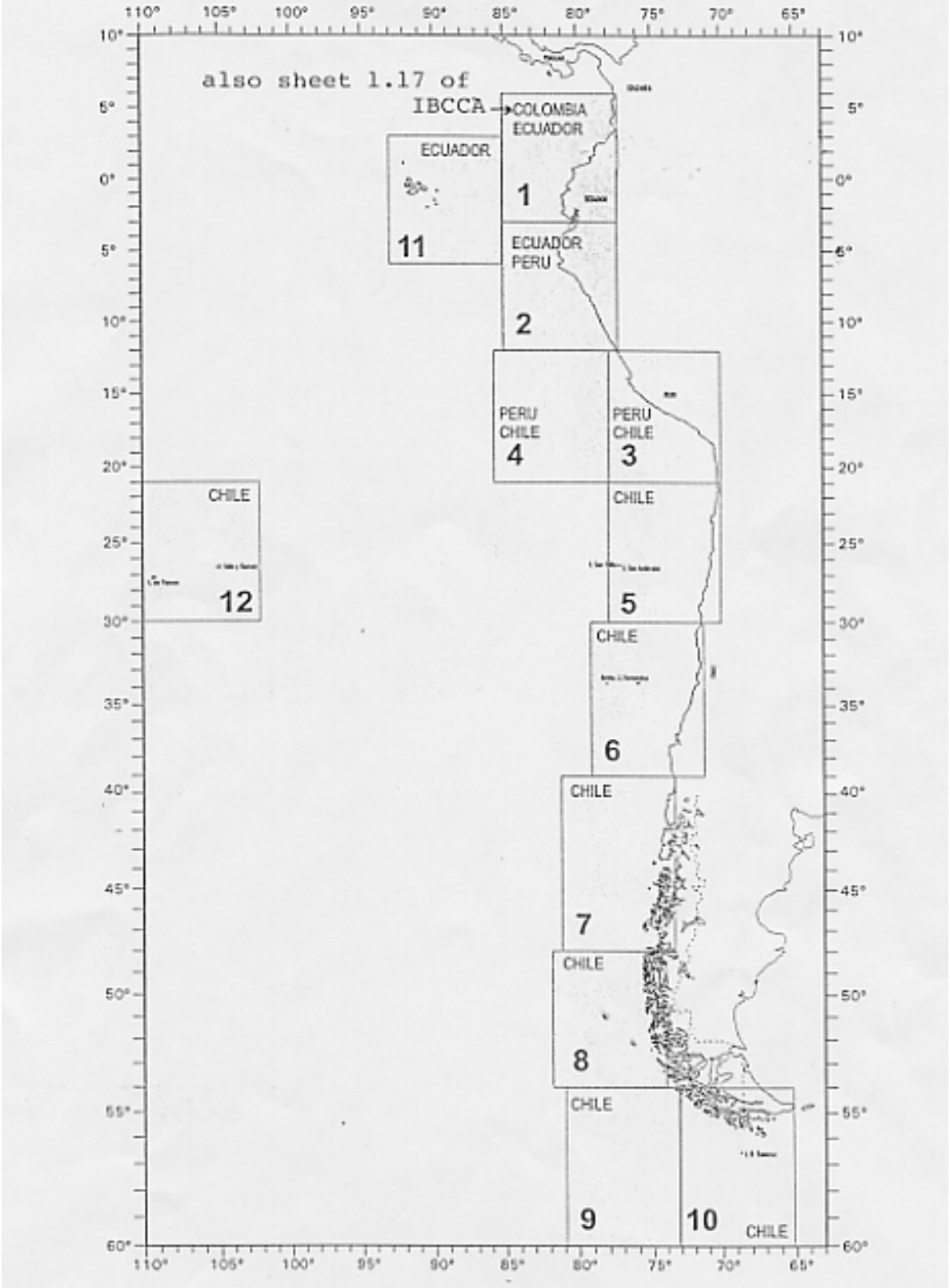
(provisional presentation)



ASSEMBLY DIAGRAM OF THE INT.BATHYM.CHART
OF THE SOUTH EAST PACIFIC:

ESQUEMA CARTOGRAFICO TENTATIVO DE LA CARTA BATIMETRICA INTERNACIONAL DEL PACIFICO SUDESTE (IBCSEP)

(AREAS DE RESPONSABILIDAD)



ANNEX V

IHB File No. S3/2620

CIRCULAR LETTER 27/2004
23 April 2004

IHO/IOC GEBCO Information

Dear Hydrographer,

This Circular Letter is to keep you informed on the progress of several activities concerning the IHO/IOC GEBCO Project.

a) Nippon Foundation – GEBCO Training Project:

- A GEBCO's Teaching Organisation Evaluation Group (TOEG) reviewed six proposals from four countries and chose the University of New Hampshire in Durham, New Hampshire, USA, as the Training Institution that will run the Training Programme. GEBCO is now in the process of negotiating a contract with the Centre for Coastal and Ocean Mapping/Joint Hydrographic Centre of the UNH.
- GEBCO has also advertised for a Project Manager, and the selection process is underway.
- IHB completed the first phase of the students' selection process by inviting Member States through IHO Circular Letter 10/2004, to provide CVs of their candidates. The CVs so far received (12) have been forwarded to the Chairman of the IHO/IOC GEBCO Guiding Committee and to the Permanent Secretary of GEBCO for consideration by the Selection Board established to examine the applications and conduct the necessary interviews. The results will be communicated to the IHB and to the IOC Secretariat for endorsement.
- As soon as the selection process is finalized, the IHB will report back to the Hydrographic Offices that have applied, providing the name of the selected students.

ACTION: No action requested of Member States.

b) Proposal for a New IHO/IOC Ocean Mapping Programme Structure

- 2003 was an important year in the life of the GEBCO Project. The Centenary Celebrations of the Project; the release of the 3rd version of the GDA on that occasion; and the fact that there was a considerable increase in the awareness of scientists in global bathymetry.
- For more than 100 years, GEBCO has successfully met the needs of the oceanographic community and has led to a better knowledge of the world's ocean bottom relief, which is the very basis of many projects covering various aspects of oceanography.

- For the IHO and IOC, the parent organizations of GEBCO, it seems natural that both should aim to improve the existing programme to make it more efficient and to fulfil the requirements of the 21st Century.
- The IHB and IOC's Secretariats have studied the current structure of GEBCO and Ocean Mapping in general and have proposed a draft new organisational structure for the ocean mapping programme activities within the IHO and IOC which will be submitted to the Member States for their consideration and comments. So far it has been passed to the Chairman of the IOC/IHO GEBCO Guiding Committee and the Chairman of the IOC Consultative Group on Ocean Mapping, for comments.
- Taking advantage of the coming IOC Executive Council (June 2004), the IOC Consultative Group on Ocean Mapping (CGOM) will introduce this initiative and it is anticipated that the Executive Council will adopt a Resolution which invites IOC and IHO Member State representatives to express their views to the IOC Executive Secretary and to the President of the IHB Directing Committee on the proposed streamlining of the ocean mapping support mechanisms, by bringing together GEBCO and IBCs under a joint IHO/IOC Ocean Mapping Board. Both the IOC and the IHB's Secretariats will jointly prepare and submit the final text of this new co-ordinating mechanism to the respective IOC and IHO governing bodies in 2005 for their approval.
- At Annex "A" you will find a Draft Working Document, including the Proposal. Also and in Annex "B" and "C" other different structures developed, prepared and presented by some of the participants who attended the last GEBCO Guiding Committee Meeting (April 2004).

ACTION: Member States are kindly invited to provide their views and comments on this initiative to reach the IHB **by 31st October 2004.**

c) Summary of the XX IOC/IHO Joint GEBCO Guiding Committee Meeting

- The XXth meeting of the GEBCO Guiding Committee (GGC) took place from 1 – 6 April 2004, on the Island of Palmaria, Porto Venere, Italy. The meeting was hosted by Dr Mike Carron of the NATO Undersea Research Center, La Spezia, and chaired by Mr David Monahan, Chairman of the GGC. The Agenda covered the first 2 days general discussion and reports, at the weekend ad hoc groups gathered and discussed various issues and the last two days were devoted to analysis and decision making. Only 3 of the 5 IHO representatives were present. The IHB was represented by Captain H Gorziglia, Director. The meeting was attended by several members of the wider 'GEBCO Community' each acting in their own personal capacity.
- **SCUFN**:
  A new digitised format of gazetteer is under preparation to facilitate formalising the application process for new under sea features names. There has been a positive response from IHO Member States to provide new members for this sub-committee. The group was sorry to learn that Colombia had to withdraw its representative. The IHB reported that it will seek a replacement from IHO Member States.
- **GEBCO Digital Atlas**:
  The editor of the GDA reported on activities including proposals for regional atlases. The issue of cost was discussed. There were three views expressed: keep it the same, reduce the cost or issue it for free. Some considered that the income derived (£20,000) was very small within the overall context of GEBCO. Several suggested that a free product would increase the visibility and recognition of GEBCO. It can currently be downloaded for free over the Internet, but in about 180 separate blocks, which takes time. This issue will be given further thought.

