

REPORT CONCERNING THE PREPARATION OF THE THIRD EDITION OF THE GENERAL BATHYMETRIC CHART OF THE OCEANS

by Captain H.L.G. BENCKER, Secretary-General of the
International Hydrographic Bureau.

(Brought up to date as of 31st December, 1952).

In the month of June 1930, the International Hydrographic Bureau drew up a report concerning the Bathymetric Soundings of the Oceans; this was presented at the Fourth General Assembly of the International Geodetic and Geophysical Union (Section of Physical Oceanography) at Stockholm in August 1930.

It is not our intention to repeat here the details and arguments contained in the monograph referred to, which was reproduced in the *Hydrographic Review*, Volume VII, No. 2, Monaco, November 1930, pages 64-97, to which the reader may refer should he deem it necessary.

Below, however, is given a brief outline of the efforts which have been made up to the present to keep up the elementary record of our knowledge concerning the topography of the ocean-bottom, grouped in its most general sense. The following is a chronological list of the fundamental compilations made on this subject since the middle of last century, with the names of their authors:

- 1854. M. F. MAURY, U.S.N. — *Map of the Basin of the North Atlantic*, Cf. *The Physical Geography of the Sea* (1860).
- 1874. J. PRESTWICH. — *Planisphere of the Oceans* (Phil. Trans. Royal Society, London, 1874, p. 674).
- 1886. Sir John MURRAY. — *Physical Charts of the World*, Charts 1A, 1B, 1C, annexed to the Report of the Challenger Expedition (1872-1876): *Summary of Scientific Results*, London, 1875.
- 1895-99. Dr BARTHOLOMEW. — The above three sheets kept up to date of soundings greater than 1.000 fathoms to the scale of 1:40 000 000.
- 1893. REICHSMARINEAMT OF BERLIN. — *Weltkarte zur Uebersicht der Meerestiefen*.
- 1899. Dr SUPAN. — *Chart of Ocean Depths (Tiefenkarte 1)* Scale 1:80 000 000 (Pettermanns Geographical Mitteilungen, Gotha, Justus Perthes, Table 12).
- 1902. Gerhard SCHOTT. — *Bathymetric Chart (Meerestiefen) of the Atlantic Ocean and of the Indian Ocean*: Scale 1:30 000 000; published at Jena in 1902.

In 1903, Prof. Thoulet, a member of the Prince of Monaco's scientific staff, constructed a Bathymetric Chart of the Azores.

The VIIth International Geographical Congress, held at Berlin in 1899, decided that there should be prepared, in 24 sheets to scale of 1:10 000 000 at

the Equator, a large-size General Bathymetric Chart of the Oceans. This decision was confirmed by the Stockholm International Congress (1899) and by the Second International Conference of Christiania in 1901.

H.S.H. Prince Albert I of Monaco undertook the preparation of this chart, the plan of which was examined and discussed by a Committee of 10 geographers which met at Wiesbaden on 15th April, 1903. The members of the Committee were: H.S.H. the Prince of Monaco, Baron Richthofen, Professor O. Krümmel, Admiral Makaroff, Mr. Hugh Robert Mill, Sir John Murray, Fridtjof Nansen, Professor O. Petterson, Professor Supan, Professor Thoulet (See: *Bulletins du Musée Océanographique* of Monaco, No. 4 of 6th February, 1904 and No. 21 of 25th December, 1904).

The work, begun in the month of June, 1903, was entrusted to seven draughtsmen (Messrs Tollemer, Lebas, Levêque, Morelli, Normand, Bataille and Bolzé) who shared the work between them under the direction of Sub-Lieutenant Ch. Sauerwein, A.D.C. to the Prince of Monaco and drawn on Mercator's projection except in the areas of the Poles which are on the gnomonic projection.

The documents used consisted chiefly of British Admiralty Charts from which a selection of soundings was made for transfer to the draft of the General Bathymetric Chart; this work was very rapidly accomplished and was completed by a few additional soundings made by cable ships and various exploring vessels. In principle, the chart so constructed contained all soundings made up till the month of July, 1903. It was lithographed and printed, then presented to the *Académie des Sciences* of Paris on 11th January, 1904. Professor J. Thoulet afterwards laid it before the VIIIth International Geographical Congress held at New York from 8th to 13th September 1904.

From a statistical point of view it is interesting to note that this 1st Edition of the General Bathymetric Chart of the Oceans shows more than 18,400 soundings plotted, distributed in depth as follows:

from 200 to 1000 metres	.....	4475	soundings
1000 to 2000	—	2925	—
2000 to 3000	—	2915	—
3000 to 4000	—	2800	—
4000 to 5000	—	2804	—
5000 to 6000	—	1663	—
6000 to 7000	—	173	—
7000 to 8000	—	69	—
8000 to 9000	—	24	—
greater than 9000	—	8	—

A Second Edition of the Prince of Monaco's general bathymetric chart was begun in July 1910 under the direction of Lieut. H. Bourée and Mr. J. Morelli, draughtsman, on the lines laid down by the second Committee which met at Monaco on 1st April 1910, (Cf. *Bulletin de l'Institut Océanographique* de Monaco, No. 175). The first sheets of this new edition were published on 1st May, 1912. Professor de Margerie took charge of the hypsometry; the revision of the bathymetry was under the care of Professor G. Schott.

