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## **Study of the implications of preparing large-scale maps for the Third United Nations Conference on the Law of the Sea**

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# DOCUMENTS OF THE SECOND COMMITTEE

## DOCUMENT A/CONF.62/C.2/L.99

### Study of the implications of preparing large-scale maps for the Third United Nations Conference on the Law of the Sea

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#### I. Background

1. At its 106th plenary meeting, held on 19 May 1978, the Conference decided that the Intergovernmental Oceanographic Commission (IOC) and other competent international bodies should be asked to study the financial and other implications, including in particular the time required, for preparing large-scale maps (1:10,000,000) of the Atlantic, Indian, Pacific and Arctic Oceans, showing the effects of different formulae for defining the outer limits of the continental shelf.

2. Following a request from the President of the Conference, the Special Representative of the Secretary-General invited the Intergovernmental Oceanographic Commission and other competent bodies to assist in this task.

3. The Executive Council of the Commission, at its tenth session in June 1978, accepted this task and instructed the secretary to arrange for this task to be undertaken with the least possible delay, working in close co-operation with the International Hydrographic Organization (IHO).

#### II. The task

4. A study of the implications of preparing suitable maps on 1:10,000,000 scale of the Atlantic, Indian, Pacific and Arctic Oceans showing the effects of three different formulae for defining the outer limits of the legal continental shelf, namely, the 200-mile limit (proposed in particular by the group of Arab States) in document NG6/2 (see annex I), the two parts of the Irish formula in document NG6/1 (see annex II) and the proposal submitted by the Soviet Union in document C.2/Informal Meeting/14 (see annex III).

III. *Commentary on the preliminary study illustrating various formulae for the definition of the continental shelf with associated map at 1:30,000,000 (A/CONF.62/C.2/L.98 and Add.1 and 2)*<sup>50</sup>

5. This study was requested by the Conference in June 1977 and contracted by the United Nations Secretariat in January 1978 to provide an assessment of the impact of various formulae proposed to define the edge of the continental shelf.

6. The scale of 1:30,000,000 was chosen for this map in order to provide a visual impression on a single sheet of paper of the margins of the world interpreted according to the different formulations and to demonstrate the areas that might accrue to coastal States or to the International Sea-Bed Authority. In the time available for the preparation of this map only immediately available data sources could be used and many generalizations had to be made. Definitive interpretations of the formulae were made without detailed supporting arguments or justifications and precision was sacrificed for speed. The result, which contained a number of errors, omis-

sions and wrong evaluations (see document A/CONF.62/C.2/L.98/Add.3),<sup>50</sup> was, however, intended to be illustrative only.

7. In particular the line depicting the outer edge of the continental margin was extremely uncertain in places because of the lack of an accepted definition of this term which could be universally applied.

8. The map did not include a presentation of the informal suggestion by the Soviet Union (C.2/Informal Meeting/14) since it had not at that time been presented. The Intergovernmental Oceanographic Commission was requested to arrange for a line illustrating the proposal of the Soviet Union to be added to the preliminary study. However, after several versions were drafted, it was found not to be possible (see the statement by the representative of the Intergovernmental Oceanographic Commission to negotiating group 6, 29 August 1978).

#### IV. Study of the proposal to prepare larger scale maps: general comments

9. The study avoids commenting on the relative value of the different proposals, recognizing that this may depend on issues outside the present task. However, in order to assess the technical implications of preparing larger scale maps showing the different formulae, it is necessary to analyse the formulae themselves and point out technical difficulties which affect the production of these maps.

10. There is clearly a danger that if a series of 1:10,000,000 maps is produced under the auspices of an international authority, it could be considered as a definitive document and be used in support of national claims. It is therefore essential to maintain a clear distinction between small-scale maps such as the 1:30,000,000-scale preliminary study prepared for illustrative purposes only, based on current knowledge of the morphology and geology of the continental margins, and large-scale definitive charts which could vary in scale from 1:10,000,000 to 1:50,000. These large-scale maps will be necessary for ultimate determination of limits by coastal States and for possible negotiations, and may include data obtained especially for the purpose.