- **NIPPON Foundation Project**:
  The Permanent Secretary explained the background and current status of this project. Participants were informed of the selection of the teaching institution (University of New Hampshire, Durham, USA, subject to contractual agreement) and the process to be followed for selecting students, as well as the appointment of a Project Manager. The IHB representative informed the meeting of the actions taken so far by the IHB requesting nomination of candidates. Some concern was expressed at the rushed timescale, but this was due to the requirement by the Nippon Foundation that this project should start in 2004. In addition to the University training scheme there were two other parts, work projects and fellowships. These were due to start later and there was more time available to initiate the process.
- **New Structure for Ocean Mapping:**
  The IHB and IOC representatives introduced the proposal for examining and restructuring the overall Ocean Mapping Programme, aiming to improve the current GEBCO and IBC Projects. The IHB representative stated clearly that this proposal was aimed at improving Ocean mapping, avoiding duplication and making better use of resources. Participants provided two further structures that could also constitute a suitable model for further development. It was agreed that the IHB and the IOC Secretariat would approach Member States and the Executive Council respectively seeking views and comments on the initiative to improve global Ocean Mapping Programme.
- **Work Programme:**
  The IHB stressed the need for the IHO to have a clearly defined GEBCO Work Programme to be submitted to Member States, identifying where resources and funding support were needed. The IHB requested that the final agreed Work Programme should go to IOC and IHO for consideration.
- **In conclusion,**
  There is a need to improve IHO participation in the Guiding Committee. The draft structure prepared by IHB and IOC Secretariat constitutes a good starting point to study a structure to improve the IHO/IOC ocean mapping programme as a whole. The next meeting of the GGC is expected to take place in Mexico in 2005. Full minutes of this meeting are under preparation by the GEBCO Permanent Secretary.

  ACTION: Member States are kindly invited to propose names and CVs of candidates to fill one vacant post as IHO representative on SCUFN. Documentation should reach the IHB **by 1st September 2004.**

On behalf of the Directing Committee
Yours sincerely,

Captain Hugo GORZIGLIA
Director

ANNEXES:

A: Proposal for a new organizational structure for the ocean mapping programme activities within IHO and IOC
B: Alternative diagram proposed by Mr. Ron Macnab at the GGC Meeting.
C: Alternative diagram proposed by GGC Task Group at the GGC Meeting.

ANNEX "A"

PROPOSAL FOR A NEW ORGANIZATIONAL STRUCTURE FOR THE OCEAN MAPPING PROGRAMME ACTIVITIES WITHIN IHO AND IOC

1.- INTRODUCTION

The Intergovernmental Oceanographic Commission (IOC) and the International Hydrographic Organization (IHO), being aware of the growing need for close-co-operation in activities of common interest to both Organizations and their Member States, agree among other topics, on the following:

To continue to co-operate in the development of the IOC/IHO General Bathymetric Chart of the Oceans (GEBCO), and in the development of International Bathymetric Charts (IBC) in accordance with the decisions of the International Hydrographic Conference and the IOC Assembly, and, in particular, to promote the free exchange of processed data between the two Organizations both for the production of future editions of GEBCO and IBC, and for use as a base for the preparation of various kinds of geological/geophysical, physical, chemical and biological overprint/overlay sheets;

Co-operate in the formulation of proposals for, and the execution of, technical cooperation projects having components which fall within the competence and the expertise of the respective Organizations, including advance exchange of relevant information and the formulation of other measures required to implement the projects;

To promote training, education and capacity building in all spheres of surveys mapping and charting of mutual interests by enhancing the awareness of the Member States of both Organizations to the importance of co-operation in the use of training facilities, research institutions, vessels, data, and the expertise and experience of personnel, especially to the benefit of developing States;

2.- RELEVANT OCEAN MAPPING PROGRAMME'S ORGANIZATIONS

2.1 THE INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO)

The International Hydrographic Organization (IHO) is an intergovernmental organization of a consultative and technical nature comprising over 70 Member States represented by their respective national Hydrographic Offices. IHO objectives include the coordination of the activities of national hydrographic offices; the greatest possible uniformity in nautical charts and documents; the adoption of reliable and efficient methods of carrying out and exploiting hydrographic surveys and the development of the sciences in the field of hydrography and the techniques employed in descriptive oceanography, all aiming at contributing to safety of life at sea, safety of navigation and the protection of the marine environment."

2.2 INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)

The Intergovernmental Oceanographic Commission is a body with functional autonomy within the United Nations Educational, Scientific and Cultural Organization (UNESCO).
The purpose of the Commission is to promote international cooperation and to coordinate programmes in research, services and capacity-building, in order to learn more about the nature and resources of the ocean and coastal areas and to apply that knowledge for the improvement of management, sustainable development, the protection of the marine environment, and the decision-making processes of its Member States. The Commission will collaborate with international organizations concerned with the work of the Commission
Among others, the functions of the Commission shall be to recommend, promote, plan and coordinate international ocean and coastal area programmes in research and observations and the dissemination and use of their results.

2.3 IHO DATA CENTRE for DIGITAL BATHYMETRY (IHO-DCDB)

The US National Geophysical Data Center (NGDC) on behalf of the IHO operates the IHO Data Centre for Digital Bathymetry and has agreed to provide the services indicated in **Annex A.**

3.- JOINT IOC-IHO OCEAN MAPPING DIRECTING BOARD (OMDB)

The Joint IOC-IHO Ocean Mapping Directing Board (OMDB) has the overall responsibility for fostering the GEBCO Global Project and the International Bathymetric Chart Regional Projects in conformity with resolutions adopted by IHO and IOC, proposing to its two parent organizations the policy and strategy for the preparation and dissemination of the world and regional series of contoured charts of the ocean floor and the "GEBCO Digital Atlas" (GDA). Its Terms of Reference are provided in **Annex B**.

A Structural Diagram illustrating the components of OMGC is given in the last page.

3.1 JOINT IOC-IHO GEBCO GLOBAL PROJECT

3.1.1 Background Information:

The preparation of the first world series of oceanic bathymetric charts was started in 1903, and was published one year later as the GEBCO, under the auspices of Prince Albert 1st of Monaco.

As additional data became available over the years, new editions were compiled, first by the Prince's scientific committee and later, after the Prince's death, by the International Hydrographic Bureau. The last sheet of the 4th Edition, which was printed by the Institut Géographique National (IGN) of France, was published in 1973.

With the increasing knowledge of the morphology and of the geological processes on the ocean bed in the 1950s and 1960s, a scientific input into the preparation of the contours was introduced into GEBCO by linking the Intergovernmental Oceanographic Commission (IOC), of UNESCO, with the IHO as joint sponsors of the project.

Under the new Joint IOC/IHO Guiding Committee for the GEBCO, a 5th Edition was prepared and completed in 1982. This edition differed in many ways from its predecessors. There were new sheet boundaries, new specifications, sounding control was shown by track lines and dots, and an extensive scientific review process was carried out prior to publication.

The contours of the 5th Edition have been digitised, together with the tracks, sounding control and the names, to form the basis for the "GEBCO Digital Atlas" (GDA) which were initially available on magnetic tape, and now on CD-ROM.

The database of the GDA is updated as new contour data are acquired and blocks of older data are replaced. Users can extract from the database the areas they need on any suitable scale.

At an appropriate time it is planned to produce a 6th Edition of printed sheets from the GDA database.

3.1.2 The Organization and Components of the GEBCO Global Project

3.1.2.1 The Joint IOC-IHO GEBCO Global Project Committee (GGPC).

The GEBCO Global Project will have a Committee formed by 3 representatives of the IHO, 3 representatives of the IOC and the Chairmen of the Sub Committees of the GEBCO Global Project Permanent Secretary. The Terms of Reference of this Committee are provided **in Annex C**

3.1.2.2 The GEBCO Global Project Sub Committees.

The following two Sub Committees will provide the required technical support for the GEBCO Global and the IBC Regional Projects:

- The Sub-Committee on Geographical Names and Nomenclature of Ocean Bottom Features (SCUFN) that recommends to the Ocean Mapping Directing Board names to be included in the global and regional charts as well as in the GDA. Its Terms of Reference are provided in **Annex D.**
- The Sub-Committee on Digital Bathymetry that advises the Ocean Mapping Directing Board on procedures to achieve a fully digital version of the GEBCO Global Projects as well as IBC Regional Projects and to prepare the "GEBCO Digital Atlas" (GDA). Its Terms of Reference are provided in **Annex E.**

3.2. JOINT IOC-IHO INTERNATIONAL BATHYMETRIC CHARTS REGIONAL PROJECTS

3.2.1 Background Information:

IOC activities in international ocean mapping began in 1969 after the endorsement by the UN General Assembly of the Long-Term and Expanded Programme of the Ocean. The first activity was the compilation of the Geological and Geophysical Atlas of the Indian Ocean taking advantage of the data collected through the International Indian Ocean Expedition (IIOE). This atlas was published in 1975 by the Academy of Sciences and the Main Administration of Geodesy and Cartography of the former USSR.