The Prince of Monaco's chart was drawn up on the Mercator projection. For the estimate of volume and in order to eliminate a source of error in the estimates of surfaces pointed out by Professor A. Penck on the *Bartholomew* chart, Dr. Max Groll, after having analysed about 15,000 soundings, published in 1912 a chart of oceanic depths on an equal-area projection on the scale of 1:40 000 000 (*Tiefenkarte der Ozeane* — Berlin); and in 1915, a second edition of the wall chart was brought up to date, on a scale of 1:20 000 000. The method of plotting this chart is described in the *Veröff. d. Inst. f. Meereskunde*, N. F. Reihe, A. Heft 2 — Berlin, E.S. Mittler & Sohn, 1912, and was analysed by Professor G. Schott in *Zeitschr. d. Ges. Erdk.*, 1913, page 392. On it, deep sea soundings were revised and selected, and account was taken of the abundance of new material collated at the beginning of the present century since the time of Bartholomew's chart. The Groll chart is in three sheets; the Atlantic sheet is on the Lambert cylindrical equal-area projection; that of the Indian Ocean is on the Lambert azimuthal equal-area projection with 20° S., and 80° E., as tangent point; that of the Pacific Ocean is plotted on the Lambert azimuthal equal-area projection with 0° and 160° W. as tangent point. The paper by Dr. Erwin Kossina, entitled « Die Tiefen des Weltmeeres » published in 1921 in the *Veröff. d. Instituts für Meereskunde*, N.F. Reihe, A., Heft 9, is based on the Groll chart, but completed by the soundings of the *Möwe* in the Atlantic, the Indian Ocean and the Pacific, in 1912-1913, and by other more recent oceanic soundings.

In the meantime the *Cabinet Scientifique* of the Prince of Monaco continued the publication of the other sheets which constitute the Second Edition of the General Bathymetric Chart of the Oceans on the scale of 1:10 000 000 at the Equator. The last sheets issued were published under the date 1st July 1927. Four printed pamphlets give a list of the documents consulted in drawing up each sheet and a list of new soundings forwarded by various authorities since the First Edition was drawn up.

This Second Edition of the Monaco chart, the plotting of which required 15 years (1912-1927) carries about 30,000 registered soundings while the First Edition showed 18,400.

Using the results of the oceanographic exploration of the *Meteor*, Professor G. Schott plotted a Bathymetric Chart of the Atlantic Ocean (*Tiefenkarte des Atlantischen Ozeans* — Hamburg) in 1927.

In the course of the same year, Professor M. P. Cheyay constructed a Bathymetric Chart of the China southern seas and Professors F. Nansen and B. Helland-Hansen published one of the Arctic Basin.

We owe a Bathymetric Chart of the Gulf of Bothnia to Professor H. Renquist, drawn up in 1930; and to G. Wüst, of Berlin, « Die Gliederung des Atlantischen Tiefseebodens », (1933).

In 1934, Professor Theodor Stocks plotted a new Bathymetric Chart for the Atlantic (« Übersichtskarte der Tiefenverhältnisse »), while Professor Van Riel, by means of material supplied by the oceanographic cruise of the *Willebrord Snellius* (1929-1930), constructed a Bathymetric Chart of the seas around the Dutch East Indies.

During 1934 also, Dr. F. A. Vening Meinesz, Delft, drew up a chart for the whole world using the results of the Submarine K-XIII cruises (1923-1932).

In 1935, the British Admiralty issued charts Nos 2935, 2936 and 2937 from echo-soundings (Sheets 1, 2, 3) for the World.

In 1936, Hydrographic Engineer S. Ogura of the Imperial Japanese Navy produced a Bathymetric Chart of the seas adjacent to Japan, taking account of the cruises of H.I.J.N. *Manshyu* prior to this date (Chart No. 6080, Jap. Hydr. Office).

Moreover, the Hydrographic Office of the U.S.A. has plotted the following bathymetric charts :

Aug. 1938 : H.O. No. 2601 : South Pacific Ocean;

Aug. 1939 : H.O. No. 5486 : Bathymetric Chart of the North Pacific Ocean;

April 1939 : H.O. No. 5487 : Bathymetric Chart of the Caribbean Sea;

March 1943 : H.O. No. 2562 : Antarctic.

Likewise available are the following partial bathymetric charts :

- 1893, 1927. F. NANSEN and B. HELLAND-HANSEN. — *Carte Bathymétrique du Bassin Arctique* — Bergen.
1928. THE AMERICAN GEOGRAPHICAL SOCIETY OF NEW-YORK. — *Map of the Antarctic*, 1:4 000 000, (4 sheets).
1930. H. RENQUIST. — *Carte bathymétrique du Golfe de Bothnie et du North Kvark* — Helsingfors.
1932. U. S. COAST GUARD, Bulletin No. 19. — *The Bathymetry of the Davis Strait Region* — Washington.
1935. G. BÖHNECKE. — *Tiefenkarte der Dänemark-Strasse, Irminger See*, Berlin.
1935. NORGES GEOGRAFISK OPMALING. — *Norwegian Charts No. 1-4: Sydishavet* (Southern Seas).
1939. DEPT. OF INTERIOR, COMMONWEALTH OF AUSTRALIA. — *Map of Antarctica*.
- 1932, 1948. H. F. P. HERDMAN, M. Sc. « Discovery Reports ». — *Regional bathymetric charts annexed to the reports* — Cambridge University Press :
South Georgia and the Shag Rocks;
The Scotia Sea, The Scotia Arc;
The Ross Sea;
Bransfield Strait and Adjacent Waters.
1946. H. H. HESS. — *H.O. Chart No. 5485. — Bathymetric Chart: Korea to New Guinea including the Philippine Sea.* — Washington.
1948. Dr. Theodor STOCKS. — *Tiefenkarte des Hawaii Sockels*, 1:5 000 000. Deutsches Hydrographisches Institut, Hamburg.
1950. Dr. Theodor STOCKS. — *Die Tiefenverhältnisse des Europäischen Nordmeeres*, 1:10 000 000, Hamburg.
1952. Chart No. 6901 — MARITIME SAFETY AGENCY. — *Depth Curve Chart of the Adjacent Seas of Japan* — Tokyo, 31 March 1952.

