Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area

First Meeting

Tianjin, People's Republic of China, 12-14 June 1990

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In this Series, entitled

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

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

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IOC/GE-IBCWP-I/3
Paris, 5 November 1990
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1. OPENING OF THE MEETING

1 The Meeting of Experts on Ocean Mapping in the WESTPAC Area was opened by the Senior Assistant Secretary IOC on Ocean Mapping, Dr. Viktor Sedov, at 09:30, Tuesday 12 June 1990, in the premises of the National Marine Data and Information Service, State Oceanic Administration, Tianjin, People's Republic of China.

2 Dr. Sedov welcomed the participants on behalf of the Secretary IOC, Dr. Gunnar Kullenberg, and gave a short address on current IOC activities and the importance of Ocean Mapping for the implementation of many international projects. (The List of Participants is given in Annex VIII of this Report).

3 Professor Xu Yukun, Deputy Director of the Department of International Co-operation, State Oceanic Administration, People's Republic of China, welcomed the participants on behalf of the State Oceanic Administration. He emphasized the importance of the compilation of an International Bathymetric Chart of the WESTPAC Region for the development of marine science in the region.

4 The Chairman of the IOC Consultative Group on Ocean Mapping (CGOM), Mr. Desmond P.D. Scott, spoke on the importance of international collaboration in compilation of bathymetric, geological and geophysical charts of the World Oceans, and of involving scientists from developing countries in this task in order to provide necessary training and education in this field.

5 Professor Hou Wenfeng, Director of the National Marine Data and Information Service, State Oceanic Administration, also welcomed the participants to the meeting.

2. ADOPTION OF THE AGENDA

6 The proposed agenda of the Meeting was adopted without any amendments (see Annex I).

3. CONDUCT OF THE MEETING. DOCUMENTATION

7 The Participants were invited to elect a Chairman and Rapporteur for the Meeting. On the proposal of Prof. Hou Wenfeng, Mr. Desmond Scott was unanimously elected as the Chairman of the Meeting, and Mr. Chris Johnston was elected as the Rapporteur.

8 Dr. Sedov, acting as a Technical Secretary for the Meeting informed the Group of the available documentation (see Annex III).

4. CONSIDERATION OF THE TERMS OF REFERENCE OF THE GROUP

9 The Terms of Reference of the Group of Experts adopted by the First Session of the IOC Sub-Commission for WESTPAC, 5-9 February 1990, in Hangzhou, China, were carefully considered by the Group and taken as guidelines for the meeting.

5. INFORMATION ON CURRENT IOC OCEAN MAPPING ACTIVITIES

10 Mr. Scott gave a detailed account of the current IOC Ocean Mapping activities. He emphasized that results from regional Ocean Mapping projects are incorporated into the "GEBCO Digital Atlas" as soon as they become available. He also spoke on the structure and organization of the IOC Ocean Mapping Programme.

6. CONSIDERATION OF USER REQUIREMENTS FOR, AND FEASIBILITY OF, PREPARATION OF AN INTERNATIONAL BATHYMETRIC CHART OF THE WESTPAC REGION (IBCWP)

11 A report submitted by the National Marine Data and Information Service of China (see Annex IV) was discussed. The Group considered that the Chinese offer was extremely valuable and recommended that at the next session of the IOC Assembly this offer should be accepted in principle but with certain modifications which have been spelled out in this report.

12 A report from the Australian Bureau of Mineral Resources (Johnston and others, 1990) was presented by Mr. Johnston. The planned series of 1:1 M scale resource maps (Annex V-A) covering the Australian margin were welcomed. The Group noted with interest the approach adopted by Australia and requested that participants in IBCWP be kept informed of future developments arising from research aspects associated with the Australian programme.

13 A Summary Report on Available Bathymetry Projects and Related Charts etc. in the WESTPAC region (Harger, 1987) was discussed. The Group felt that this was a valuable summary of sources of data within the area. However, the Group wished to extend a caution to the future IBCWP Editorial Board in that changes might have occurred since 1987.

14 Captain Christian Andreasen said that the U.S. National Ocean Service (NOS) would be willing to liaise with Japan, China and other countries on quality control parameters and data exchange formats associated with digital data from the region.

15 The Group noted that the Chinese Atlas of Geology and Geophysics of South China Sea (Ministry of Geology and Mineral Resources, 1987) (see Annex III) includes bathymetric maps at 1:2 M scale which could be a useful starting point for additional work in producing 1:1 M scale maps for this area.

16 The view of the Group with respect to choice of scales was that 1:1 M scale at 33° latitude (in keeping with the Australian series) should be used for all maps produced along the western part of the region. Maps covering the eastern part of the region could be produced using a smaller scale (see item 8 below).

17 It is not expected that the first session of the Editorial Board will be convened until at least September 1991. However, well before the session the IOC Secretariat should arrange for the preparation of a draft Sheet Assembly Diagram. This draft should be sent to the National Marine Data and Information Service (China), and others, for comment prior to distribution of the final draft to members of the Editorial Board well in advance of the session.

7. PREPARATION OF SPECIFICATIONS FOR THE IBCWP

18 "Specifications for International Bathymetric Charts Produced Under Regional Mapping Projects" (IOC/CGOM-II/3, Annex IV) were studied, and modified to meet local needs. The resulting "Draft Specifications for IBCWP" are attached to this report (Annex VII).

8. IMPLEMENTATION MECHANISMS

19 The Group of Experts considered the offer by China to compile, print and publish the whole of the final chart series and decided that this

task was too large for any one centre.

20 The western (marginal) part of the region was therefore divided into six subregions (for approximate limits see Annex VI). The compilation, printing and publishing of sheets from these subregions will need to be implemented in different ways, and further negotiations will be needed before the overall mechanisms can be finalized.

21 No attempt has been made to determine sheet limits within any of the subregions, as responsibility for defining sheet limits lies with the Editorial Board (see item 6). The sheet limits for all subregions should conform to the IBCWP Specifications (see Annex VII).

Subregion 1-- Sea of Okhotsk and SE Kamchatka.

22 The Group of Experts considered that the Soviet Union should be invited to compile these sheets. However printing and publishing of the sheets from this subregion would be a matter for negotiation between the USSR and the Chief Editor.