11. The analysis that follows considers the suitability of map scales in relation to the quantity and precision of the information to be displayed. At 1:30,000,000 the quantity of information displayed does not lead to overcrowding. The precision with which the position of the lines requested can be drawn at any scale depends on (a) the practical interpretation of the formulae; and (b) the quality and quantity of the geographical, morphological and geological data. These factors will be discussed in relation to each of the formulae.

#### V. The 200-nautical-mile limit

12. Document NG6/2 of 11 May 1978 describes the proposal to use a line drawn at 200 nautical miles off shore from

<sup>50</sup>Official Records of the Third United Nations Conference on the Law of the Sea, vol. IX (United Nations publication, Sales No. E.78.V.3).

the baselines from which the breadth of the territorial sea is measured.

13. In principle a limit drawn 200 miles from the coastline can readily be depicted with an accuracy appropriate to any chosen scale. However, it would be necessary to carry out a careful and detailed review of the extent to which features affecting the baselines under the provisions of the informal composite negotiating text<sup>51</sup> would affect the drawing of such lines. No estimate has been made of the cost, time or other requirements of drawing the 200-mile line from baselines as provided for in the negotiating text, since doing so would presuppose knowledge of the manner in which coastal States would apply the relevant provisions.

14. The data required are the world coastline, already available in suitable graphic form on Mercator's Projection on a scale of 1:10,000,000 at the equator in the *Carte générale du monde* (Institut géographique national, France) which is being used on sheets of the fifth edition of the General Bathymetric Chart of the Oceans (GEBCO) (see annex IV). The coastline also exists in digitized format. Some information on baselines is already available from national declarations made by coastal States.

15. There are several areas of uncertainty. The above coastline has been compiled for specific purposes. It is not known what off-shore features, islands, etc., have been omitted because of scale considerations. To check for missing information would be a considerable task. Whereas the use of baselines already declared presents no cartographic problem, it would be inappropriate to make assumptions about undeclared baselines. Even the declared baselines may not all be acceptable internationally and there is some doubt as to the propriety of using these on an international document.

16. In view of these uncertainties, the only immediately practical procedure is to draw the 200-mile limit based on the coastline. Two methods of preparation are possible: by computer or by hand.

17. The following are estimates of the time needed for preparation and of production costs:

(a) The maps prepared by computer using the coastline as a base would take 12 to 14 months to produce taking into account programme and tape preparation, print out, scribing, and printing time, including the initial time to arrange contracts. Conversion to equal-area or other projections would take two months more. The cost would total approximately \$50,000, including the price of the original tape, plotting time on the computer, preparation and production, printing, management and overheads.

(b) To prepare the series by hand would take a minimum time of six to eight months and would not cost appreciably less than (a). Both these figures depend on the availability of a large number of competent staff.

#### VI. *The Irish formula*

18. The Irish formula contains two options for establishing the outer edge of the continental margin where it extends beyond 200 nautical miles from the baselines, both options requiring the establishment of the position of the "foot of the continental slope".

19. Determination of the "foot of the continental slope" presents some interpretational difficulty. The formula states that "in the absence of evidence to the contrary, the foot of the continental slope shall be determined as the maximum change of gradient at its base". This allows considerable flexibility in the positioning of the line based on the nature of the "evidence". This "evidence" could be morphological or geological. "In the absence of evidence to the contrary", the definition is purely morphological and is based on geometrical

<sup>51</sup> *Ibid.*, vol. VIII (United Nations publication, Sales No. E.78.V.4).

concepts associated with a margin profile, and this is the only aspect that has been considered in this study. The "maximum change of gradient at its base" suggests that if there are several large changes of gradient, only that at the base (a word which is synonymous with foot) should be chosen to determine the foot of the continental slope.

20. The drafting of foot of slope lines beyond 200 nautical miles on a world map at any scale thus raises a variety of difficulties. There are basically three types of slope:

(a) Slopes connecting a shallow shelf and normal deep ocean floor. These may cross terraces, ridges, canyons, etc. which give rise to rapid changes of gradient.