The International Geological-Geophysical Atlases of the Atlantic and Pacific Oceans (GAPA) is another endeavour of IOC in Ocean Mapping. The Atlantic Ocean Atlas was published in 1991 and the Pacific Ocean Atlas was published in 2003, thus completed the GAPA project

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3.2.2 The Organization and Components of the IBC Regional Projects

3.2.2.1. The IBC Regional Projects

There are 8 established IBC regional projects:

- IBC Southern Ocean, covering the Antarctic (IBCSO)
- IBC Artic Ocean (IBCAO)
- IBC Caribbean Sea and Gulf of Mexico (IBCCA)
- IBC Central East Atlantic (IBCEA)
- IBC Mediterranean (IBCM)
- IBC South East Pacific (IBCSEP)
- IBC West Indian Ocean (IBCWIO)
- IBC Western Pacific (IBCWP)

Additional IBC projects may be established as necessary.

3.2.2.2 The Joint IOC-IHO IBC Regional Projects Committee (IRPC).

The IBC Regional Project Committee will comprise the Chairman of each of the IBC Projects listed above. The Terms of Reference of this Committee are provided in **Annex F**

ANNEXES

ANNEX A Services provided by IHO Data Centre for Digital Bathymetry (DCDB)
ANNEX B Terms of Reference of the Joint IOC-IHO Ocean Mapping Directing Board (OMDB)
ANNEX C Terms of Reference of the Joint IOC-IHO GEBCO Global Project Committee (GGPC)
ANNEX D Terms of Reference of the GEBCO Global Project Sub-Committee on Undersea Feature Names (SCUFN) .
ANNEX E Terms of Reference of the GEBCO Global Project Sub-Committee on Digital Bathymetry (SCDB).
ANNEX F Terms of Reference of the Joint IOC-IHO IBC Regional Projects Committee (IRPC)

ANNEX A

Services provided by IHO Data Centre for Digital Bathymetry (DCDB)

Oceanic soundings are acquired by hydrographic and oceanographic ships during surveys and on passage between survey areas and ports. In addition many warships, fisheries and others vessels also collect oceanic soundings.

These data are submitted to the IHO Data Centre for Digital Bathymetry (DCDB) at Boulder, Colorado (USA), in digital or hard copy (collector tracing) format. The DCDB carries out the following functions:

(1) Operation of the data center with a focus of activity on oceanic regions with depths greater than 100 meters.

(2) Provision free of charge to the IHO and IOC for use by its Member States, of the data needed for their national or international projects. The IHO and IOC Member States will submit their requests for data through directly to the IHO-DCDB. IHO Member States' Hydrographic Offices (HOs) will provide the center with the digital bathymetric data collected by their nation's institutions in oceanic regions, such as the national oceanographic commissions.

(3) Maintenance of a quality control facility whereby data provided to the center are at least subjected to simple checks for violation of physical principles (instantaneous changes in position, impossibly high ship speeds, etc.) and completeness of labeling, referring detected obvious errors back to suppliers of data for possible corrections. Member States' Hydrographic Offices may be requested to assist in resolving matters of quality control concerning data originated by their nation's organizations.

(4) Maintenance of inventories in digital form of all digital bathymetric data including digital contour data and the production of an annually updated catalogue of recently acquired bathymetric data. The center will provide this catalogue to the IHB in a form analogous to the IHO publication B-4.

(5) Maintenance of trackline catalogues of newly collected data for further studies.

(6) Collaboration with various international organizations in the development of exchange formats and standards to expedite bathymetric data exchange, including digital bathymetric contours.

(7) The operational procedures, systems and formats supporting the Banking of Bathymetric data at the IHO DCDB are given in APPENDIX 1 TO Annex A.

Appendix 1 to ANNEX A

OPERATIONAL PROCEDURE, SYSTEMS AND FORMATS SUPPORTING THE BANKING OF BATHYMETRIC DATA AT THE IHO DATA CENTRE FOR DIGITAL BATHYMETRY (DCDB)

The IHO DCDB operates on the basis that the prime responsibility for quality control of the data rests with the collector or custodian of the raw data. DCDB receives data from IHO Member States' Hydrographic Offices or other national Institutions or Agencies in oceanic regions on any specially agreed-upon transfer media. Contributors are responsible for providing digital cruise data and headers (which list general information about the cruise and data acquired during the cruise) preferably in MGD77 format. The MGD77 format is described in a separate document available from DCDB. Data provided in other formats are accepted when accompanied with concise documentation. If data are provided to DCDB in an alternate format, written headers on MGD77 coding forms are accepted.

As soon as the data package arrives, DCDB reviews the accompanying written enclosures, checks the physical condition of the data storage media and assigns the data a project number used as a permanent identifier. Documentation which should be provided as enclosures with the data by each contributor is listed in Appendix 1. If data are not provided in MGD77 format, a concise description of the format used and completed MGD77 header coding forms should be included. DCDB provides enclosure forms and header coding forms to contributors on request. If the data and headers are in MGD77 format, or if the data are in a well documented alternate format with completed MGD77 header coding forms, data processing begins. Acknowledgement via mail or electronic mail is sent to the contributor within one week of receipt of the data. If necessary the acknowledgement includes a request for any information needed by DCDB to begin processing.

Within 3 weeks of the arrival of the data to DCDB they are copied for archival protection reasons and are scanned electronically using a digital scanning routine to determine whether the format matches that described in the written documentation. A manual check of the printout of the scanning routine is completed to determine if the data are entered in the proper record fields. After this scanning review is completed, a follow-up letter or electronic mail notice is sent to the contributor explaining the results and describing the expected date of completion of assimilation. This notice will also include a request for further documentation on any received format not familiar to DCDB staff.

The first step of assimilation occurs when the data are electronically transferred to a computer to begin error checking. Validation software is employed to routinely check several parameters. Latitude and longitude are checked to determine whether they fall within the normal ranges of 90E to –90E and 180E and –180E respectively. Each depth value, 2-way travel time, magnetic value, and gravity value

is checked against physically possible values. Any value not physically possible (see Appendix 2) is flagged by the software. Navigation is also checked by comparing the time and navigation points for accelerations and/or course changes physically possible on an oceanic vessel. If there are errors discovered in the navigation check, plots of the navigation are reviewed. If there is a discrepancy, a staff person further reviews the situation and communicates with the contributor as necessary.

There are two checks done by DCDB staff at this point in the assimilation process. First the header record is reviewed for possible data entry errors. Second, randomly selected depths of the survey are compared to GEBCO chart depths as a check for two possible errors – mismatched units of depth such as fathoms instead of meters or the misplacement of a decimal point in the depth record.

The staff at DCDB reviews any errors discovered and flagged by the validation software or during the two checks discussed above. If there are relatively few errors, the processing continues. But if there are a significant number of flagged errors, the contributor is notified and asked to correct and resubmit the data or provide enough information so the errors can be corrected by DCDB staff.

Next, an inventory file is created, which is a compacted version of each cruise. Normally the inventory file includes just enough data to define the trackline of the original cruise, usually about 2 percent of the total. The inventory file includes a list of the total number of data records for each parameter in the data set and a complete header for each cruise. The trackline of the inventory is displayed on a computer screen, where it is reviewed for obvious errors such as ship travel across a land mass, gaps in the cruise track or unusual navigational deviations. Quality Control processing is now complete.

The final assimilation steps are data management and archival functions. All assimilated cruises are added to the master inventory which is available for IHO Member States' hydrographic offices and other appropriate Agencies as described in documentation establishing the IHO DCDB. A copy of the master data file for each cruise is archived on-site and another off-site for added security. The inventory file, which is used by DCDB as part of the data request system, is also duplicated and stored in two locations. After the data are archived, the results of the DCDB validation software checks are offered to the contributor of the data along with a copy of the assimilated data set.

Sub - Appendix 1 to Annex A

Documentation to be Provided with Data

ITEM	EXAMPLES
Contributor	Royal Australian Navy
Project Name	1986 Offshore Cruises
Contact	John Smith
Address	self explanatory
Telephone number	self explanatory
Facsimile number	self explanatory
Electronic mail address	(if applicable)
Digital Data Format	Internal J.O.D.C. (provide complete documentation)
Cruises Names	OFF8601, OFF8602
Storage Media	CD-Rom
Character Code	ASCII or EBCDIC (only)
Record Size	120 bytes
Block Size	1920 bytes
Other Media Specific Information	(if applicable)
Cruise Information	MGD77 Header Coding Forms
Comments	Anything that will assist DCDB staff in the data processing.

Sub - Appendix 2 to Annex A

Data Range limits

DATA PARAMETER	**ALLOWABLE RANGE**
Latitude	90E to –90E
Longitude	180E to –180E
2-way Travel Time	greater than 0 less than 15 seconds
Corrected Depth	0 to 11,000 meters
Magnetic Total Field	20,000 to 72,000 nanoteslas
Gravity	977,000 to 985,000 mgals.