Such is the list of the principal bathymetric charts that have so far been constructed.

The new outlook opened up by modern methods of echo-sounding in the study of bathymetric depths in all the oceans of the world has led numerous International Conferences which deal with questions common to Oceanography,

Hydrography, Geography and Geology, to recommend that these new soundings should be systematically centralized and brought to the knowledge of all to whom such knowledge would be useful: navigators, oceanographers, geographers, geologists, and other scientists.

The general oceanic navigational charts published by the various Hydrographic Offices certainly endeavour to attain this last-mentioned aim, but owing to the fact that the information is scanty and lacks general centralization, as well as to the discontinuity of the charts published, they fall short of giving the impression of completion of a comprehensive whole which is necessary for a general study. Oceanic navigational charts are, in fact, graphical instruments serving to plot the position, to trace the ship's course and to solve navigational problems in general. They rarely show depth contours in the open sea; interpretation of the sounding figures they show serves chiefly for the practice of navigation; and they are not tinted so as to permit the user to obtain at a single glance a comprehensive view of the general aspect of oceanic depths.

It is for these reasons that the International Hydrographic Conference, held at Monaco in April, 1929, instructed the International Hydrographic Bureau to centralize oceanic echo-soundings and to keep the General Bathymetric Chart of the Oceans (the Second Edition of which had been completed by the *Cabinet Scientifique* of the Prince of Monaco in 1927) up to date. *International Hydrographic Bulletin* No. III, Monaco, 1928, pages 63-67, indicates the conditions under which it was possible to undertake, on an international plane, the work of preparation of the Third Edition of the General Bathymetric Chart of the Oceans. By a Circular-Letter to its Members, the International Hydrographic Bureau requested that all new oceanic soundings be sent to it in the form of convenient tables giving the exact geographical positions of the soundings and all the conditions under which they were taken (nature of apparatus, sea-temperature, velocity of sound used, etc.), so that correction might be ensured under the best conditions possible. Plotting sheets on a scale which permits the soundings to be inserted without overlapping, and to the degree of accuracy provided by observations in the open sea, have been prepared by the International Hydrographic Bureau for the purpose of systematically recording new soundings. Sheets gratuitously supplied by the Hydrographic Office of the Imperial Japanese Navy were used for this purpose; these sheets have a system of meridians and parallels on the Mercator projection, the scale being 10.16 cm. (4.2 ins.) to a degree of longitude, i.e. approximately 1.8 mm. (0.075 in.) per sea mile (about 1:1 000 000), at the Equator. If they could so be assembled, this set of about 1000 sheets would cover a rectangular plane measuring 44 × 30 metres; i.e. 1 320 sq. metres.

This scale is amply sufficient for the insertion, with adequate accuracy, of the details of the oceanic soundings. Each of the plotting sheets, of the convenient size of 100 × 65 cm. (39.4 × 25.6 ins.), covers an average area of from 4 to 6 degrees of latitude by 10 degrees of longitude, and the necessary oceanic portion embraces about 1000 working sheets which together constitute the collecting sheet for all oceanic soundings throughout the world, which is kept at the International Hydrographic Bureau.

Recording new soundings is thus a fairly easy matter; but it is of first importance to be able to compare these new soundings with those already taken near the same positions. The Bureau was thus led to plot the soundings already known, on the collecting sheets, and to do this with the desired accuracy it was indispensable to refer to the original sources of the soundings. All the Bathymetric Charts mentioned above are, in fact, plotted on relatively small

scales and soundings taken from the 1:10 000 000 scale chart of Monaco, for example, could not be inserted on larger-scale sheets (to a scale of 1:1 000 000), without gross errors of position being introduced. Thus it is necessary to consult the original documents, charts or lists of soundings, which give the geographical position of the soundings by latitude and longitude, in order to extract from the observation made, and from the material in our possession all that is useful, without which later comparison would be impossible or would only introduce a series of errors.

If, on the official charts published by the Hydrographic Offices, the soundings are inserted with all needful accuracy after each has been submitted at the source to meticulous analysis and sifting by the Office, it does not appear that the same care has been taken on all the general bathymetric charts enumerated above; it seems rather as though more attention has been given to a generalization of the whole with a view to drawing in the main outlines and approximate depth contours. New soundings, inserted after the others, are frequently only indirectly connected to the preceding systems; successive compilations by reduction or increase of scale have caused an accumulation of errors. Even on the 1:10 000 000 chart we have found errors attaining 10 sea-miles; conversions of units have not always been made on a uniform basis and accurately — there also we have noted appreciable errors reaching hundreds and sometimes even thousands of metres.

As we have already pointed out above, the origin of the soundings inserted on the various general bathymetric charts so far published does not always appear very clearly. It is only since the Second Edition of the General Bathymetric Chart of Monaco that the source has been clearly stated in the pamphlets which accompany each sheet of the 3rd Edition; these give the positions of new soundings by latitude and longitude.

Moreover, the majority of these positions are taken from the *List of Oceanic Depths, etc.*, published regularly by the British Admiralty since the year 1888 until 1939-1946, and from 1947 to 1951. These lists contain soundings recorded with all the authority desirable, for they have mostly been taken either by surveying vessels, or by special research ships and by British cable ships provided with all the instruments necessary for this kind of work. The French *Annales Hydrographiques* and the German *Annalen der Hydrographie* also contain similar oceanic soundings, thus affording an abundant source of material. Similarly, the Hydrographic Office of the United States of America has published a series of pamphlets: Nos 210 a-h, 1931-1939, giving lists of soundings, and the German Admiralty has drawn up lists of soundings made by its various research vessels (*Beiheft zu den Nachrichten für Seefahrer 1930-1939*).