Subregion 2-- Japan Sea and waters surrounding Japan.

23 The Japan Hydrographic Department has already published a series of 4 sheets and is preparing a 5th sheet on a scale of 1:1 M (but on Lambert's conformal conic projection - standard parallels 30°N and 43°N) which cover the eastern part of the Japan Sea and at their eastern limits extend into the deep water to the east of Japan (see Annex V-B). The material contained in these sheets may be redrawn for inclusion in the IBCWP.

24 Responsibilities for compilation of the western part of the Japan Sea might be taken by the Soviet Union and North Korea in collaboration with the Japan Hydrographic Department.

25 The Japan Hydrographic Department may be invited to publish the sheets for this subregion, or they could be printed and published by China.

Subregion 3-- The Central Western Pacific.

26 The subregion is bounded on the north by the southern limit of subregion 2, on the west and south-west by the limit of WESTPAC, on the south-east by subregion 4 and on the east by longitude 140°E.

27 The data from the north-western part of this subregion will be compiled by China (National Marine Data and Information Service, Tianjin). The remaining sheets in the subregion might be compiled by countries such as Philippines and Indonesia, with technical assistance offered by other members of the Editorial Board.

28 Sheets from this subregion should be printed and published by NMDIS, China, as the other sheets in this subregion, unless other arrangements result from further negotiation.

29 The Group of Experts considered that subregion 3 should be given priority within the IBCWP Project.

Subregion 4-- The Australian northern and eastern margin.

30 This subregion extends south of the island of New Guinea and covers the Australian northern and eastern margin. It is being prepared as

part of a series of maps for the entire Australian margin. These maps will be compiled, printed and published by the Bureau of Mineral Resources, Australia (see Annex V-A).

Subregion 5-- Waters surrounding New Zealand.

31 Compilation of these sheets will be decided by negotiation with New Zealand. Any unmapped area between Australia and New Zealand should be covered by mutual agreement between these two countries.

Subregion 6-- SOPAC Area.

32 The area covered by the SOPAC chart "Bathymetry of the South-west Pacific" (1983): 40° S to 5°N; 140° E to 155° W, but omitting the area covered by subregions 4 and 5. Mapping in this area needs to be discussed further with the SOPAC Secretariat which should be invited to send a representative to meetings of the Editorial Board.

33 The remainder of the WESTPAC region to the east of these subregions could be covered at a later stage, as opportunity permits, by a number of sheets at the same or smaller scale.

34 The Group suggested that in order to facilitate implementation of the IBCWP project, each member of the Editorial Board should act as the national co-ordinator for his/her country and ensure data flow from that country. The Chief Editor, in turn, would ensure the transmission of all necessary data to the compilers of the individual sheets.

35 A responsible compiler should be appointed for each sheet as it is taken in hand for compilation. This person would prepare compilation sheets on a scale of the order of 1:250,000 which when complete would be submitted to the Chief Editor for review and quality control. Whenever possible the compiler should meet with the Chief Editor in person, so as to ensure that a full explanation can be given of the procedures followed, data used, etc. Additional funding may be required for this purpose.

36 Whenever possible whole sheets should be allocated to one responsible compiler. However this may not always be possible, (e.g. in the Japan Sea), and in these cases close collaboration between individual compilers will be needed during the compilation stage. When adjacent sheets are the responsibility of different compilers, it will be necessary for them to exchange copies of their compilations to ensure smooth continuation of contours from one sheet to the next. This should occur before compilation sheets are submitted to the Chief Editor.

9. CO-OPERATION ARRANGEMENTS WITH INTERNATIONAL AGENCIES IN THE WESTPAC REGION

37 Mr. Kunikazu Nishizawa will report to the East Asia Hydrographic Commission (EAHC) later this year on the outcome of this meeting and he will continue to be the primary link with that Commission. The Chief Editor for IBCWP will be asked to establish and maintain links to both CCOP and the South Pacific Applied Geoscience Commission (SOPAC).

10. ANY OTHER BUSINESS

38 Mr. Nishizawa suggested that a training course be considered for participants in the programme. The Group felt that this suggestion had

considerable merit and recommended that the IOC Secretariat organize such a course along the lines of a similar course which was held in Madagascar for participants in the Western Indian Ocean Programme. If possible a suitable oceanographic research vessel should be made available for this course.

11. CONCLUSION

39 The Group adopted a recommendation to the IOC Assembly, proposing the creation of a project to prepare an International Bathymetric Chart of the Western Pacific (IBCWP), and the establishment of an Editorial Board for this purpose. Attached to the recommendation are Draft Terms of Reference for the Editorial Board (See Annex II).

12. ADOPTION OF THE SUMMARY REPORT

40 The Summary Report was adopted before closure of the Meeting.

13. CLOSURE OF THE MEETING

41 The Chairman closed the session at 18:00 on Thursday 14 June 1990, and in so doing thanked the Director of the National Marine Data and Information Service, Prof. Hou Wenfeng, and his staff for the hospitality and administrative support that had been provided.

ANNEX I

AGENDA

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ANNEX II

RECOMMENDATION
ON BATHYMETRIC CHART OF THE WESTERN PACIFIC

The ad hoc Group of Experts on Ocean Mapping in the WESTPAC Area,

- A -

Recognizing the importance of bathymetric charts and relevant geological and geophysical charts, of nearshore and offshore areas as a basis for multidisciplinary and co-operative marine research and for mineral resource exploitation,

Noting that a high-precision International Bathymetric Chart of the Mediterranean on a scale of 1:1,000,000 has now been published, that the International Bathymetric Charts of the Caribbean Sea and Gulf of Mexico, Western Indian Ocean and Central Eastern Atlantic are in various stages of compilation,

Recommends that the Intergovernmental Oceanographic Commission undertake the preparation of an International Bathymetric Chart of the Western Pacific (IBCWP);

Requests the IOC Assembly, at its Sixteenth Session, to establish an Editorial Board for IBCWP consisting of one suitably qualified expert from each of the participating countries together with a Chief Editor who should also be appointed. Proposed draft terms of reference for the Editorial Board are attached hereto as an Annex.