ANNEX B

JOINT IOC-IHO OCEAN MAPPING DIRECTING BOARD (OMDB)

Terms of Reference

Considering the need to promote and coordinate the development of their ocean mapping projects, the Intergovernmental Oceanographic Commission (IOC), of UNESCO, and the International Hydrographic Organization (IHO) establish a joint Ocean Mapping Directing Board (OMDB) with the following Objectives and Rules of Procedure:

1. Objectives

The objectives are to:

1.1 Foster the achievement of, and keep under continuous review, all ocean mapping activities agreed by the two parent organizations. Provide annual reports on the jointly sponsored programs, to both Parent Organizations.

1.2 Guide the ocean mapping programme, for implementation by its two subsidiary committees, i.e. the GEBCO Global Project Committee (GGPC) and the IBC Regional Projects Committee (IRPC), and make recommendations to the two parent organizations on policy and strategy issues to be followed for the preparation and dissemination of all products from the global and regional projects.

1.3 Develop a costed four-year work programme, identifying tasks, products, responsibilities, resources and target dates. This programme shall be updated and submitted by the Board to the Parent Organizations annually.

1.4 Taking into account technological development and data availability, identify new applications for bathymetric data and/or define new bathymetric products. Draft specifications for these products, as appropriate.

1.5 Explore the potential, for the better interpretation of oceanic bathymetry, of techniques such as acoustic imagery and satellite observations.

1.6 Provide a technical link between the groups supervising each ocean mapping project, so as to ensure that common specifications are used for all resulting products.

1.7 Encourage subsidiary regional bodies to identify their requirements for the development of bathymetric chart series, as well as overlay series showing other scientific parameters, including marine resources.

1.8 Advise the IHO (in its capacity as the World Data Centre for Bathymetry),on matters connected with the collection and exchange of bathymetric data, including the development of automatic data assimilation, archival, retrieval and distribution methods, soliciting the advice and assistance of the IOC Committee on International Oceanographic Data and Information Exchange (IODE), and others as necessary.

1.9 Stimulate the flow of data relevant to the Ocean Mapping programme by actively identifying sources of new data and encouraging release of data to appropriate data banks, with the object of ensuring that maximum available data are provided to the World Data Centre for Bathymetry and its IHO Data Centre for Digital Bathymetry.

1.10 Provide advice on ocean mapping, as requested by intergovernmental and non-governmental organizations.

1.11 Develop and promote training opportunities in ocean mapping.

1.12 Recommend and develop measures for optimum publicity, distribution and sales of copies of Ocean Mapping Projects and other bathymetric products produced under the aegis of the Committees.

2. Rules of Procedures

2.1 Membership of the Ocean Mapping Directing Board is covered by the following guidelines:

(1) The Board will consist of 12 members, plus a Permanent Secretary. Five members will be nominated by the IHO and five by the IOC. The other two members will be the Chairpersons of the GEBCO Global Project Committee (GGPC) and the IBC Regional Projects Committee (IRPC).

(2) In close consultation, the Parent Organisations will ensure that nominated members of the Directing Board will be appointed from as wide a geographical area as possible.

(3) Members of the Board are experts acting in their personal capacity and shall not represent their governments[1].

[1] So far as IOC is concerned, the Directing Board is classed as a Joint Group of Experts under the IOC guidelines for subsidiary bodies.

2.2 The Chairperson and Vice-Chairperson are elected by the Board and endorsed by the Parent Organizations. The Chairperson, or in his/her absence the Vice-Chairperson, will conduct the business of the Committee. The Chairperson and Vice-Chairperson should come from different Parent Organizations.

2.3 The Chairperson is elected for a four-year period and will normally be succeeded by the Vice-Chairperson. The Chairperson may be re-elected for one additional four-year period

2.4 Meetings of the Board will normally be held every 2 years. The venue and date will be discussed at Board Meetings and confirmed twelve months in advance. In the intervening period the Board will conduct its business by correspondence (usually electronic).

2.5 The Chairperson, at the request of Members of the Board, may invite interested scientists and hydrographers to attend meetings as observers. IHB and the IOC Secretariat will have *ex-officio* representation at meetings.

2.6 Meetings of the Board will be held in conjunction with those of the GEBCO Global Project Committee (GGPC) and of the IBC Regional Projects Committee (IRPC). GGPC and IRPC meetings will be conducted in parallel, typically over two days, and will immediately be followed, by an OMDB meeting, at same venue, normally for two days.

2.7 The Board, under the Chairperson's guidance, will appoint a Permanent Secretary to the Board. He will be primarily tasked, on the occasion of meetings of the Board, to make the necessary arrangements, send invitations, prepare the documentation (including an agenda), act as rapporteur and write a report of discussions and conclusions.

2.8 The Board should strive to make decisions by consensus. If a vote is necessary, the quorum required is 7 members, the majority required for acceptance is to be a simple majority.

2.9 Any nominated member of the Board [see 2.1 (1)] absent from two consecutive OMDB meetings will loose its position. A replacement will then be nominated by IHO or IOC as appropriate.

2.10 A yearly report on the progress and status of all ocean mapping projects (see 1.1) is to be submitted by the Chairperson through IHB and the IOC Secretariat to the Parent Organizations. It should include all recommendations of the Board (see 1.2), an updated work programme (see 1.3) and any other relevant information.

ANNEX C

JOINT IOC–IHO GEBCO Global Project Committee (GGPC)

Terms of Reference

1. Objectives:

The objectives are to:

1.1 Guide the GEBCO project and make recommendations to the Ocean Mapping Directing Board (OMDB) on the policy to be followed for the preparation and dissemination of that world series of contoured charts of the ocean floor and of the "GEBCO Digital Atlas".

1.2 Identify the needs of the various users of the bathymetry of the world's oceans; study the ways and means whereby these needs can be met, and implement actions found feasible, which meet these needs.

1.3 Stimulate the flow of data relevant to the GEBCO Project by actively identifying sources of new data and encouraging the release of data to appropriate data banks, with the object of ensuring that maximum available data are provided to the World Data Centre for Bathymetry and the IHO Data Centre for Digital Bathymetry.

1.4 Supervise the means of maintaining, further developing and routinely updating the "GEBCO Digital Atlas" (GDA). Activities to include but not restricted to:

(1) Organizing procedures for new compilations of bathymetry;

(2) Advising on standards and methodology;

(3) Generating and developing a supplementary file containing ship tracks, for the purpose of providing graphic presentation for quality assurance related to interpreted bathymetric information;

(4) Producing a worldwide gridded data set of bathymetric data, at the best resolution compatible with the compiled bathymetry available, in order to support various marine applications, e.g. geosciences, law of the sea, offshore exploration.

(5) Integrate, in an appropriate way the geographical names of undersea features; and

(6) Consider the best medium and software for the effective use of the GDA by all users.

1.5 Investigate and develop new extra-budgetary logistic and financial arrangements necessary for the furtherance of the GEBCO Project.

1.6 Prepare and maintain, in association with national and international bodies, an authoritative Gazetteer on Geographical Names of Undersea Features.

1.7 Maintain, as necessary, advisory Sub-Committees on: Undersea Feature Names and Digital Bathymetry. Form Working Groups to investigate and report on specific topics as required.

1.8 Advise regional IBC projects, through the IBC Regional Projects Committee (IRPC), of the specifications for, and collaborate in the preparation of, bathymetric charts at scales suitable for regional projects, to help ensure their compatibility with, and later inclusion in, the GDA.

2. Rules of Procedure

2.1 Membership of the GEBCO Global project Committee is covered by the following guidelines:

(1) The Committee will consist of 8 members, 3 members will be appointed by IHO and 3 by IOC. The additional two members will be the Chairpersons of the Sub-Committee on Undersea Feature Names (SCUFN) and the Sub-Committee on Digital Bathymetry (SCDB).

(2) Members of the Board are experts acting in their personal capacity and shall not represent their governments[2].

2.2 The Chairperson and Vice-Chairperson will be elected by the Committee and endorsed by the OMDB. They should come from different Parent Organizations.

2.3 The Chairperson is elected for a four-year period and will normally be succeeded by the Vice-Chairperson. The Chairperson may be re-elected for one additional four-year period.

2.4 The Chairperson, or in his/her absence the Vice-Chairperson, will conduct the business of the Committee. Meetings will usually be held every 2 years, in

[2] So far as IOC is concerned, the Project Committee is classed as a Joint Group of Experts under the IOC guidelines for subsidiary bodies.

parallel with a meeting of the IBC Regional Projects Committee (IRPC) and will normally last 2 days. The GGPC and IRPC meetings will precede that of the OMDB, which will be held at the same location. In the intervening period the Committee will conduct its business by correspondence (usually electronic).

2.5 The Committee should strive to decide by consensus. If a vote is required, the quorum required is 5 delegates, the majority required for acceptance is to be a simple majority.