The International Hydrographic Bureau has had no difficulty in procuring these official original lists, thanks to the kind co-operation of the Hydrographic Offices of its States-Members. But a large number of original oceanographic soundings — and by no means the least interesting — have been published in Reports or Memoranda relative to various scientific explorations of the sea, often organized independently of the Hydrographic Offices, and these are not so easily obtainable as the *Lists of Oceanic Depths*.

However, the number of these voyages of exploration is not very great, if we merely consider those which have added to our knowledge of bathymetry; and the International Hydrographic Bureau keeps a chronological list of these voyages and takes note of the Memoranda or Reports dealing therewith and of the sounding work recorded. (See: « Chronological List of Main Maritime Discoveries & Explorations », H. Bencker, Hydr. Rev., Vol. XXI, Monaco, Aug. 1944, pp. 130 et seq.).

International Hydrographic Bulletin No. VII, 1931, pages 168 to 197, gives the text of a communication laid before the Assembly of the International Union of Geodesy and Geophysics held at Stockholm in August 1930, by Ingénieur Hydrographe General P. de Vanssay de Blavous, then President of the Directing Committee of the International Hydrographic Bureau; this communication offers a detailed account of the preparation of the new edition of the Bathymetric Chart and the results obtained from consultation with a certain number of oceanographers: Dr Jules Richard, Baron Berget, Professor Rafael de Buen, H. R. Mill, Professor F. Vercelli, Dr T. Wayland Vaughan, Professor S. Defant, Professor E. de Margerie, Ingénieur Hydrographe P. Marti, Ingénieur Hydrographe Général E. Fichot, Professor G. Schott, Professor Dr B. Schulz, Professor J. Paul Goode, Professor Rolf Witting.

Since 1931 the International Hydrographic Bureau has collated on its draft sheets (approx. scale 1:1 000 000) all the sounding results which it has been possible to obtain. Under the direction of Ingénieur Hydrographe Général de Vanssay, of Admiral Tonta and Commander Bencker, now under the direction of Vice-Admiral J. D. Nares, the soundings have been plotted on the draft sheets by the Bureau's draughtsmen Messrs Huet, del Corso, Martin, Antognini, Maybury and Ferrero. Miss d'Osmond and Miss Gosselin helped forward the work of comparison of soundings on the oceanic chart used for the construction of the minutes and contributed to the work of metrical conversion. The echo soundings having been corrected for a standard velocity of 1500 m/s.

From 1934 to 1938 the International Hydrographic Bureau was the beneficiary of a subsidy granted by the Scientific Academy of Washington for the purpose of speeding up the work involved in the production of the Third Edition of the General Bathymetric Chart of the Oceans. This enabled a second draughtsman to be temporarily employed on this work. There have been, however, no regular subsidies since they were interrupted by the war; with the exception of 1948-49, when some 648 gold francs were received.

The following statistical table (Table A) shows the date of publication of each of the sheets of this chart already issued, the number of soundings used for the compilation of each of these sheets as appearing in the minutes of soundings kept by the International Hydrographic Bureau, and the selection made for publication.

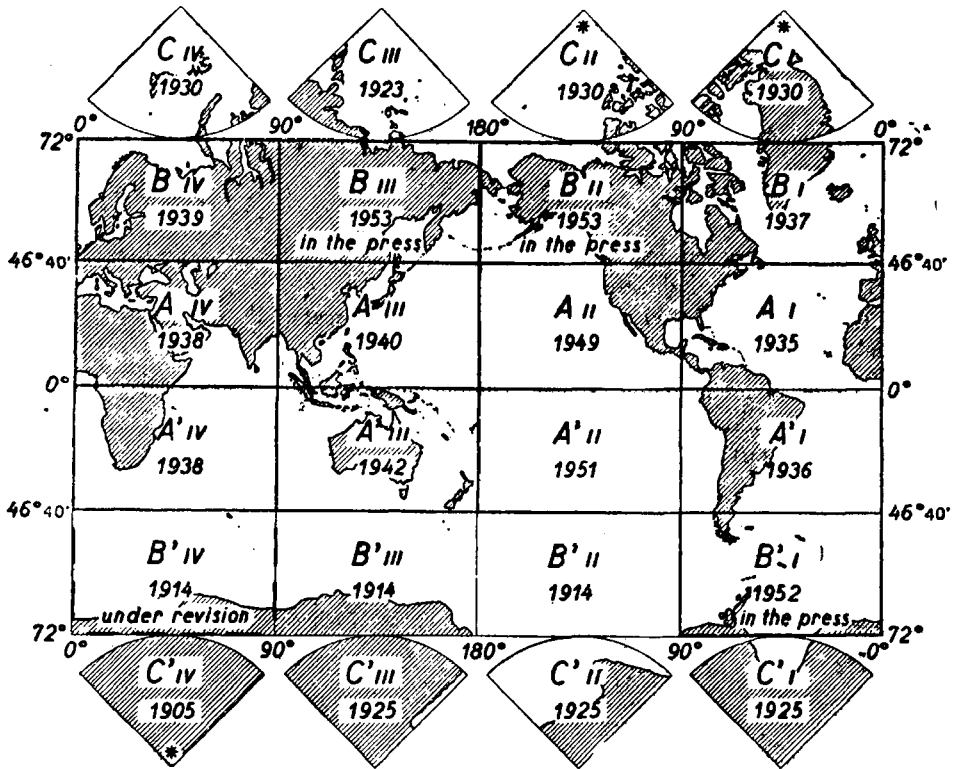
The table also indicates the number of soundings appearing on former editions of each sheet and finally the total of the soundings annually dealt with for plotting the minutes.