- B -

Being aware that China has offered to assist in the preparation and publication of such a chart in the form of mutual assistance under TEMA,

Thanks China for this generous offer;

Recommends that China be invited to nominate a Chief Editor for the IBCWP;

Urges Member States of IOC to assist Member States of the region in the implementation of the bathymetric mapping project, including provision of existing data, acquisition of survey data and related training;

Recommends also that a training course be held in the region aboard an oceanographic research vessel, along the lines of that held for the International Bathymetric Chart of the Western Indian Ocean.

Appendix to Recommendation on Bathymetric Chart of the Western Pacific

TERMS OF REFERENCE FOR THE EDITORIAL BOARD FOR THE INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN PACIFIC

The IOC Editorial Board for the International Bathymetric Chart of the Western Pacific shall:

1. BASIC FUNCTIONS

Supervise the preparation and publication of the IOC International Bathymetric Chart of the Western Pacific (IBCWP) using all available bathymetric data as input to the series, taking into account, in particular, the holdings of the World Data Centre for Bathymetry (IHO), the IHO Data Centre for Digital Bathymetry and the World Data Center "A" (Marine Geology and Geophysics), and subsequently consider the need to prepare and publish geological/geophysical series of the same areas.

2. PROGRAMME DEVELOPMENT

Prepare a detailed plan of action for carrying out the project and activities, to be submitted to the IOC Consultative Group on Ocean Mapping (CGOM) for its consideration.

2.2 PROMOTION

Promote the IBCWP and related supporting activities in the Member States of the IOC Sub-Commission for the Western Pacific (SC-WESTPAC) and in their marine scientific communities.

2.3 CO-ORDINATION

Identify the participants (institutions, individual scientists and experts), keeping them informed of the actions that each of them is expected to undertake in the implementation of the IBCWP and on activities being taken by the other participants so as to avoid unnecessary duplication of effort and to optimize results.

2.4 SCIENTIFIC AND TECHNICAL ADVICE

Advise the participants, as appropriate, of the methods and procedures to be used in carrying out the work related to the agreed project and activities, and on any methodological questions falling within the Editorial Board's sphere of competence.

Advise the Member States of the SC-WESTPAC on the requirements for Training, Education and Mutual Assistance in the marine sciences (TEMA) related to the WESTPAC region, and advise the IOC of these requirements.

2.5 COLLABORATION

Collaborate with the IOC Consultative Group on Ocean Mapping concerning the technical specifications for the IBCWP, taking into account the draft "Specifications for the IBCWP" drawn up by a Group of Experts in June 1990.

2.6 EVALUATION

Evaluate progress in the implementation of agreed projects and activities, with a view to proposing new approaches or new directions in the light of results achieved.

3. OTHER FUNCTIONS

3.1 TECHNICAL POLICY

Advise the Member States participating in the IBCWP on technical requirements for the effective implementation of the agreed projects and activities for the achievement of the Editorial Board's objectives in this field.

3.2 REPORTING

Present a Report on the scientific and technical aspects of its activities and progress to each session of the Consultative Group on Ocean Mapping, and also inform the SC-WESTPAC on developments and progress with preparation of the IBCWP.

ANNEX III

LIST OF DOCUMENTS

WORKING DOCUMENTS

IOC/IBCWP/1GE	Provisional Agenda
IOC/IBCWP/2GE	Annotated Provisional Agenda
IOC/IBCWP/3GE	Draft Summary Report
IOC/IBCWP/4GE	Provisional List of Documents
IOC/IBCWP/5GE	Provisional List of Participants

OTHER DOCUMENTS

IOC/SC-WESTPAC-I/3	Summary Report of the First Session of the IOC Sub-Commission for the Western Pacific.
	Summary Report on Available Bathymetric Projects and Related Charts etc. in the WESTPAC Region, prepared by Dr. J.R.E. Harger, 1987.
IOC/CGOM-II/3 Annex IV	Specifications for the International Bathymetric Charts Produced under Regional Ocean Mapping Projects.
------	Letter from Mr. D.P.D. Scott of 10 October 1989 to Professor Hou Wenfeng.
------	Telex from Professor Hou Wenfeng of 8 January 1990 to Mr. D.P.D. Scott.
------	Bathymetric Mapping of the Australian Continental Margin: A possible model for the IOC WESTPAC region (Johnston, C.R. et al, 1990), BMR Record 1990/56 (see enclosed copy).
------	Atlas of Geology and Geophysics of the South China Sea compiled by the Second Marine Geological Investigation Brigade of the Ministry of Geology and Mineral Resources, published by Map Publishing House of Guangdong Province in 1987.

ANNEX IV

PROPOSAL FOR THE COMPILATION OF THE 1:1M BATHYMETRIC CHART OF THE WESTERN PACIFIC MARGINAL SEAS THROUGH INTERNATIONAL CO-OPERATION

1. BACKGROUND

Seawater covers over two-thirds of the earth's surface, so it is difficult to directly observe the seafloor features. The technology of remote sensing used in mapping on land cannot be ideally applied to the development of ocean mapping because of the impenetrability of the huge ocean water masses by wave beams. Although, for half a century, trenches with depth over 10,000 metres, rift zones running several thousand kilometres and a large number of seamounts have been discovered in the oceans, little has yet been understood of the seafloor topography so far.

One of the first and most important steps in the growing development of the oceans is the preparation of bathymetric charts showing the topography of the ocean bottom in as much detail as possible on the basis of the collection and analysis of the increasing bathymetric data. In recent years, many coastal nations and international organizations have compiled and published bathymetric charts for various oceanic regions.