2.6 The Chairperson is to submit an annual report to the OMDB.

2.7 The Chairperson is to provide a costed business plan for approval at the biennial meeting of the OMDB.

ANNEX D

GEBCO Sub-Committee on Undersea Feature Names (SCUFN)

Terms of Reference.

1. Objectives:

1.1 The Sub-Committee on Undersea Feature Names reports to the Joint IOC-IHO GEBCO Global Project Committee (GGPC) as its designated authority for all matters concerning undersea feature names.

1.2 It is the function of the Sub-Committee to select those names appropriate for use on GEBCO graphical and digital products, on the IHO small-scale INTernational chart series, and on the regional IBC series.

1.3 The Sub-Committee shall:

(i) Select undersea feature names on the basis of:

a) undersea feature names provided by national and international organizations concerned with nomenclature;
b) names submitted to the Sub-Committee by individuals, agencies and organizations involved in marine research, hydrography, etc.;
c) names appearing in scientific journals or on appropriate charts and maps, with valid supporting evidence.
d) Names submitted to the Sub-Committee by the Chairpersons or Chief Editors of IBC projects, in relation to the work on these projects.

Such names will be reviewed before they are inputted into the Gazetteer.

(ii) Define when appropriate the extent of named features;
(iii) Provide advice to individuals and appropriate authorities on the selection of undersea feature names in international waters and, on request, in waters under national jurisdiction;
(iv) encourage the establishment of national boards of geographical names and undersea features, and when such a board does not exist for a given coastal state, co-operate in the naming of seafloor features related to those national waters;
(v) prepare and maintain an international and worldwide gazetteer of undersea feature names;

(vi) encourage the use of undersea feature names included in the Gazetteer, on any maps, charts, scientific publications, and documents by promulgating them widely;

(vii) prepare and maintain internationally agreed guidelines for the standardization of undersea feature names and encourage their use;

(viii) review and address the need for revised or additional terms and definitions for submarine topographic features.

(ix) maintain close liaison with the UN Group of Experts on Geographical Names, the focal point of which shall be invited to attend meetings of the Sub Committee, and international or national authorities concerned with the naming of undersea features.

2. Rules of Procedure

2.1 Membership of the Sub-Committee on Undersea Feature Names is covered by the following guidelines:

(1) The Sub Committee will consist of 10 members, 5 members will be appointed by IHO and 5 by IOC.

(2) Members of the Sub Committee are experts acting in their personal capacity and shall not represent their governments[3].

2.2 The Chairperson and Vice-Chairperson will be elected by the Sub Committee and endorsed by the Joint IOC-IHO GEBCO Global Project Committee (GGPC). They should come from different Parent Organizations.

2.3 The Chairperson is elected for a four-year period and will normally be succeeded by the Vice-Chairperson. The Chairperson may be re-elected for one additional four-year period.

2.4 The Chairperson, or in his/her absence the Vice-Chairperson, will conduct the business of the Sub Committee. Meetings will usually be held every 2 years, ideally before the GGPC meeting. In the intervening period the Sub Committee will conduct its business by correspondence (usually electronic).

2.5 The Sub Committee should strive to decide by consensus. If a vote is necessary, the quorum required is 6 delegates, the majority required for acceptance is to be a simple majority.

2.6 The Chairperson is to submit an annual report to the GGPC.

2.7 The Chairperson is to provide a costed business plan for approval at the biennial meeting of the GGPC.

[3] So far as IOC is concerned, the SCUFN Sub Committee is classed as a Joint Group of Experts under the IOC guidelines for subsidiary bodies.

ANNEX E

GEBCO Sub-Committee on Digital Bathymetry (SCDB)

Terms of Reference

2. Objectives:

1.1 The Sub-Committee on Digital Bathymetry reports to the Joint IOC-IHO GEBCO Global Project Committee (GGPC) as its designated authority for all matters concerning digital bathymetry.

1.2 It is the function of the Sub Committee to maintain a watching brief on developments in deep sea bathymetric mapping and related activities, and on the evolving technologies used to support such work.

1.4 The Sub-Committee shall:

(i) Keep under review, and provide advice on, standards and procedures for ensuring the continued and effective management, availability and depiction of digital bathymetric data.

(ii) Maintain, routinely update and further improve the GEBCO Digital Atlas (GDA) by:

a) developing procedures for incorporating new compilations of bathymetry;

b) advising on standards and methodology;

c) generating and developing a supplementary file containing shiptracks, for the purpose of providing graphic presentation for quality assurance related to interpreted bathymetric information;

d) integrating in an appropriate way the geographical names of undersea features; and

e) investigating the best medium and software for the effective use of the GDA by all users.

(iii) Investigate and recommend ways and means by which digital methods may be used to expedite production of the GEBCO (6^{th} Edition).

(iv) Provide advise on matters connected with the collection and exchange of bathymetric data.

(v) Interact with the relevant committees and working groups, to bring about, to the extent possible, uniformity and compatibility with IODE developments and also with IHO Classification Criteria for Deep Sea Soundings (IHO Special Publication No. 44, Annex A).

2. Rules of Procedure

2.1 Membership of the Sub-Committee on Digital Bathymetry is covered by the following guidelines:

(1) The Sub Committee will consist of 10 members, 5 members will be appointed by IHO and 5 by IOC.

(2) Members of the Sub Committee are experts acting in their personal capacity and shall not represent their governments[4].

2.2 The Chairperson and Vice-Chairperson will be elected by the Sub Committee and endorsed by the Joint IOC-IHO GEBCO Global Project Committee (GGPC). They should come from different Parent Organizations.

2.3 The Chairperson is elected for a four-year period and will normally be succeeded by the Vice-Chairperson. The Chairperson may be re-elected for one additional four-year period.

2.4 The Chairperson, or in his/her absence the Vice-Chairperson, will conduct the business of the Sub Committee. Meetings will usually be held every 2 years, ideally before the GGPC meeting. In the intervening period the Sub Committee will conduct its business by correspondence (usually electronic).

2.5 The Sub Committee should strive to decide by consensus. If a vote is necessary, the quorum required is 6 delegates, the majority required for acceptance is to be a simple majority.

2.6 The Chairperson is to submit an annual report to the GGPC.

2.7 The Chairperson is to provide a costed business plan for approval at the biennial meeting of the GGPC.

[4] So far as IOC is concerned, the SCDB Sub Committee is classed as a Joint Group of Experts under the IOC guidelines for subsidiary bodies.

ANNEX F

JOINT IOC–IHO IBC REGIONAL PROJECTS COMMITTEE (IRPC)

Terms of Reference

1. Objectives:

The objectives are to:

1.1 Keep under continuous review all regional ocean mapping activities of the Committee, reporting to the Ocean Mapping Directing Board (OMDB) on the progress made with each International Bathymetric Chart (IBC) project sponsored by the Board.

1.2 Facilitate the exchange of expertise and experience between the groups supervising each regional IBC project.

1.3 Provide a technical link between the IBC projects, so as to ensure that a standard form of presentation is used for all ocean mapping products published by, or on behalf of the International Oceanographic Commission (IOC) and the International Hydrographic Organization IHO)**.**

1.4 Encourage regional IBC projects to identify the requirements for bathymetric chart series and overlay (overprint) series showing other scientific parameters, including marine resources

2. Rules of Procedure

2.1 Membership of the IBC Regional Projects Committee is covered by the following guidelines:

(1) The Committee will consist of the Chairpersons of each IBC Regional Project.

(2) Members of the Board are experts acting in their personal capacity and shall not represent their governments[5].

[55] So far as IOC is concerned, the Project Committee is classed as a Joint Group of Experts under the IOC guidelines for subsidiary bodies.

2.2 The Chairperson and Vice-Chairperson will be elected by the Committee and endorsed by the OMDB.

2.3 The Chairperson is elected for a four-year period and will normally be succeeded by the Vice-Chairperson. The Chairperson may be re-elected for one additional four-year period.

2.4 The Chairperson, or in his/her absence the Vice-Chairperson, will conduct the business of the Committee. Meetings will usually be held every 2 years, in parallel with a meeting of the GEBCO Global Project Committee (GGPC) and will normally last 2 days. The IRPC and GGPC meetings will precede that of the OMDB, which will be held at the same location. In the intervening period the Committee will conduct its business by correspondence (usually electronic).

2.5 The Committee should strive to decide by consensus. If a vote is required, the quorum required is half the IRPC membership, plus one delegate, the majority for acceptance is to be a simple majority.

2.6 The Chairperson is to submit an annual report to the OMDB.

2.7 The Chairperson is to provide a costed business plan for approval at the biennial meeting of the OMDB.

…….