TABLE A.
Statistics of soundings used for the preparation of the General Bathymetric Chart of the Oceans

Year	Sheet	Used in Plotting sheets	Selected for Third Edition	Percentage shown	Plotted Second Edition	Plotted First Edition	Total plotted by I.H.B.	Yearly increase	
1935	A _I	70.000	7.800	11 %	4.820	3.280			
					September 1936...		173.300		
1936	A' _I	18.900	3.100	16 %	1.668	996	186.000	+ 12.700	
1937	B _I	41.000	7.000	17 %	2.780	2.470	195.600	+ 9.600	
1938	A _{IV}	27.000	3.700	14 %	3.379	2.111	210.000	+ 24.400	
—	A' _{IV}	17.000	2.960	17 %	2.190	1.460			
1939	B _{IV}	3.700	2.745	93 %	1.255	845	223.000	+ 13.000	
1940	A _{III}	29.500	9.000	31 %	3.518	1.606	235.000	+ 12.000	
1941	.....						246.200	+ 11.200
1942	A' _{III}	24.367	4.935	20 %	4.054	2.599	254.700	+ 8.500	
		(Credit suppressed in consequence of restrictions decided upon during the war)							
1943				d°			258.900	+ 4.200	
1944				d°			261.400	+ 2.500	
1945				d°			264.100	+ 2.700	
1946		(This year work was resumed)						270.020	+ 6.900
1947	A _{II}	37.835	9.876	26 %			272.455	+ 2.435	
1948		(From this year an auxiliary draughtsman was engaged)						281.255	+ 8.800
1949	A _{II}	selection reduced to 5.153		14 %	1.681	1.222	311.600	+ 30.345	
1950	.....						320.698	+ 9.098
1951	A' _{II}	12.919	2.160	17 %	791	574	329.576	+ 8.878	
1952	B' _I	23.282	802	3 %	686	157			
—	B _{II}	25.041	819	3,3%	1.453	395			
—	B _{III}	16.743	462	2,7%	740	150	335.003	+ 5.427	

When this Table is compared with the annexed assemblage of the sheets of the Third Edition of the Prince of Monaco's Bathymetric Chart, it will be seen that the majority of the soundings concern the 8 middle sheets covering each side of the Equator; the other 16 sheets for the Northern or Southern latitudes and for the polar caps include only a rather limited number of measurements. This is

owing to the use of the Mercator projection: the four sheets *A* of the General Bathymetric Chart of the Oceans making up the equatorial strip from latitude 0° to 46°40' N., represent 80 % of the surface of the Northern hemisphere; the four sheets *B* (lat. 46°40' N. to 72° N), represent 24 % and the four sections *C* of the polar cap account for only 6 % of the Northern hemisphere. If, then, we adopt as unit the surface of an equatorial sheet *A*, one sheet *B* is equal to 0.3 of the said surface and one sheet *C* equals 0.1.



The work of preparation of each of the 24 sheets of the General Bathymetric Chart is not only in relation to the above numbers, but is moreover in proportion to the relative coefficient of sea/land surface of each of the sheets. Further, the soundings are less dense and fewer in the Northern and Southern sections of the Chart; and, as may be seen from the above statistics, the 8 equatorial sheets *A* now published (1951) must in themselves alone contain more than 95 % of the accumulated data.

Table B gives for each sheet of the Bathymetric Chart the ratio of sea to land surface charted on the sheet.

Each sheet of the Third Edition of the General Bathymetric Chart of the Oceans is accompanied by a pamphlet which gives the sources of the information used for the compilation of the sheet, which had never previously been the case. In particular, this pamphlet mentions all the hydrographic charts used, of which there are a great number, and all the lists of soundings having their origin in scientific cruises of research and other vessels. This original document, therefore, permits the analysis and any necessary discussion of the results shown; it establishes the chart on trustworthy scientific data and not on the result of some random compilation that cannot be checked.

The hydrographic charts used in the preparation of the sheets of the Third Edition are enumerated in the pamphlet that accompanies each sheet at the time of their issue. Use has been made to date of a total of about 197 hydrographic charts published by the British Admiralty Hydrographic Department; 132 charts issued by the U.S.A. Hydrographic Office, 61 by the U.S. Coast & Geodetic Survey, and 135 charts published by the Hydrographic Office of the French Navy. In every case the most recent edition of these charts has been used and a comparison made of the soundings shown thereon by means of special tables for the conversion of soundings in fathoms to metrical values.

In 1951, the U.S. Navy Hydrographic Office supplied the I.H.B. with 16 photostats of its Pacific Ocean Position Plotting Sheets, providing a large number of oceanic soundings.

The Bureau has also obtained reproductions supplied by the Hydrographic Department, British Admiralty, of 117 plotting sheets of soundings taken in the Antarctic by the research vessel « Discovery II ».

These numerous soundings have been added to the plotting sheets for the General Bathymetric Chart of the Oceans now on file at the I.H.B.

With regard to the recording of echo-soundings greater than 1.000 metres and wherever the data supplied has permitted, a correction for the local velocity of sound in sea water has been applied. At first these corrections were made by means of various tables combined and extended by the International Hydrographic Bureau itself, then consistently by means of the *Tables of the Velocity of Sound in Pure Water and Sea Water for Use in Echo-Sounding and Sound-ranging*, by D. J. Matthews, F. I. C., 2nd Edition, 1939, publication H. D. No. 282 of the Hydrographic Department of the British Admiralty, the use of which was adopted by the Vth International Hydrographic Conference and has proved particularly convenient for this kind of computation.