Since the United Nations General Assembly endorsed the Long-term and Expanded Programme of Oceanic exploration and Research in 1969, IOC has been active in promoting of the international ocean mapping. In 1970 the compilation of a Geological/Geophysical Atlas of the Indian Ocean was started (published in 1975 by the Academy of Sciences and the Main Administration of Geodesy and Cartography, USSR) using the findings of the International Indian Ocean Expedition. And two further atlases in this series covering the Atlantic and Pacific Oceans are now in preparation. In 1972, the IHO and the IOC set up the Joint IOC/IHO Guiding Committee to compile the 5th Edition of the General Bathymetric Chart of the Oceans (GEBCO), which was published in 1982 by the Canadian Hydrographic Service. This series of 16 1:10M and 2 polar GEBCO sheets is based on a large amount of valuable sounding data and incorporates the latest research findings on modern marine geological structures and geophysics. In 1973, a group of experts was set up to prepare the 1:1M Bathymetric Chart for the Mediterranean Sea and the Black Sea. It was the first IOC regional mapping project and this region is at present one of the best explored regional seas in the world from the point of view of cartography of the sea bottom. The first edition of this chart series was printed and published by the Head Department of Navigation and Oceanography, USSR, on behalf of the IOC, in 1982. The editorial boards for ocean mapping set up so far by the IOC including: the 1:1M Bathymetric Chart Editorial Board for the Caribbean Sea and the Gulf of Mexico and their adjacent regions, initiated in 1986; the Bathymetric Chart Editorial Board for the Western Indian Ocean with members from countries of the region and other interested countries, which was set up in 1989; and the Editorial Board for the Central Eastern Atlantic established by the IOC Assembly at its Fourteenth Session in April 1987. At meetings of relevant IOC Regional Committees, plans for a 1:500,000 Bathymetric Chart for the Red Sea and the Gulf of Aden have been drawn up and proposals put forward for International Bathymetric Charts for the Central Indian Ocean, the Southern Atlantic and the Western Pacific.

At the meeting of the IOC WESTPAC Sub-Commission held in Hangzhou, China, in February 1990, the Chairman appointed a group of experts to

analyse the situation and discuss the proposal for the bathymetric chart of the Western Pacific Ocean. Today, the successful convening of a meeting of the IOC Group of Experts on Ocean Mapping in the Western Pacific Region in Tianjin, China, will surely greatly contribute to this project.

2. USER'S REQUIREMENTS

The 5th Edition GEBCO Sheets and their plotting sheet system illustrate the outstanding progress and achievement in ocean mapping of the world today. However, display of the bottom features of the marginal seas is limited due to their large scale. On the other hand, the 1:1M World Map which has been in use for over 70 years only covers the land. The bathymetric chart for the Western Pacific Ocean may be regarded as an appropriate expansion and extension of the two above mentioned series of maps of the marginal seas. With definite purposes for application, it provides the users of sea bottom topography with a common and most effective interpretation.

Ocean bottom topography provides the support for all marine activities, and the bathymetric chart offers a useful tool for drawing up plans and programmes as well as various marine laws and regulations in ocean management.

Development of maritime transportation and trade is a prerequisite for improving the economies of the coastal countries, and the provision of sufficient hydrographic data according to the modern standards is thebasic requirement for guaranteeing the sailing safety of ships andocean engineering constructions.

The Exclusive Economic Zone (EEZ) may extend to a range of 200 nautical miles from the accepted baseline. On the one hand, the coastal countries are responsible of the hydrographic surveys in the EEZ. In order to support the increasingly growing fishing activities and mariculture, the users in the field of fishery will undoubtedly need marine environmental information, including bathymetric charts.

The control of nonrenewable marine resources will be extended to the outer limits of the continental shelf and the coastal states will urgently need to know the scope of their continental shelves, which requires the provision of the latest ocean measurements so as to identify the location of the outer limits of the continental shelf and verify the potential reserves of nonrenewable resources. The National Ocean Service (NOS) of the United States used the multi-beam sounding system to provide full-coverage measurement of the ocean bottom, acquiring the bathymetric chart for the continental shelf and slope in such detail and precision as has never been achieved before. The bathymetric chart thus obtained is used to define the regional features and resource conditions of the surveyed area. Comprehensive work on hydrography and geophysics is required for the exploration and industrial exploitation of marine oil and gas. An adequate sounding and topographic information service is necessary for the prospect of reserves, detailed exploration, well site determination, platform development, and oil and gas pipeline planning.

The rugged sea bottom, especially near-bottom topography, affects the physical, chemical and biological processes of the ocean and therefore it is a factor which warrants special attention in marine scientific

research. The bathymetric chart contributes to the interpretation of seafloor geology and it is also the basic map for compiling sailing charts, marine special-subject (gravity, magnetics, sedimentation, geological structure and resources) maps and for plotting various statistical data.

The bathymetric chart, like other maps, is a form of expression in written language, a special way of processing, storing and transferring bathymetric information and may establish digital topographic models. It thus has a variety of potential benefits. Its scientific content and successful artistic expression can enlighten the users on the applications of the chart and broaden their thinking. With the development of science and technology and the uninterrupted introduction of new concepts, in addition to satisfying the needs of the users in the fields of ocean shipping, fishing, oil and gas exploitation, marine laws and regulations, and environmental protection, the bathymetric chart may be valuable to marine scientists as well as to decision makers.

3. CONDITIONS AVAILABLE FOR THE COMPILATION OF THE BATHYMETRIC CHART

Since the 1970s, the Hydrographic Department of the Maritime Safety Agency, Japan, has been carrying out surveys for nautical charts, and has compiled and published over 100 sheets of a Continental Shelf Topography Chart on a scale of 1:200,000 and 5 sheets of a Bathymetric Chart on a scale of 1:1M covering the whole of Japan including the continental shelf and slope, thus providing valuable experience for the co-operative compilation of the bathymetric chart for the Western Pacific. The Hydrographic Department has set up the nautical chart digital database and developed automatic plotting of its current nautical and bathymetric charts. As a result, the ratio of nautical charts being compiled automatically has been increasing.

The Soviet Union published the Marine Atlas in the early 1950s and, in the 1970s compiled the Oceanic Atlas, which has new and scientific contents. Moreover she has conducted a survey of the national continental shelf, and compiled and published bathymetric charts of the continental shelf.

Starting the continental shelf survey in 1969, Australia plans to compile over 280 sheets of the 1:250,000 Continental Shelf Bathymetric Chart and establish an Hydrographic Information System on the Hewlett Packard 9000/840 Computer.

China began to conduct a bathymetric survey in the sea area 100-150km offshore in the early 1950s. Up till now, over 30 large-scale comprehensive marine surveys and international co-operative investigations, including ocean sounding, have been undertaken in the adjacent waters of China, acquiring large amounts of sounding data, some of which have been published as bathymetric charts according the needs of the users.