(b) Slopes connecting a shallow shelf and extra-deep ocean floor in oceanic trenches. The region between the shelf edge and the axis of the trench may contain ridges parallel to the trench axis giving rise to several reversals of gradient in profiles.

(c) Slopes from shallow shelves to normal deep ocean floor, interrupted by areas of intermediate or shallow depth. The preliminary study indicates that examples of these types, especially of the third type, occur outside the 200-mile limit.

21. In order to enhance significantly the illustrative value and the accuracy of the foot of the slope line in a new study at a larger scale, it will be necessary to examine several tens of thousands of individual echo-sounding profiles. In the preliminary study, the foot of the slope line was obtained for convenience directly from the *World Ocean Floor Physiographic Diagram*, which was provided to all delegations at the seventh session of the Conference. This Diagram, however, used only a part of the total slope data now available and furthermore has inherent positional inaccuracies. Nevertheless it took 10 years to complete at a total cost of over one million dollars.

22. In addition to profiles, it is necessary to establish the topography between the profiles from other depth data and geological knowledge and this can best be done using detailed contouring. Such contours are currently being prepared in the international project, the General Bathymetric Chart of the Oceans, the fifth edition of which, providing world cover, is due to be completed in 1982.

23. The over-all accuracy and usefulness of a presentation of the line depicting the foot of the continental slope will depend on the quantity of data, its distribution in space and its availability.

24. It is estimated that at least three years will be necessary to complete a delineation of the foot of the slope line to the accuracy appropriate to a scale of 1:10,000,000 and that the cost could exceed one million dollars.

#### VII. *Irish formula 3 a*

25. This option requires the measurement of sediment thickness seaward of the foot of the slope line to be obtained initially from geophysical data and later tested by drilling.

26. The preliminary study used a composite of published maps of sediment thickness, contoured initially in units of the reflection time for seismic waves, and then recontoured in units of thickness using some measured and some assumed seismic velocities. Incompleteness of data coverage and quality necessitated considerable interpolation and extrapolation.

27. The preliminary study also showed that the line in Irish formula 3 a is seldom further than 120 nautical miles from the base of the slope (equivalent to 1.2 nautical miles sediment thickness) and often is less than 60 nautical miles (equivalent to 0.6 nautical miles sediment thickness). In such thicknesses the base of the sediments is not difficult to identify and the accuracy of the measurement of the sediment thickness is such that the ambiguity of the 1 per cent line is no greater than that of the foot of the slope line. Very few drilled holes are at present available to test the thickness profiles.

28. However, although a considerable body of data exists, or is presumed to exist, that will permit identification of the base of the sediments in this manner, a considerable amount of processing and interpretation will be needed before they can be compiled in map form. Even so, there may be insufficient profiles in some areas to satisfy the need for data points at 60-mile intervals required by the formula.

29. Even for the purpose of preparing 1:10,000,000-scale maps, the task of locating, gaining access to, sorting and co-ordinating the many thousands of individual seismic reflection profiles that exist in the public domain will be enormous. Reflection profiles are not filed in data centres, and most profiles reside in private or national libraries not accessible to the public. The research task can thus not be accomplished by a single agency so that a multinational and multi-institutional study would be required. This would involve dozens of experts who may already be committed to other ongoing research projects. The task could take many years and could cost over one million dollars.

#### VIII. *Irish formula 3 b*

30. Since Irish formula 3 *b* incorporates the same foot of the continental slope line as formula 3 *a*, it is subject to similar difficulties of interpretation (see paragraphs 19 and 20 above) that will not be resolved to any significant extent by increasing the map scale.

31. Once the foot of the continental slope is established on a map series at 1:10,000,000, the addition of a line 60 nautical miles from the foot of the slope would be a relatively small additional task. Its accuracy would be dependent on the accuracy of the foot of the slope line.