In the Third Edition of the General Bathymetric Chart of the Oceans, some names of the principal oceanic deeps have not been retained, nor have those relating to the denominations of the various ridges or other general features of submarine relief, the nomenclature of which, while having formed the object of

careful study by different authors, has not yet been established by international convention. A provisional list of the principal oceanic depths appeared in the « Hydrographic Review », Volume VII, No. 2 Monaco, November 1930; but this list must be seriously revised and altered to bring it into line with more recent researches: some deeps which had been given names have now completely disappeared.

Moreover, a Committee of the International Association of Geodesy and Geophysics (Section of Physical Oceanography) was appointed at the Conference held in Edinburgh in September 1936, to study the Criteria and Nomenclature of the Major Divisions of the Ocean Bottom and, secondarily, the appellations of the different seas, the latter having been subject to constant revision through the centuries.

The deliberations of this Committee were condensed in a Report drawn up in 1940 (Scientific Publication No. 8 of the Association of Physical Oceanography); a brief analysis of this Report appeared in the « Hydrographic Review », Volume XIX, Monaco, August 1942, p. 9; in the same volume on page 60 will be found an Essay on the International Vocabulary for *Maritime Geographical Terminology relating to the Various Hydrographic Subdivisions of the Globe*; also, on page 75, an alphabetical list of certain local common geographical names appearing on marine charts, which are generally not translated.

The work of the above-mentioned International Committee is being continued and their final report will be considered when deciding on the final names to be inserted on the Bathymetric Chart.

In another connection the International Hydrographic Bureau has drawn up for the special needs of standardization of hydrographic publications of the national Hydrographic Offices, and more particularly in view of the geographical distribution of Notices to Mariners and volumes of Sailing Directions, a Special Publication, at present under revision*, on *Limits of Oceans and Seas*; the revision of this publication formed the subject of a communication by the International Hydrographic Bureau to the last General Assembly of the International Union of Geodesy and Geophysics (Section of Physical Oceanography).

Table E shows the position regarding soundings received at the I.H.B., soundings plotted and soundings still to be plotted on the plotting sheets for the General Bathymetric Chart.

* Third Edition, issued April 1953.

TABLE E:

General Bathymetric Chart of the Oceans

As of 31st December 1952

Upper figure: soundings plotted on I.H.B. plotting sheets

Lower figure: soundings received at I.H.B., still to be plotted.

	IV	III	II	I	TOTAL PER SECTION	
					plotted	to be plotted
C	346 —	33 —	72 —	1,192 —	= 1,643	
B	3,700 208	16,743 —	25,041 —	41,000 1,389	= 86,484	..... 1,597
A	27,000 4,477	29,500 1,133	37,835 340	70,000 8,727	= 164,335	..... 14,677
A'	17,000 1,959	24,367 148	12,919 68	18,900 2,744	= 73,186	..... 4,919
B'	4,441 1,165	2,680 —	1,347 —	23,282 —	= 31,750	..... 1,165
C'	None	810 252	362 212	129 —	= 1,301	..... 464
				TOTAL ...	358,699	22,822

Table F shows the cost of printing for each separate sheet of the General Bathymetric Chart.

TABLE F

Printing Cost for Sheets
of the General Bathymetric Chart of the Oceans

(Cost of compilation of tracing, draughtsman, etc. not included).

Sheet	date	Fr. Francs	rate	Gold francs	Firm
A	1935	21.517	4.952	3.542	Institut Cartographique de Paris (Erhard Frères)
A' _I	1936	14.066	4.952	2.856	d°
B I	1937	20.363	6.95	2.930	d°
A IV	1938	18.414	9.90	1.860	Gaillacq-Monroq, Paris
A' _{IV}	1938	16.825	9.90	1.522	d°
B IV	1939	31.880	12.4	2.571	d°
A III	1940	27.732	14.309	1.939	d°
A' _{III}	1942	41.742	14.309	2.919	d°
A II	1949	404.774	86	3.543	Inst. Géogr. National, Paris
A' _{II}	1951	630.937	114	5.518	Inst. Géogr. National, Paris
				mean = 2.920	Gold francs
		estimates			
B' _I	1952	669.000	d°	5.851	Ets Dufrenoy, Paris
B II	d°	969.000	d°	8.475	d°
B III	d°	855.000	d°	7.478	d°

As only 600 copies of this chart are printed, the cost price of roughly 1,100 French francs per sheet is somewhat high compared with that of a coloured chart, large numbers of which are reproduced.

However, 600 printed copies have so far been sufficient to supply the demands for sheets in the interval originally estimated for each successive edition, i. e., in normal periods, 12 to 15 years.

For the compilation of the Third Edition of the General Bathymetric Chart, the International Hydrographic Bureau has at no time employed more than two draughtsmen from 1933 to 1952, and from 1938 to 1948, the Bureau employed one draughtsman only.

The monthly cost of a draughtsman is at present 28 000 French francs (245 Gold francs) plus 30 % for social security contributions.

One draughtsman easily plots from 15 000 to 20 000 soundings in the course of a year on the collecting sheets. It may be seen from Table E that

358 000 soundings have been plotted on the I.H.B. minutes and that, for the termination of the Third Edition, about 23 000 (say 6 %) of the total mentioned remain to be plotted. A single draughtsman can therefore terminate in about 13 months the work sheets required for compiling the 3rd Edition of the General Bathymetric Chart.