The China National Marine Data and Information Service, which is concurrently the WDC-D (Oceanography), is a comprehensive department for marine information technology and public-benefit service, maintaining business contact with the surveying and mapping agencies of a dozen ministries, commissions and administrations at home and carrying out various forms of co-operation and exchange in technology and data. For example, the National Laboratory of Resources and Environment Information System of the Chinese Academy of Sciences is a research centre under the guidance of international experts. With the VAXII 785 Computer at its core, the centre

owns an information acquisition, processing and analysis system consisting of the IIS Image Processing System, Plaincomp C-120, Orthocomp Z2 Rectifier and SEG-6C Colour Rectifier as well as the ARC/INFO Geography Information Software and several microcomputers.

The Research Institute of Surveying and Mapping of the National Bureau of Surveying and Mapping is carrying out the programme of acquiring, compiling and processing the data, including marine information, and of establishing databases on the basis of the VAXII/750, 780, 785, and MICRO VAXII Computer, CALCOMP9100, ALTEK Graph Digitizer, TEKTRONIX 4991 Scan Digitized Workstation as well as the Log-E and DIPIX Digitized Graph Processing System. The Department of Cartography of the Wuhan Technical University of Surveying and Mapping has developed the Map Database Management System, the General-Purpose Map Projection Transformation Software Package and the Microcomputer Geography Information System. The National Marine Data and Information Service started early research on computer-aided ocean mapping. In 1987, it imported from the United States the Intergraph system, whose major equipment includes the MICRO VAXII Computer, Interpro 32 Colour Graph Workstation, TISO 12 Digitizer and Gerber 3278 Plotter. In combination with the IBM4341 Oceanographic Data Processing System and aided by a microcomputer laser filmset and a whole set of printing equipment, the Intergraph System has acquired satisfactory results of cartography in the compilation of marine special-subject maps, acquisition, editing and output of bathymetric data and application programming. It may be believed that China's capability as mentioned above alone constitutes the support for the compilation of the bathymetric chart of the Western Pacific Ocean. The National Marine Data and Information Service is under the State Oceanic Administration which is in charge of the national marine work. In response to the ocean mapping programme for the Western Pacific, the Administration will provide technological and budgetary support and guarantee. To sum up, we believe that at present conditions are basically ripe for the implementation of a bathymetric chart programme for the Western Pacific region. This is mainly manifested in the fact that the coastal countries of the Western Pacific have conducted widespread sounding surveys, and own marine scientific talents in various disciplines, the softwares and hardwares for establishing sounding and topographic databases, automatic mapping systems and satellite image and data processing. At the same time they are provided with the data and technical conditions necessary for the compilation and publication of the bathymetric chart as well as the financial support for the publication of this chart series.

4. RECOMMENDATIONS FOR CO-OPERATION

The statistics from the seven coastal regions of the world oceans show that only 30% of the waters has been surveyed in sufficient detail, 27% needs to be surveyed again and 42% lacks survey or has not been surveyed. It is obvious, therefore, that the compilation of the 1:1M bathymetric chart for the Western Pacific requires extensive international co-operation among the coastal countries in this region and other interested participating nations. We hope that more countries and organizations will join in this significant international ocean mapping activity.

In this connection, we make the following recommendations:

(i) Area of Coverage

The focal coverage of the bathymetric chart of the Western Pacific is 65°N-45°S, 100°E-165°W, including a series of Western Pacific marginal seas, straits, bays and adjacent waters. Large as it is, this region boasts many coastal nations, which have conducted widespread hydrographic

surveys. While preparing the valuable sounding data of this region, we will first consider the data in the possession of the WDCs and the WODCs. We will also take into consideration the data owned by other well-known mapping projects in this region such as GEBCO, GAPA, CCOP, etc., whose sounding and topographic data may also be quite useful. Of course, it may be a good idea to divide as appropriate this region into sub-regions on the basis of the coverage of the data, but perhaps that will affect the integrity and the joining of the plotting sheets. In view of this, China intends to undertake the task of plotting, printing and publishing all the sheets for this region, while seeking support and co-operation from the Soviet Union, Japan, Australia, etc. We think that the prospects are promising.

The selection of the chart scale for this region is also very important. Mr. Scott said in a record letter: "As I mentioned above, on what scale should the printed chart series be published? i.e. do sufficient data exist in the region from which to prepare a series on a scale of 1:1 million?" We feel that the final chart scale of the bathymetric charts in relation to the GEBCO, GAPA and CCOP programmes is generally too small, affecting the display of ocean bottom topography. In view of their general-purpose applications, they cannot replace the unified and systematic compilation of 1:1M bathymetric charts and their functions. Moreover, the chart scale of other regional mapping projects sponsored by IOC is 1:1M, so for consistency, in this region the same scale should be used. Furthermore, it is also necessary to keep the scale of the bathymetric chart of this region in line with that of the 1:1 M land mappling programmes. Therefore, for this region, we intend to use the 1:1 M scale, although for the areas that lack sufficient data, a smaller scale may be necessary.

(ii) Institutional Arrangements

a) In the name of the IOC Sub-Commission for WESTPAC, the coastal countries in the Western Pacific and other interested participating countries are invited to recommend expert candidates to form, through consultation, the Editorial Board for the International Bathymetric Chart of the Western Pacific. China is willing to be the Chief Editor of this Board and set up the administrative body (headquarters) in Tianjin, China. The responsibilities of the administrative body are to acquire, analyse, manage and exchange the various valuable sounding and topographic data of this region, undertake to report to the IOC Consultative Group on Ocean Mapping the detailed plan, recommendations and annual reports on the project and activities to be implemented, keep abreast of the progress of the mapping project, co-ordinate the mapping tasks, carry out scientific and technological consultations related to the mapping project, analyse the problems and guarantee quality, and keep the IOC Sub-Commission for WESTPAC informed of progress with the mapping project.

b) In the name of IOC, the International Hydrographic Organization is invited to participate in this mapping acitivity, and to co-operate with the Editorial Board for the International Bathymetric Chart of the Western Pacific region in the fields of sounding and topographic data acquisition, and the editing of the bathymetric chart.

c) Countries outside the region, and international programmes and bodies (GEBCO, GAPA, CCOP, SOPAC, EAHC) are invited to participate in the co-operative mapping and provide technological and data support.