REINVENTING GEBCO
A PROPOSED MANIFESTO FOR THE TWENTY-FIRST CENTURY

A discussion paper submitted to the Twentieth Meeting of the GEBCO Guiding Committee

Ron Macnab
Geological Survey of Canada (Retired)
Portovenere, Italy
April 3, 2004

1 GEBCO's Mission

Before attempting any administrative or technical re-organization, it is essential to have a clear idea of what a renewed GEBCO can and should do. The following are suggested as key elements in choosing a direction for the future:

1. To construct an accurate and up to date digital model of global bathymetry from original observations.

2. To promote international cooperation and coordination in the design and execution of ocean mapping programs.

3. To sanction the naming of undersea features.

2 Current project layouts in the GEBCO and IBC undertakings

GEBCO's traditional chart scheme comprises seventeen sheets, complemented in recent years by nine 'update sheets'. The IBC project scheme consists of eight separate project areas, divided into nearly 130 sheets. Thus we are faced with the necessity of assembling and manipulating information in nearly 160 separate map/project areas, and of managing the overall process so that seamless outputs are generated on time and according to specifications.

There are several disadvantages to this approach:

(a) it is difficult to monitor progress over so many fronts in order to identify problems and to resolve them in a timely fashion;

(b) project areas are divided arbitrarily, fostering the fragmentation of data sets that should otherwise remain intact;

(c) there is a significant cost in production and communication overhead, given the necessity of matching the contents of adjoining sheets, and of sharing information among numerous project teams;

(d) there is a strong potential for duplication of effort when work is pursued independently in overlapping areas;

(e) there are prospects of incompatible products arising from the use of different data sets.

3 A simplified project scheme for building a digital model of global bathymetry

The Ocean is large, but Life is short. To achieve meaningful results within the careers and lifetimes of participants, the job must be broken into manageable segments. It is recommended that GEBCO define eight Ocean Project areas, each one corresponding to a major oceanic area and its marginal seas:

Arctic Ocean
Indian Ocean
Mediterranean and Black Seas
North Atlantic Ocean
South Atlantic Ocean
North Pacific Ocean
South Pacific Ocean (perhaps further sub-divided into SE and SW components)
Southern (circum-Antarctic) Ocean

A suggested administrative and technical structure that would support this arrangement is illustrated in the Appendix.

There are several advantages to this approach:

(a) fewer project areas result in a simpler, leaner management structure;

(b) project areas are naturally and geographically integrated, so major features may be defined with coherent data sets;

(c) reduced production and communication overheads (no edge matching!);

(d) less scope for overlaps and duplication of effort between project areas;

(e) common databases to ensure compatibility of output products;

(f) better value from limited funds?

(g) easier to create and apply uniform specifications.

4 Ocean Projects: what they would do

The Ocean Project for any given area would seek to accomplish the following:

(a) assemble all available acoustic observations in analog and digital form;

(b) digitize selected analog observations;

(c) as an interim measure, fill blank areas with information from alternative sources, e.g. altimetry;

(d) combine and rationalize all assembled observations;

(e) preserve the rationalized observations for future re-use and updates

(f) build a seamless grid for the project area;

(g) create standard derivative products, e.g. isobaths and shaded relief images from the grid;

(h) post seamless grid and standard derivative products on the Web for public distribution;

(i) prepare thorough documentation for all data sets and procedures;

(j) (optional) design and prepare more advanced derivative products;

(k) (optional) prepare scientific papers addressing the contents of the grid and derivative products.

5 Ocean Project Working Groups: composition and tasks

Each Ocean Project would be the responsibility of an Ocean Project Working Group (OPWG). It is hardly necessary to state that the leadership and membership of each OPWG would have to consist of competent and well-qualified individuals who had the required enthusiasm and willingness to commit to their undertaking. OPWGs should be quasi-autonomous bodies with the freedom to establish their own operating procedures, however they would have to agree to certain conditions and specifications in order to qualify for the support and endorsement of IOC/IHO.

Ideally, an OPWG should be based in its project area, and housed in a recognized institution with adequate facilities. To achieve regional buy-in and credibility, it would be essential to draw upon local talent wherever possible, but members from elsewhere should be invited to join in order to capitalize on their specialized skills and knowledge, and to help promote communication with external parties.

6 SCUFN

No change is anticipated in the mandate or the operation of this sub-committee.

7 DCDB

The role of the DCDB would remain essentially unchanged, except for the addition of a new function: to act as a closed archive for the refined data sets that were used to produce grids within each project area. These data sets would be homogenized into one coherent global data base. It is strongly recommended that this archive remain inaccessible to the public, for several reasons:

(a) it may contain proprietary or classified data sets that were contributed to the initiative under a non-disclosure agreement;

(b) representing a significant investment of human, financial, and other resources, its future use should be reserved for GEBCO purposes, e.g. scientific research, updating with new data sets, building custom products, etc;

(c) it prevents misuse of the data base by casual or opportunistic operators, which might reflect badly upon GEBCO.

8 A commentary on synthetic bathymetry derived from observations of satellite altimetry

Pros:

Near-global coverage
Reasonably uniform coverage
Free – collected for other purposes
Useful for tectonic investigations
Useful reconnaissance tool for large unmapped features

Cons:

Wide 8-12 km footprint limits the resolution of seabed features
Depth accuracy limited to several hundred metres
Also reflects the effect of sediment layers beneath the seabed
Creates illusion that global seabed already fully mapped

9 The necessity for revenue generation

Much has been said about the voluntary nature of GEBCO, however this approach has drawbacks because it restricts the participation of individuals who might not have access to the funding necessary for salaries and/or expenses. It also curtails the scope of certain project activities because money is not available to pay for selected services.

Two possible approaches have been suggested for dealing with this situation:

(a) implement a business plan that would permit GEBCO to generate revenue through the sale of value-added products; these products could be sold directly to the public, or indirectly through licensing and partnership arrangements whereby the products were embedded in selected commercial packages;

(b) approach funding organizations that might be prepared to support GEBCO's objectives through the outright provision of operating grants.

10 An expanded role for GEBCO

GEBCO could do other things in addition to producing a model of global bathymetry. Some suggestions:

(a) advocate the furtherance of global ocean mapping, particularly in areas that remain poorly mapped;

(b) persuade major data holders to contribute the contents of their archives to centralized data centres;

(c) monitor the state of ocean mapping worldwide;

(d) support the development of advanced techniques for manipulating and visualizing bathymetry;

(e) devise innovative means of disseminating bathymetric information.

Appendix: Proposed GEBCO-IBC Re-organization

The accompanying figure illustrates an organizational structure that would support a fully-integrated IBC/GEBCO operation. It would consist of several elements:

(a) a Directing Committee that combined the functions of the IBC Consulting Group for Ocean Mapping (CGOM) and the GEBCO Guiding Committee. The DC would report to IOC and IHO through an Executive Committee that included a Chairman, a Vice-Chairman, and a Permanent Secretary;

(b) the DCDB, whose function would remain largely unchanged;

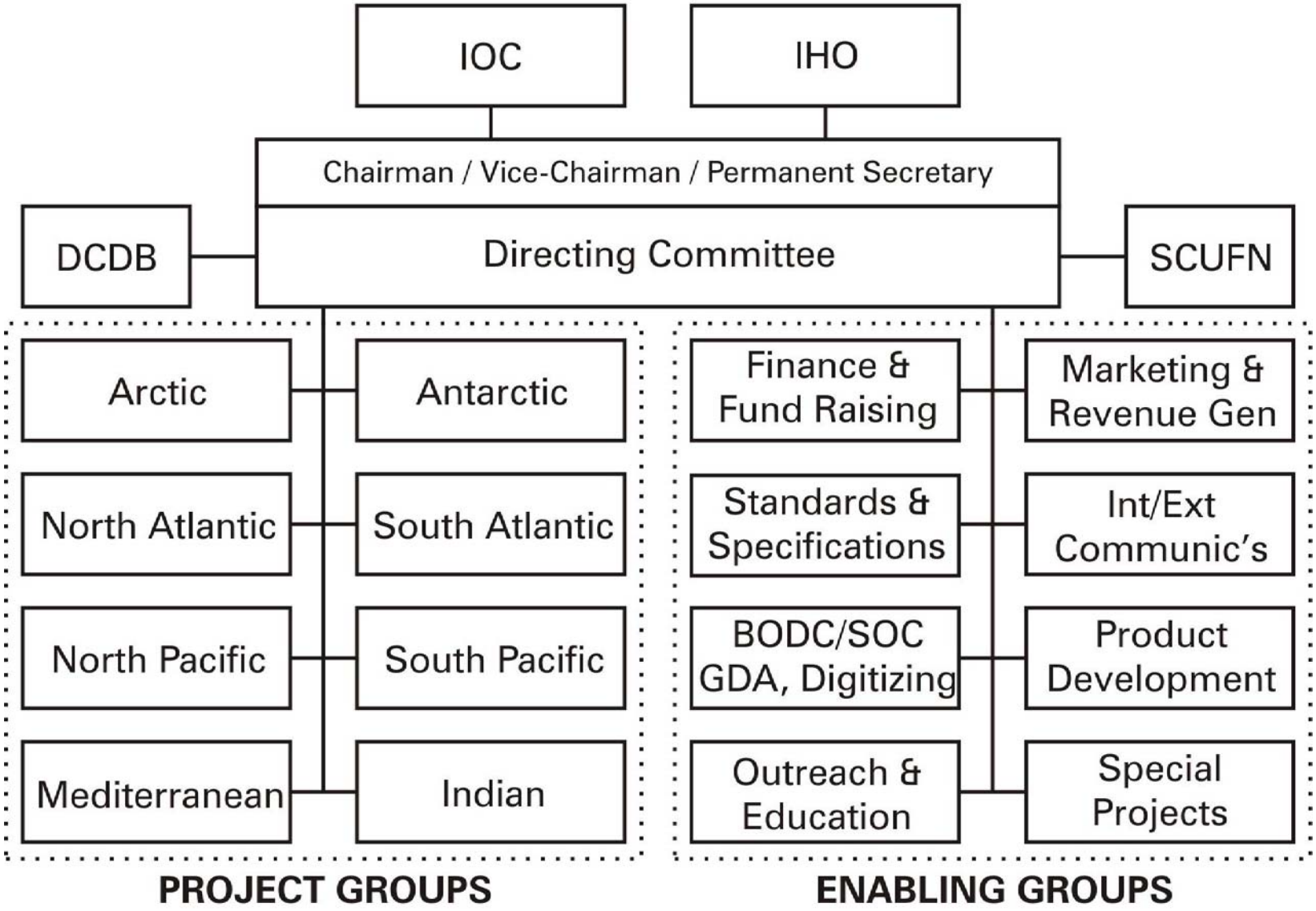
(c) SCUFN, whose function would remain largely unchanged;