During the last few years the International Hydrographic Bureau has examined the possibilities of photographic reproduction of selected basic plotting sheets of the General Bathymetric Chart, chiefly in parts where the soundings are numerous. Different procedures have been tried out, either by photography to true scale such as is habitually practised in Hydrographic Offices, i.e. on glass by the wet collodion method; by the « Copycat » (Paris) system of direct contact; or by means of the micro-film method of Thomson-Houston, Paris. All the above procedures are practically equivalent, the cost being at present about 1 200 French francs (11 Gold francs) per square metre of the minutes.

Below is given as an Addendum a *Chronological List of Oceanographic Explorations* additional to that published in the « International Hydrographic Review » in 1930. It should be noted that in future, it might be more convenient to publish such list by country and in chronological order, as was done by Professor Rafael de Buen in the « Lista cronológica de las campañas y navegaciones a las que se deben observaciones científicas de carácter oceanográfico » which he published in 1930 in the *Memorias del Consejo Oceanográfico Ibero-Americano*, No. 5, Madrid. Such a system would enable a check to be made by countries, as a preventive measure against inadvertent omissions in the list.

Addendum

CHRONOLOGICAL LIST OF OCEANIC EXPLORATIONS

(Continuation of Chronological List of Oceanic Explorations since 1800 which appeared in « Hydrographic Review », Vol. VII, No. 2 Monaco, November 1930, page 72).

Year Année	Name of Vessel Nom du Navire	Natio- nality	Comd. or Institution Cdt ou Institution	Area Explored Lieu d'Exploration
1911-12, 1916	Edouard Gêramec.	Fr.	C. Fr.	Atlantique Nord.
1914-1932	International Ice Patrol.		U.S. Coast Guard.	Atlantique Nord.
1919-1924-30 1932	Tampa.	U.S.A.	U.S. Coast Guard.	Grands-bancs.
1919-24-30	Modoc.	U.S.A.	U.S. Coast Guard.	Grands-bancs.
1922-26	Africana.	S. A.		Oc. Indien Merid.
1923-32		Ned.	Gravim. Exped. Dr. Vening Meinesz.	Indien, Pacifique N.E.
1924	Telconia.	Ital.	Italcable.	Atlantique Nord.
1925, 27-28	Citta di Milano.	Ital.	Pirelli et Cie.	Atlant. Nord-Spitzberg.
1925-27 1928-30 1933-35	Meteor.	Germ.	Deutsche Atlantische Expedit. Dr. Hans Maurer.	Atlant. N.-Mer Septentr. Océan Ind., Groenland, Terre-Neuve.
1925-27 1929-31	Discovery.	Br.	Explor. Br.	Oc. Atlant. N. et S.
1925-27 1929-31	RRS William Scoresby.	Br.	Explor. Br.	Oc. Indien et Atlant. S.
1925-28	Mansyû.	Jap.	Hydr. Jap.	Pacifique Nord.
1926	K. XIII.	Ned.	Gravim. Holl.	Atlantique Nord.
1927	Wilkins Arctic Exped.	U.S.A.	Amer. Geog. Society.	Arctique.
1927-32	Albatross II	U.S.A.	U.S. Fish. Com.	Atlantique Nord.
1927-28-29 1930-31	Emden. Berlin, Meteor.	Germ.	Marineleitung.	Atlant. N., Méditerr. Ind. (fossé de l'Emden) Autour du monde.
1927-31-33	Poseidon.	Germ.	Expl. G.	Oc. Septentrional, Mer du N., Baltique.

Year Année	Name of Vessel Nom du Navire	Natio- nality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1928	Modoc.	U.S.A.	Intern. Ice Patrol.	Atlantique Nord.
1928	S.-21.	U.S.A.	Gravim. U.S.	Atlantique Nord.
1928-29	Giralda.	Sp.	Hydr. Sp.	Atlantique Nord.
1928-30 1935	Johan Hjort.	Norv.		Atlantique Nord.
1928-29 1931-35	Explorer. ,	Br.		Atlantique Nord.
1928, 1929-32-33	Ormonde.	Br.	Hydr. Br.	Atlantique Nord.
1928-30	Byrd Antarctic Exped.	U.S.A.	Expl. U.S.A.	Austral. Antarctique.
1928-30	City of New-York.	U.S.A.		New Zealand, Mer de Ross.
1928-30	Sōyōmaru.	Jap.		Mers de Chine.
1929	Björnøy.	Sve.	Expl. Sve.	Atlant. N.-Septentrion.
1929	Ste-Jeanne-d'Arc.	Fr.		Atlantique Nord.
1929-30	Rosemary.	Br.		Atlantique Nord.
1929	Syumpu Maru.	Jap.		Mers de Chine.
1929-30	Willebrord Snel- lius.	Ned.	Expl. Holl. P.M. van Riel, F. Pinke.	Atlantique, Indien, Pacifique.
1929-30	Discovery.	Br.	Expl. Br.	Austral.
1929-30	Hannibal.	U.S.A.	Hydr. U.S.	Atlantique Nord.
1929-31	Mission Hydrographique Française de l'Indochine.			Mers de Chine.
1929-31	Exp. Ant. Norvégienne - Consul Lars Christensen.			Antarctique.
1929-31	Maryland.	U.S.A.		Oc. Pacifique N.E.
1929-30-32	Xauen.	Sp.	Expl. Sp.	Atlantique Nord.
1929-33	Lexington.	U.S.A.		Oc. Pacifique N.E.
1929-31-32 1934	Cyrus Field.	Br.	C. Br.	Atlantique Nord.
1929-32 1933-34 1935-37	RRS Discovery II.	Br.	Expl. Br.	Atlantique Sud, Atlantique Nord, Antarctique, Oc. Indien.