#### IX. *Proposal of the Union of Soviet Socialist Republics*

32. As with the Irish formulae, the proposal of the Soviet Union is concerned with wide margins exceeding 200 nautical miles. The proposal suggests that the words "but not further than 100 nautical miles from the outer limit of the 200-mile economic zone" should be inserted in the existing text of article 76. There would then be no circumstances where the outer limit of the continental shelf of a coastal State would exceed 300 nautical miles from baselines for the establishment of the territorial sea. The addition of the 300-mile line to charts at a scale of 1:10,000,000 already showing the 200-mile line discussed in section V above would require relatively small additional effort and cost.

33. Difficulty with implementation of the proposal of the Soviet Union lies with the fact that its application in specific geographic areas requires delimitation of "the outer edge of the continental margin". No practical guidelines are provided in the text of the proposal to define "the outer edge of the continental margin". Since considerable flexibility is given in the use of "scientifically sound geological and geomorphological data" for this purpose, determination of this limit, as with the Irish formulae (see paragraphs 19, 20 and 30 above), would not be significantly improved by an increase of the map scale.

#### X. *Conclusions*

34. With the information available at the present time, only the 200-mile limit drawn from the coastline (as distinct from baselines) can be more accurately displayed on a 1:10,000,000 scale than on the 1:30,000,000 scale of the preliminary study (see paragraph 16 above).

35. The preparation of a map series at 1:10,000,000 showing with appropriate precision the 200-mile line based on a published coastline would take between 6 and 16 months and would cost approximately \$50,000.

36. Difficulties of interpretation of the "foot of the continental slope" in the Irish formulae and "the outer edge of the

continental margin" in the proposal of the Soviet Union prevent any greater precision and clarity being achieved at present by producing a map on a scale of 1:10,000,000.

37. If these difficulties were to be removed, the preparation of a map series at 1:10,000,000, showing with appropriate precision (limited by variations in the availability of data) the 200-mile line (if drawn from baselines), the two parts of the Irish formula and the 300-mile line from the proposal of the Soviet Union, would take at least three years and cost about two million dollars.

38. The work could only start after a decision had been made, funding assured and contractors found. A crucial limitation on the time required may be the lack of sufficient specialized personnel available to carry out this task. It could therefore not be completed within the period of six to ten months (from May 1978) specified by the Conference.

#### ANNEX I

##### Informal suggestion by the group of Arab states\*

##### *Article 76. Definition of the continental shelf*

The continental shelf of a coastal State comprises the sea-bed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured.

#### ANNEX II

##### Informal suggestion by Ireland\*\*

##### *Article 76. Definition of the continental shelf*

1. The same as in the informal composite negotiating text, namely:

"The continental shelf of a coastal State comprises the sea-bed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance."

2. The continental margin comprises the submerged prolongation of the land mass of the coastal State, and consists of the sea-bed and subsoil of the shelf, the slope and the rise. It does not include the deep ocean floor nor the subsoil thereof.

3. For the purpose of this Convention, the coastal State shall establish the outer edge of the continental margin wherever the margin extends beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured, by either:

(a) A line delineated in accordance with paragraph 4 by reference to the outermost fixed points at each of which the thickness of sedimentary rocks is at least 1 per cent of the shortest distance from such point to the foot of the continental slope; or,

(b) A line delineated in accordance with paragraph 4 by reference to fixed points not more than 60 nautical miles from the foot of the continental slope.

In the absence of evidence to the contrary, the foot of the continental slope shall be determined as the point of maximum change in the gradient at its base.

4. The coastal State shall delineate the seaward boundary of its continental shelf where that shelf extends beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured by straight lines not exceeding 60 nautical miles in length, connecting fixed points, such points to be defined by co-ordinates of latitude and longitude.

5. Every delineation pursuant to this article shall be submitted to the Continental Shelf Boundary Commission for certification in accordance with annex. . . . Acceptance by the Commission of a delineation so submitted in accordance with annex . . . and the seaward boundary so fixed shall be final and binding.

6. The coastal State shall deposit with the Secretary-General of the United Nations charts and relevant information, including geodetic

\* Document NG6/2, dated 11 May 1978.

\*\* Document NG6/1, dated 1 May 1978.

data, permanently describing the outer limit of its continental shelf. The Secretary-General shall give due publicity thereto.