(iii) **Technical Programme**

a) Referring to the available regional cartographic literature, the Editorial Board for the International Bathymetric Chart of the Western Pacific region will formulate technical specifications and legends and report to the IOC Consultative Group on Ocean Mapping.

Unified provisions must be made for the intervals of contours for the region as a whole, but for different sea areas appropriate adjustments and changes may be made according to topographic characteristics.

b) Based on the available sounding and topographic data catalogue provided to the Editorial Board for the International Bathymetric Chart of the Western Pacific region by the participating countries, a data collection and exchange mechanism will need to be established.

c) A Data Quality Control Group could be established if the Chief Editor deems it necessary.

d) To facilitate the management, use and renewal of the sounding and topographic data, the sounding and contour data are predigitized and databases are established. Unified design is made of the function, content, data structure, input data types, digitized patterns and encoding system as well as the precision of the input/output data.

e) Backed by the sounding and topographic databases, the bathymetric fair chart is compiled and plotted, mainly depending on computer-aided plotting technology, combined with conventional plotting technology.

f) After defining priority sea areas for mapping, a specimen map should be compiled as a basis for modification and addition of specifications by the Editorial Board.

g) Before the fair chart goes to press, the chart editors and scientific and technological co-ordinators should undertake to make a scientific evaluation and explanation, in combination with regional oceanographic research findings, on the ocean bottom features plotted by using the contour lines, and report to the Editorial Board.

On the basis of the fair chart, data and literature, an appraisal meeting should be held with the participation of the IOC, IHO, the IBCWP Editorial Board, printing and publishing departments and earth scientists, to make an appropriate evaluation of the scientific and cartographic level of the fair chart, before finalizing the various technical requirements for chart production.

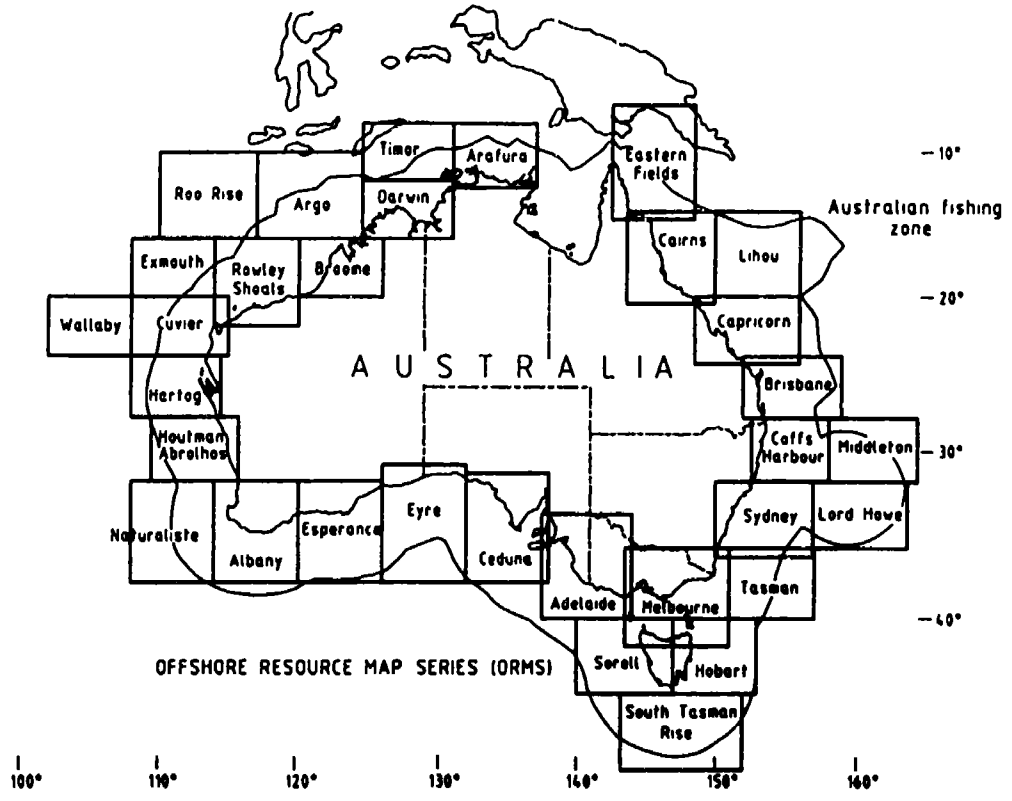
As a national marine institution, the China National Marine Data and Information Service maintains good co-operative relations with well-known earth scientists and computer experts both at home and abroad, so that the scientific nature and high quality of the marine cartographic products may be guaranteed. Since 1976, the Service has edited and published over 20 oceanographic atlases with various contents and editions, and over 200 kinds of special-subject charts which contain large amounts of

topographic ocean sounding data.

The Service has become a department with prestige and distinctive features in the field of ocean mapping for national marine environmental elements and marine resources. We will follow with great interest this international co-operative mapping activity, and make great efforts to support it and seek financial aid for it, making our contribution to the editing, plotting and publication of the WESTPAC Bathymetric Chart.

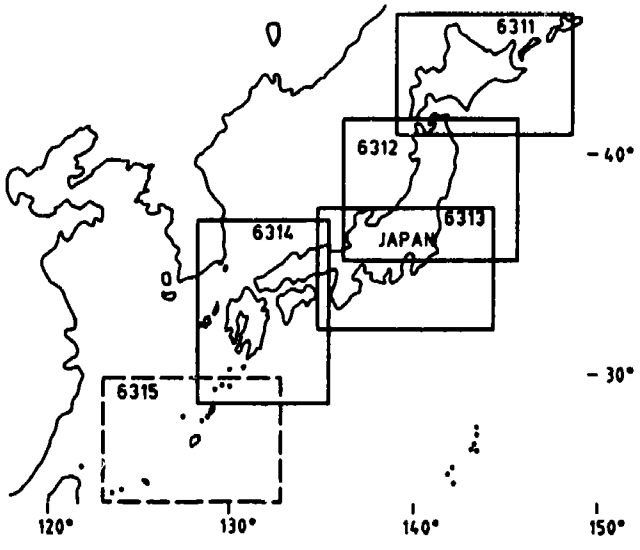
ANNEX V

PUBLISHED AND PLANNED SERIES OF BATHYMETRIC CHARTS FOR MARGINS OF AUSTRALIA AND JAPAN



A

Planned series of 1:1M scale resource maps (including contoured bathymetry) for the Australian Margin. Maps to be produced using Mercator projection with true scale at 33° latitude