(d) eight Project Groups charged with constructing digital bathymetric models in their assigned areas;

(e) eight or so Enabling Groups that provided the necessary technical and administrative infrastructure for the Project Groups.

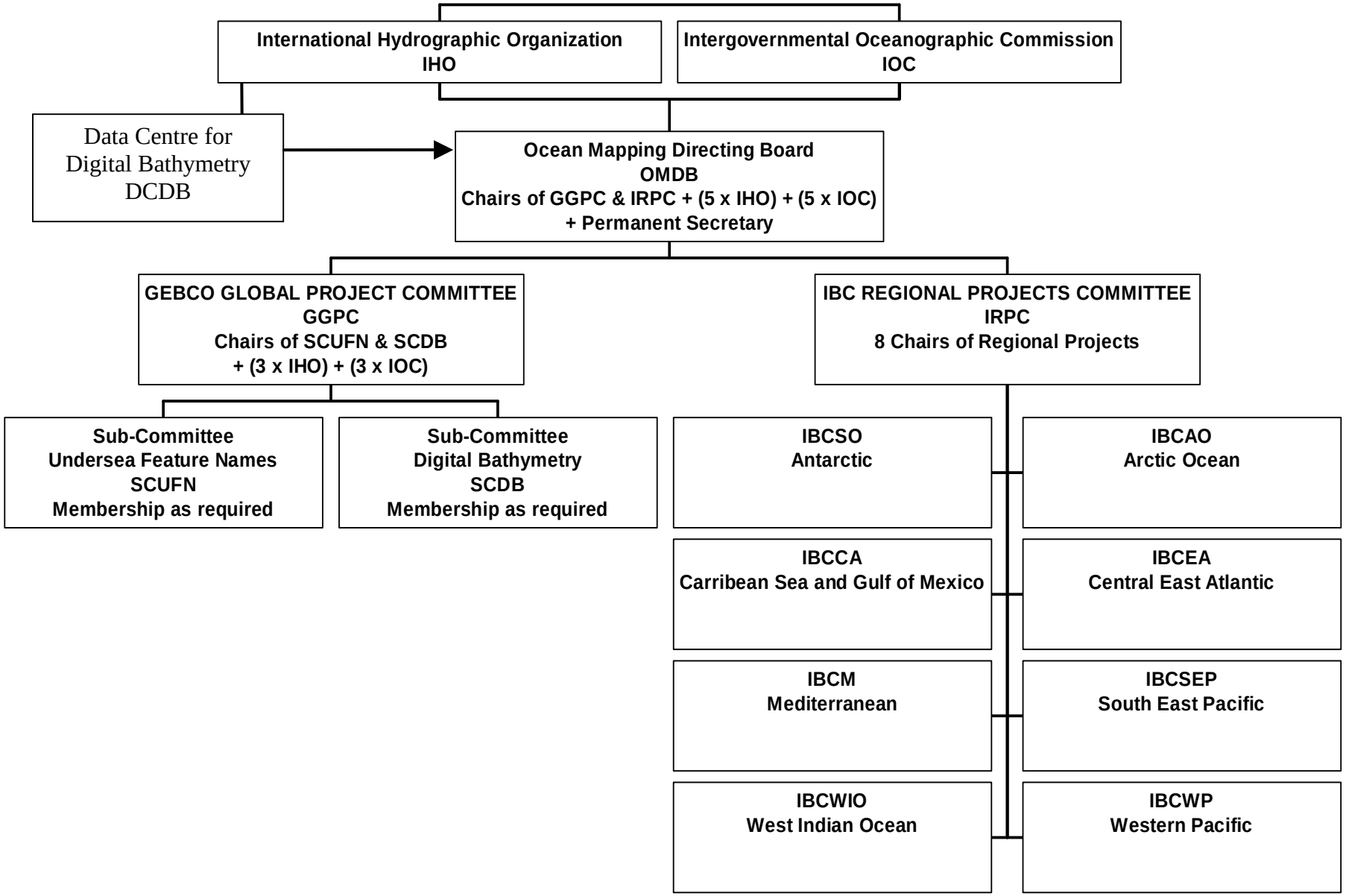
Membership in the DC would include representatives of IOC and IHO, the heads of DCDB and SCUFN, the heads of the Project and Enabling Groups, and others invited to join as appropriate.