7. The provisions of this article are without prejudice to the question of delimitation of the continental shelf between opposite or adjacent States.

### ANNEX III

#### Informal suggestion by the Union of Soviet Socialist Republics\*

##### *Article 76. Definition of the continental shelf*

The continental shelf of a coastal State comprises the sea-bed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, but not further than 100 nautical miles from the outer limit of the 200-mile economic zone, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend beyond the outer limit of the 200-mile zone.

\* \* \*

The Soviet delegation deems it necessary to propose that the outer edge of the continental shelf should be defined with reference to a precise distance criterion, by fixing a specific maximum distance of up to 100 miles beyond the limit of the 200-mile economic zone. This would make it possible to determine exactly where the continental shelf of a particular State ends and where the international area, i.e., the area proclaimed to be the common heritage of mankind, begins.

For this reason it is suggested that the words "but not further than 100 nautical miles from the outer limit of the 200-mile economic zone" should be inserted in the existing text of article 76 after the words "to the outer edge of the continental margin".

Within the indicated 100-mile strip beyond the limit of the economic zone, any scientifically sound geological and geomorphological data could be used to determine the precise limits of the continental shelf of a particular State, and in cases where such data are not available, paragraph 3 *b* of the Irish text submitted at the fourth session of the Conference could be applied.

Thus, according to the proposed formulation the outer edge of the continental shelf would be determined in the following manner:

\* Document C.2/Informal Meeting/14, dated 27 April 1978.

- (i) Where the continental margin does not extend beyond the confines of the 200-mile economic zone, the edge of the continental shelf will lie along the outer limit of the economic zone.
- (ii) In cases where the edge of the continental margin extends less than 100 miles beyond the outer limit of the 200-mile economic zone, the continental shelf of the coastal State will be determined on the basis of scientifically sound geological and geomorphological data. If such data are not available, the outer edge of the continental shelf will be determined in accordance with paragraph 3 *b* of the Irish text ("not more than 60 nautical miles from the foot of the continental slope"), on the understanding, however, that the edge of the continental shelf shall not under any circumstances be fixed at more than 100 miles beyond the outer limit of the 200-mile economic zone.
- (iii) Where the continental margin extends beyond the 100-mile strip adjacent to the 200-mile economic zone, the edge of the continental shelf will be fixed at a distance of 100 miles from the outer limit of the economic zone.

Consequently, according to the suggested formula the 100-mile extension of the continental shelf beyond the outer limit of the 200-mile economic zone represents a maximum limit beyond which no State may exercise its sovereign rights over the continental shelf.