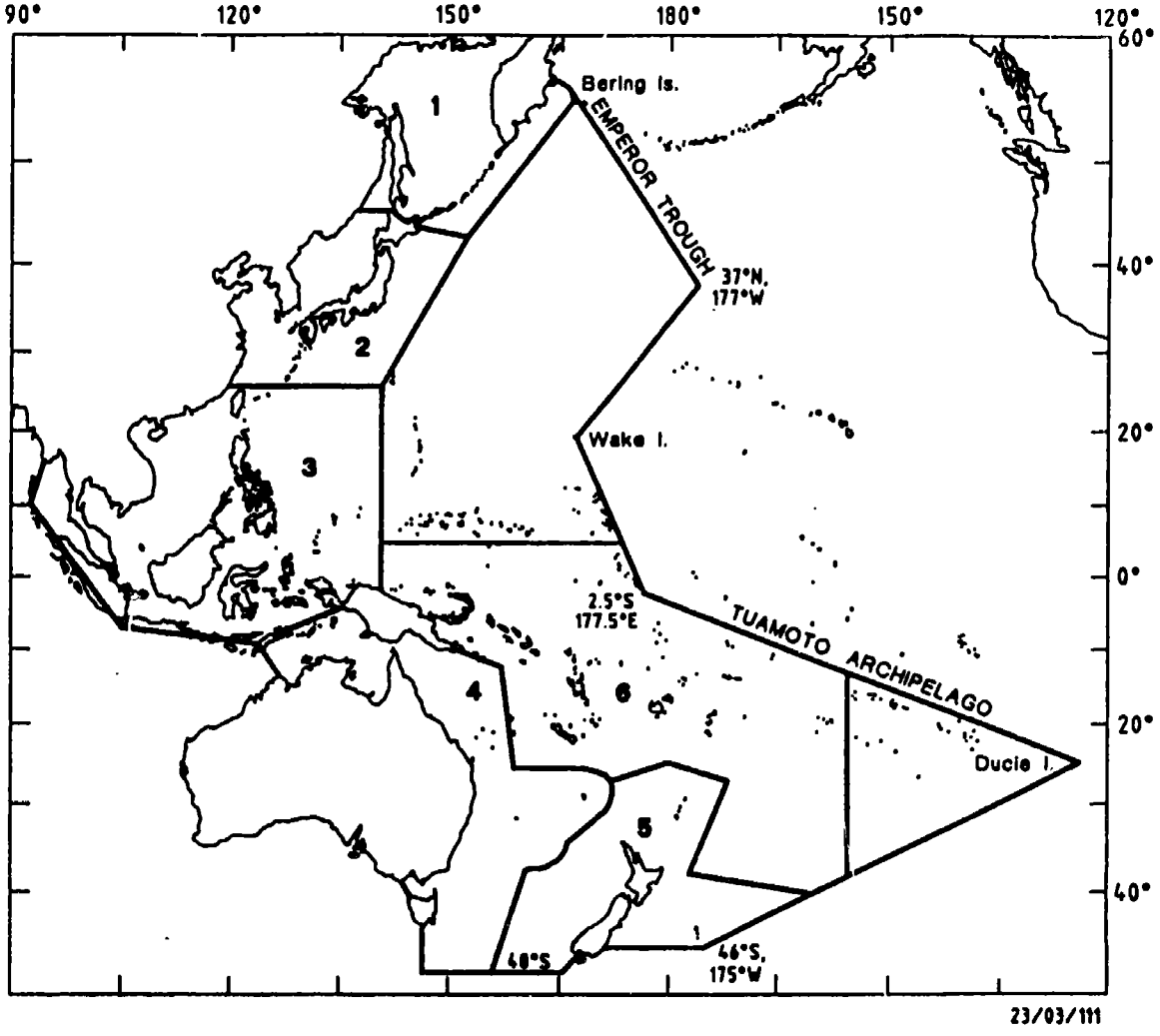
B

23/03/112

Published series of four 1:1M scale bathymetric maps for the Japanese Margin. Dashed sheet has yet to be published (approximate location only). Maps produced using Lamberts conformal conic projection - standard parallels 30°N and 43°N.

ANNEX VI

APPROXIMATE LIMITS OF PROPOSED SUBREGIONS COVERING THE WESTERN PART OF THE WESTPAC AREA



Subregions:
1. Sea of Okhotsk and SE Kamchatka
2. Japan sea and waters surrounding Japan
3. The Central Western Pacific
4. The Australian northern and eastern margin
5. Waters surrounding New Zealand
6. SOPAC area.

ANNEX VII

SPECIFICATIONS FOR THE INTERNATIONAL BATHYMETRIC CHART OF THE WESTERN PACIFIC (IBCWP)

SECTION 100 - GENERAL

101 - **Introduction**

A. International Bathymetric Charts produced under Regional Mapping Projects are a continuation and further development of the General Bathymetric Chart of the Oceans (GEBCO), under the general guidance of the IOC Consultative Group on Ocean Mapping. These charts are prepared and published with the co-operation of IHOs Volunteering Hydrographic Offices (VHOs) and/or groups of scientists from appropriate institutions.

B. For the IBCWP series, an Editorial Board will be established by the IOC Assembly or Executive Council, for the purpose of technical direction of its compilation and publication.

SECTION 200 - BASIC SPECIFICATIONS

201 - **Projection**

All sheets shall be shown on Mercator Projection using the International Ellipsoid, WGS-84.

202 - **Scale**

A. A scale of 1:1,000,000 at 33° Latitude shall be used for the western sheets as shown in the sheet Assembly Diagram (to be prepared by the Editorial Board). At a later stage it may be found desirable to produce some of the eastern sheets on a smaller scale.

203 - **Graticule**

A. A scaled border of each sheet shall be shown subdivided into 1 minute increments of latitude and longitude.

B. Meridians and parallels shall be drawn every 2°.

C. Labelling of the graticule shall be every 1°.

D. The tropics of Capricorn and Cancer shall be shown.

204 - **Size**

The neat line size of each sheet shall not exceed 700 x 900 mm.