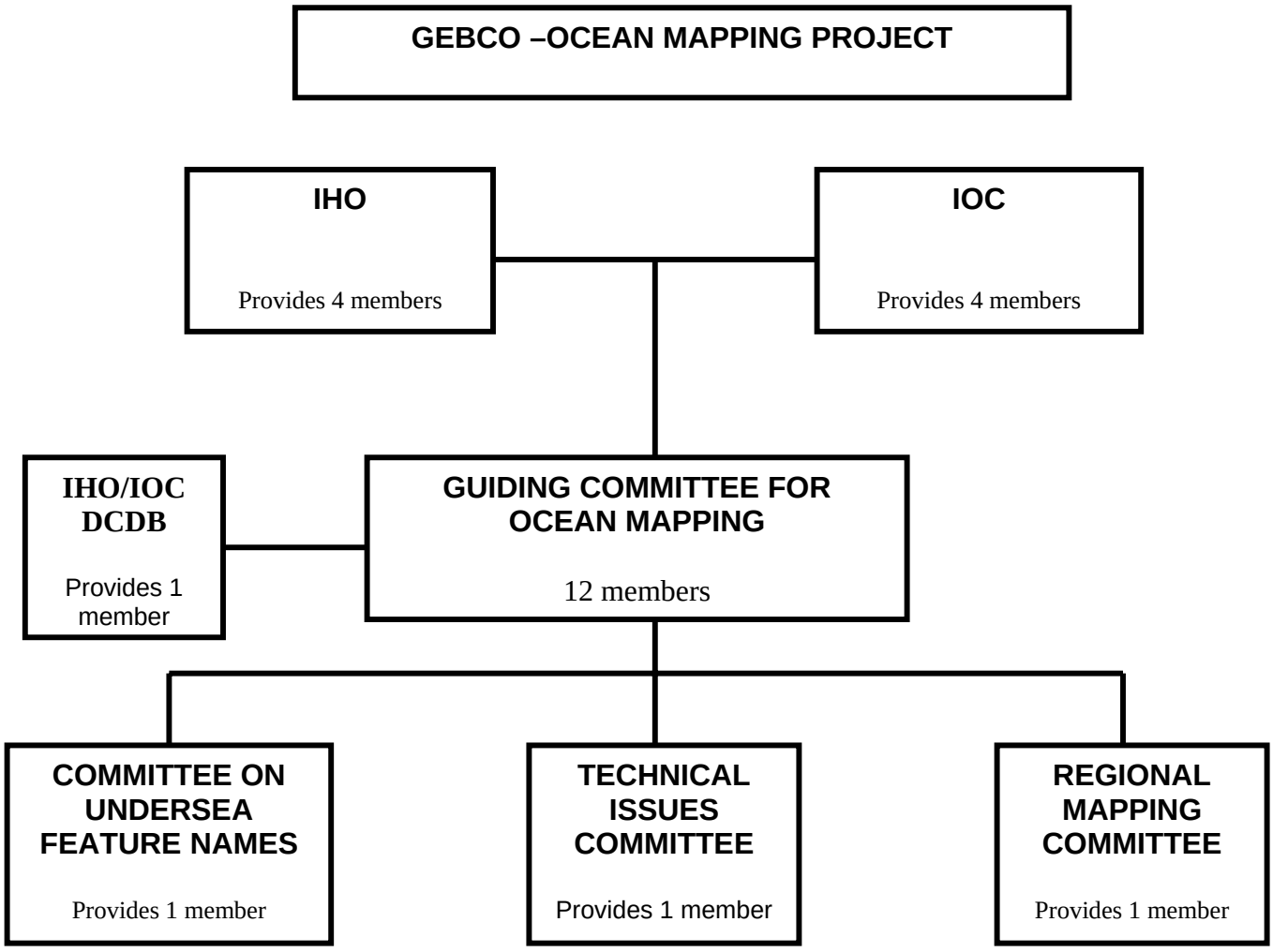
PROPOSED GEBCO/IBC RE-ORGANIZATION



RM, April 3, 2004

Proposed Ocean Mapping Programme Organization




GEBCO –OCEAN MAPPING PROJECT
IHO
Provides 4 members
IOC
Provides 4 members
IHO/IOC DCDB
Provides 1 member
GUIDING COMMITTEE FOR OCEAN MAPPING
12 members
COMMITTEE ON UNDERSEA FEATURE NAMES
Provides 1 member
TECHNICAL ISSUES COMMITTEE
Provides 1 member
REGIONAL MAPPING COMMITTEE
Provides 1 member

ANNEX VI

LIST OF ACRONYMS

ACUF	Advisory Committee On Undersea Features (SCUFN)
AGU	American Geophysical Union
AWI	Alfred Wegener Institute for Polar and Marine Research (Germany)
BODC	British Oceanographic Data Centre
CERESCOR	Centre de Recherche Scientifique de Conakry (Guinee)
CGMW	Commission for the Geological Map of the World
CGOM	IOC Consultative Group on Ocean Mapping
CHS	Canadian Hydrographic service
CIOH	Centro de Investigaciones Oceanográficas e Hidrográficas
DCDB	Data Centre for Digital Bathymetry (IHO Centre at the NGDC, USA)
DHN	Dirección de Hidrografía y Navigación
DTM	Digital Terrain Model
EB	Editorial board
EMSCS	European Mediterranean Seismological Centre (France)
GAPA	International Geological/Geophysical Atalses of the Atlantic and Pacific Oceans
GDA	GEBCO Digital Atlas (GEBCO data base)
GEBCO	General Bathymetric Chart of the Oceans (IOC-IHO)
GLOSS	Global Sea Level Observing System (IOC)
HDNO	Head Department of Navigation and Oceanography (Russian Federation)
IASC	International Arctic Science Committee (Norway)
IBC	International Bathymetric Chart
IBCAO	International Bathymetric Chart of the Arctic Ocean
IBCCA	International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
IBCEA	International Bathymetric Chart of the Central Easten Atlantic
IBCM	International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series
IBCSO	International Bathymetric Chart of the south Ocean IBCSO IBCSO
IBCSEP	International Bathymetric Chart of the South-East Pacific
IBCWIO	International Bathymetric Chart of the Western Indian Ocean
IBCWP	International Bathymetric Chart of the Western Pacific
IFREMER	Institut Français de Recherche pour l`Exploitation de la Mer
IGOSS	Integrated Global Ocean Services System (IOC-WMO)
IHB	International Hydrographic Bureau (Monaco)
IHO	International Hydrographic Organization (Monaco)
INEGI	Instituto Nacional de Estadistica Geografia e Informatica (Mexico)
INOCAR	Instituto Oceanográfico de la Armada (Ecuador)
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IOS	Institute of Oceanographic Sciences (UK)
ISM	International Sea Mapping
NERC	Natural Environment Research Council (UK)
NGDC	National Geophysical Data Centre (USA)
SCAR	Scientific Committee on Antarctic Research (UK)

SCDB	Sub-Committee on Digital Bathymetry (GEBCO)
SCOR	Scientific Committee on Oceanic Research (USA)
SCUFN	Sub-Committee on Undersea on Feature Names (GEBCO)
SEMAR	Secretaría de Marina Armada (Mexico)
SHOM	Service Hydrographique et Oceanographique de la Marine (France)
SOC	Southampton Oceanographic Centre (UK)
SOPAC	South Pacific Applied Geoscience Commission (Fiji)
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
VHO	Volunteering Hydrographic Office
WVS	World Vector Shoreline
WWW	World Wide Web

In this Series, entitled

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

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans S. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Also printed in Spanish)***
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping ***(Also printed in French and Spanish)***
12. Joint 100-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica lnternacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica ***(Spanish only)***
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources ***(Also printed in French and Spanish)***
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities ***(Also printed in Spanish)***
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CCPS Working Group on the Investigations of 'El Niño' (***Also printed in Spanish)***
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and lntercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. Cancelled
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic ***(Also printed in French)***
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping

59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans ***(Also printed in French)***
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' ***(Spanish only)***
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico ***(Also printed in Spanish)***
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOG-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO, Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" ***(Spanish only)***
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic ***(Also printed in French)***
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
199 First Session of the Joint 100-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel, South Africa, 1997
120. Report of Ocean Climate Time-Series Workshop, Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate, USA, 1997

121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997

122. First Session of the IOC-IUCN-NOAA *Ad hoc* Consultative Meeting on Large Marine Ecosystems (LME), France, 1997

123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997

124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996 ***(also printed in Spanish)***

125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997

126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997

127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998

128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997

129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997

130. First Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 1998

131. Fourth Session of the Health of the Oceans (HOTO) Panel of the Global Ocean Observing System (GOOS), Singapore, 1997

132. Sixteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997

133. First Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1998

134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997

135. Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), France, 1998

136. Seventh Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting, Germany, 1997

137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998

138. Implementation of Global Ocean Observations for GOOS/GCOS, Second Session, France, 1998

139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998

140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998

141. Ninth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Ecuador, 1998 ***(Spanish only)***

142. Seventh Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Croatia, 1998

143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998

144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999

145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999

146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999

147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999

148. Second Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1999

149. Eighth Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Japan, 1999

150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999

151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999

152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999

153. Seventeenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999

154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998

IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998

155. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICSU/Impl-III/3, France, 1999

156. First Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Venezuela, 1999 ***(also printed in Spanish and French)***

157. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999

158. Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Russian Federation, 1999

159. Third Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), Chile, 1999

160. Fourth Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS). Hawaii, 2000

161. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000

162. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000

163. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000

164. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000

165. Second Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Cuba, 2000 ***(also printed in Spanish and French)***

166. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000

167. First GOOS Users' Forum, 2000

168. Seventh Session of the Group of Experts on the Global Sea Level Observing System, Honolulu, 2001

169. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 ***(also printed in French)***

170. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001

171. First Session of the IOC-SCOR Ocean CO_2 Advisory Panel, France, 2000

172. Fifth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Norway, 2000 ***(electronic copy only)***

173. Third Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, USA, 2001 ***(also printed in Spanish and French)***

174. Second Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Italy, 2001

175. Second Session of the Black Sea GOOS Workshop, Georgia, 2001

176. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000

177. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Morocco, 2002 ***(also printed in French)***

178. Sixth Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Australia, 2001 ***(electronic copy only)***

179. *Cancelled*

180. Second Session of the IOC-SCOR Ocean CO_2 Advisory Panel, Honolulu, Hawaii, U.S.A, 2002 ***(electronic copy only)***

181. IOC Workshop on the Establishment of SEAGOOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 (SEAGOOS preparatory workshop) ***(electronic copy only)***

182. First Session of the IODE Steering Group for the Resource Kit, USA, 19–21 March 2001

183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002

184. Seventh Session of the IODE Group of Experts on Marine Information Management (GEMIM), France, 2002 ***(electronic copy only)***

185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2001 ***(electronic copy only)***

186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002 ***(electronic copy only)***

187. Fourth Session of the ad hoc Advisory Group for IOCARIBE-GOOS, 2002, Mexico ***(also printed in French and Spanish)***

188. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IBCWIO), Mauritius, 2000

189. Third session of the Editorial Board for the International Bathymetric Chart of the Western Pacific, Chine, 2000

190. Third Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Vietnam, 2002

191. Eighth Session of the IOC Consultative Group on Ocean Mapping, Russian Federation, 2001

192. Third Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Lisbon, 2003 ***(also printed in French)***

193. Extraordinary Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Chile, 1999 ***(Spanish only; electronic copy only)***

194. Fifth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, France, 2002

195. Sixth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, South Africa, 2003

196. Fourth Session of the Coastal Ocean Observations Panel, South Africa, 2002 ***(electronic copy only)***

197. First Session of the JCOMM/IODE Expert Team On Data Management Practices, Belgium, 2003 *(also JCOMM Meeting Report No. 25)*

198. Fifth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2003

199. Ninth Session of the IOC Consultative Group on Ocean Mapping, Monaco, 2003 ***(Recommendations in English, French, Russian and Spanish included)***