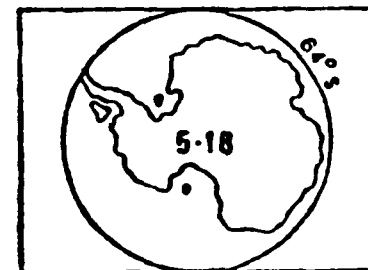
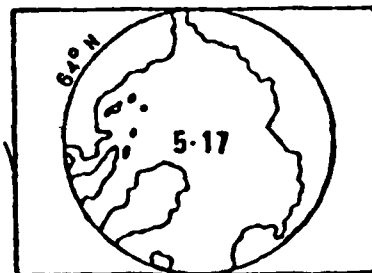
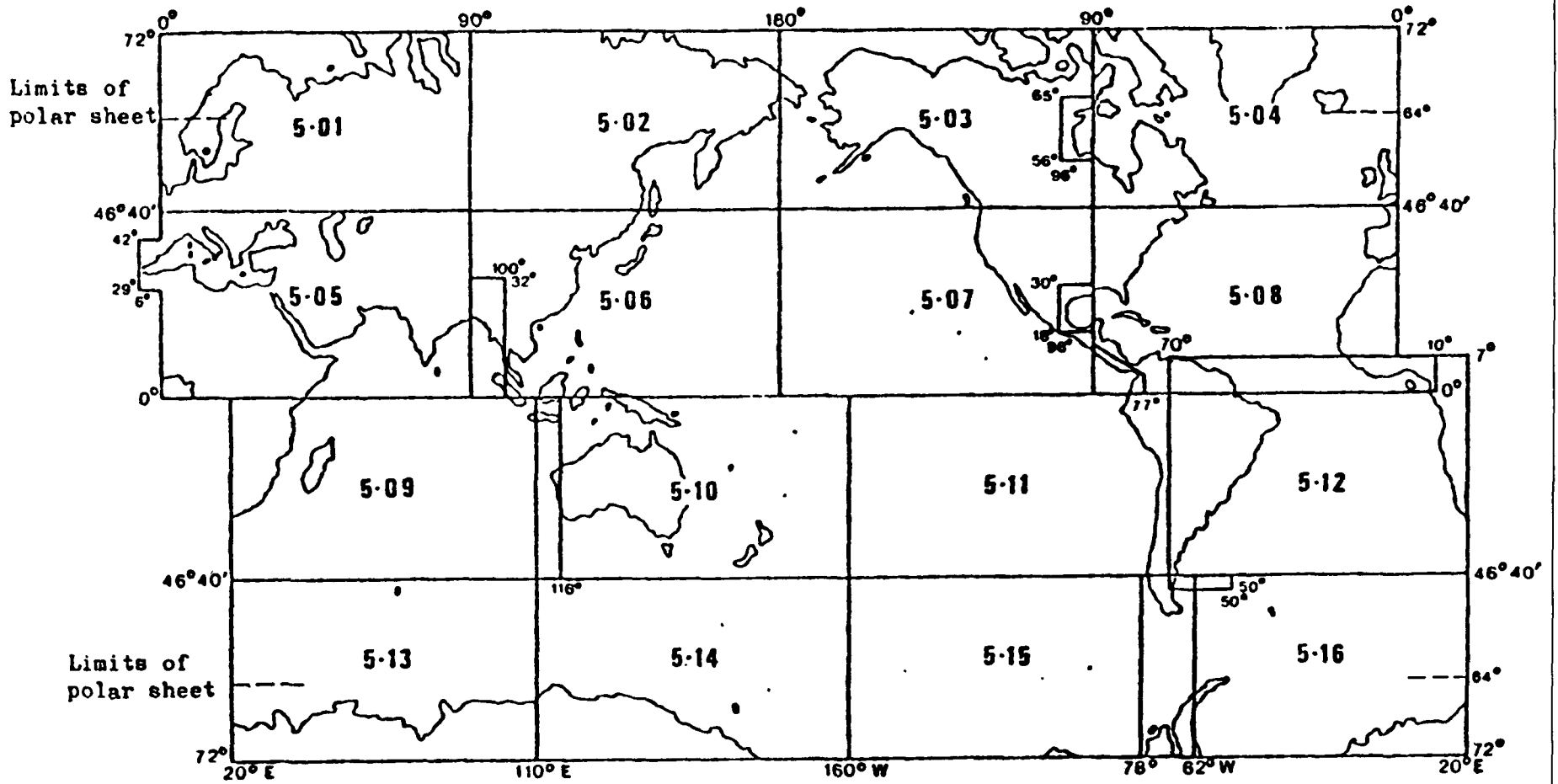
### ANNEX IV

#### General Bathymetric Chart of the Oceans (GEBCO)

GEBCO is the only internationally-produced series of bathymetric maps which covers the entire world. The series is produced under the auspices of the IOC and the IHO and represents a successful blending of marine geoscientists and hydrographers working in concert. The series covers the world in 18 sheets, 16 of which are at a scale of 1:10,000,000 at the equator, Mercator projection, while the two polar sheets are at 1:6,000,000 on polar stereographic projection. Contour interval is 500 metres in the worst case, being reduced to 100 metres in many areas. Data control is shown on the body of the maps so that users can perceive the framework within which the contours were interpreted.

The participants in this programme do so on a voluntary basis and consequently the costs to IOC have been minimal. To date, four sheets have been printed, with another three scheduled for press in early 1979. Three other sheets are in drafting stage and it is projected that the remaining sheets will be printed by May 1982.

Assembly diagram for GEBCO sheets (5th edition)



3086x