205 - **Numbering**

A. For each chart a consecutive sheet number shall be used as shown in the Assembly Diagram.

B. Sheet numbers shall be printed in 8 mm Arabic figures in the lower right-hand and top left-hand corner of each sheet.

206 - **Dating**

The date of the chart publication to be shown on each sheet shall be the date of going to press.

207 - **Units of measurement**

Depths and topographic heights shall be shown in metres. Depths should be corrected from the latest edition of the Echo-Sounding Correction Tables, published by the United Kingdom Hydrographic Department, and this should be stated on the face of the chart.

208 - **Marginal information**

A. All marginal information shall be in English (a Chinese or other language version of certain sheets may be printed if so wished).

B. This shall include:

1. The general title of the chart.
2. Sheet number.
3. Projection, ellipsoid and scale (see 201, 202).
4. Unit of measurement used for depths and heights.
5. Code of colours used to portray hypsometry.
6. Code of colours used to portray bathymetry.
7. An index of areas and names of countries whose Hydrographic Offices or groups of scientists prepared plotting sheets for the sheet.
8. The names of scientific co-ordinators of the chart series and of scientists responsible for the scientific content of the sheet.
9. The logo of the Intergovernmental Oceanographic Commission (IOC) of Unesco.
10. Edition number and date of publication (see 206) followed by the statement:
"Published by the ..... (name of publisher)
under the authority of the IOC (of Unesco)".
11. List of the sources of the data used (for the chart series).

SECTION 300 - TOPOGRAPHY

301 - For the land part, topographic maps shall be used.

302 - The World Vector Shoreline (WVS) shall be used. The coastline shall be shown as a firm line in black.

303 - A. Contours on land shall be at 200 m intervals.

B. The thicker lines shall be at 200, 1,000, 2,000, 3,000, etc., m. intervals.

C. Additional contours which may be required by the data must be shown.

D. A colour change for hypsometry shall be used at the following intervals: 0-200, 200-1,000, 1,000-2,000, etc., m.

E. Glaciers shall be shown by contours or by symbols. The signficant heights shall be shown.

304 - **Hydrology of the land**

On the chart shall be shown, as appropriate:

- rivers and channels;
- lakes;
- lagoons.

305 - Major cities and towns, priority being given to those on the coast.

SECTION 400 - BATHYMETRY

401 - Compilation sheets shall be prepared by the participants in the Project, according to agreed zones of responsibility, on a scale of the order of 1:250,000. The British Admiralty 1:250,000 plotting sheets may be used; they should be prepared according to the Appendix to these Specifications.

402 - **Soundings**

A. A sparse pattern of numerical soundings shall be shown to indicate maximum and minimum (and other significant) depths, where known, over major undersea features in such a way as not to detract from the paramount objective of indicating sea floor relief by means of contours.

The exact position of all numerical soundings shown shall be indicated by a dot. The depth shall be written as cartographically convenient against the dot using 1.5 mm sans-serif figures. Where space does not permit the juxtaposition of the figures they may be offset and linked by a fine line to the dot placed in the exact position.

B. In order to indicate contour reliability, all soundings used shall be shown as dots representing discrete soundings or lines representing continuously sounded traverses. Areas of detailed surveys, where soundings are denser than can be conveniently shown, shall be indicated by numbered boxes referenced in the margin.

403 - **Depth contours and colours**

A. Basic contours shall be at 200 m intervals.

B. The 200 m contour line and all contours at 1,000 m intervals shall be drawn using thick lines.

C. 20, 50 and 100 m contours, if necessary, shall be drawn using thin lines.

D. A colour change for the bathymetry shall be used at the following intervals: 0-200, 200-1,000, 1,000-2,000, 2,000-3,000, etc., m.

SECTION 500 - NOMENCLATURE AND GEOGRAPHICAL NAMES

501 - A. A proposed list of names for inclusion on each sheet will be forwarded to the GEBCO Subcommittee on Geographical Names and Nomenclature of Ocean Bottom Features, with a request for guidance on any that might be controversial. In preparing this list account should be taken of the guidelines contained in the GEBCO publication "Standardization of Undersea Feature Names".

B. As a general policy, local names (cities, towns, mountain ranges, rivers, etc.) shall be in exact agreement with the form prescribed by the most authoritative national source. However, in those cases where the national names differ substantially from the normal English usage, the English version shall be shown alongside in parenthesis.

C. The nomenclature for undersea features shall be shown in the English language.

APPENDIX TO ANNEX VII

RECOMMENDATIONS FOR PREPARATION OF PLOTTING SHEETS FOR INTERNATIONAL BATHYMETRIC CHARTS PRODUCED UNDER REGIONAL MAPPING PROJECTS

1. For plotting and contouring purposes the British Admiralty's 1:250,000 plotting sheets for oceanic soundings may be utilized.

2. Soundings should be in metres, corrected using the latest edition of the "Echo Sounding Correction Tables".

3. The position of the sounding should be the central point of the group of figures representing it. But the position may also be indicated by a dot with the sounding figure alongside, and if necessary, by a thin line drawn to connect the two.

4. The soundings figures should be inscribed across the track; the figures should be easily readable, the recommended average size being 1.5-2 mm in height.

5. The largest possible number of soundings should be shown on the plotting sheets so long as their clarity is not impaired. When soundings are very dense, the number may be reduced if care is taken not to eliminate the more important soundings: maxima and/or minima.

6. The margin of each plotting sheet should contain the following legend:

"Compiled by ....."
"Last brought up to date on ....."
"Prepared under the IOC (International Bathymetric Chart of the Western Pacific)".

7. Each plotting sheet should be accompanied by two overlays:

(i) overlay contour lines with contouring made through each 100 metres, additional contours may be drawn through 50 and 10 metres, where warranted (on the shelf and abyssal plains);

(ii) overlay source materials on which should be shown the following:

a) areas of soundings and position of isolated soundings with the appropriate legends required to indicate the source and the date of such soundings;
b) information on the method of navigation and its precision;
c) information on the type of the echosounder and its precision.

8. On each plotting sheet and overlay the date of completion of compilation should be indicated.

ANNEX VIII

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