Year Année	Name of Vessel Nom du Navire	Natio- nality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1929-37	Ramapo.	U.S.A.		Océan Pacifique Nord.
1929-33	Pourquoi-pas?.	Fr.	Explor. Fr.	Atlantique Nord.
1929-33 1936	John W. Mac Kay.	Br.	C. Br.	Atlantique Nord.
1929 1931-34 1936	Lord Kelvin	Br.	C. Br.	Atlantique Nord.
1929, 1930	Dominia.	Ital.	Italcable.	Atlantique Nord.
1930	Falken.	Sve.	Hydr. Sve.	Baltique.
1930-34	Godthaab.	Dan.	Explor. Dan.	Atlant. N. Groenland Orien.
1930	Veslekari.	Norv.		Groenland Oriental.
1930	Europa. Columbus Cap Arkona.	Germ.		Océan Indien.
1930	Neptun.	Germ.	C. Germ.	Océan Pacifique.
1930	Fitzroy.	Br.	Hydr. Br.	Mer du Nord.
1930	Ormonde.	Br.	Hydr. Br.	Chypre.
1930	Magnaghi, Azio, Dardanelli.	Ital.	Hydr. Ital.	Libye.
1930	George Sedov.			Terre François-Joseph. Severnaja Semlja.
1930	West Virginia, California.	U.S.A.		Océan Pacifique N.E.
1930	Berio.	Portug.	Hydr. Portug.	Cape Town, Durban.
1930	Antarès.	Fr.		Océan Austral.
1930	Breman, Neptun.	Germ.		Atlantique Nord.
1930	William Scoresby.	Br.		Atlantique Nord.
1930	Wyoming.	U.S.A.		Atlantique Nord.
1930	Norvegia.	Norv.		Antarctique.
1930-31	Europa.	Germ.		Atlantique Nord.
1930-32, 1934	Cyrus Field.	Br.	C. Br.	Atlantique Nord.

Year Année	Name of Vessel Nom du Navire	Natio- nality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1930-35	Hvidbjornen.	Dan.		Islande, Groenland.
1931	Nautilus.	U.S.A.	Woods Hole Ocean. Ins.	Atlantique N.-Arctique.
1931	Houston, Colorado New Mexico, Ne- vada, Idaho.	U.S.A.		Pacifique N.E.
1931	Marie-Louise Mac- Kay.	Br.	C. Br.	Atlantique Nord.
1931-32	Challenger.	Br.	Hydr. Br.	Atlantique Nord.
1931-32	Ponchartrain.	U.S.A.	U. S. Coast Guard.	Atlantique Nord.
1931	Lydonia, Oceanog- rapher.	U.S.A.	U. S. Coast & Geod. Survey.	George Bank.
1931	Vettor Pisani.	Ital.		Mediterran. Océan Ind.
1931	Meteor.	Germ.		Détroit de Danemark.
1931	Xauen.	Sp.	Inst. Espagn. Océanogr.	Détroit de Gibraltar.
1931-34	Cambria.	Br.	C. Br.	Océan Indien Sud.
1931	Quest.	Exped.	Suedo-Norvégienne.	Arctique, Terre du N.E.
1931-32 1934-35	Karlsruhe.	Germ.		Océan Atlant. N. & S. Océan Indien.
1931-33, 1935	Challenger.	Br.	Hydr. Br.	Atlantique Nord.
1931-35	Muirchu.	Irlande		Atlantique Nord.
1931-36	Mirror.	Br.	C. Br.	Atlantique Nord.
1931-36	General Greene.	U.S.A.	Explor. U.S.	Atlantique Nord.
1931-37	Lady Denison Pender.	Br.	C. Br.	Atlant. N.-Oc. Indien.
1932	Knipovitch.	U.R.S.S.		Terre François-Joseph.
1932	Persey.	U.R.S.S.		Spitzberg.
1932	Krassine, Sibiria- kov.	U.R.S.S.		Passages du N.E.
1932	Acadia.	Can.		Baie d'Hudson.
1932	Heimland.	Norv.		Atlantique Nord.

Year Année	Name of Vessel Nom du Navire	Nationality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1932	Polaris.	Norv.		Atlantique Nord.
1932	Cap Arcona.	Germ.		Atlantique N. & S.
1932	O-13.		Gravim. Holl.	Atlantique Nord.
1932	Sökongen.	Dan.		Groenland Oriental.
1932	Retriever.	Br.	C. Br.	Atlantique Sud.
1932	Marblehead.			Pacifique N.E.
1932-33	Johan van Oldenbarnevelt.	Ned.		Méditerr., Socotra, Océan Indien.
1932	O-XIII.		Gravim. Holl.	Atlantique Nord.
1932	S. 48 (Chewink).	U.S.A.	The Navy Princeton Gravity Expedit.	Antilles, Bahamas.
1932-33	Endeavour.	Br.	Hydr. Br.	Atlantique Nord.
1932-33	Atlantis.	U.S.A.	Woods Hole Oceanogr. Inst.	Atlantique Nord.
1932-35	Norseman.	Br.	C. Br.	Atlantique N. & S.
1932-35	Emile Baudot.	Fr.	C. Fr.	Océan Indien, Méditerr.
1932-33, 1935	Enterprise.	Br.	C. Br.	Atlantique N. & S.
1932, 1935	Ampère.	Fr.	C. Fr.	Méditerr., Atlant. Nord. Banc de l'Ampère.
1932-34	Sirius.	U.S.A.		Pacifique N.E.
1932-1934 1935-36	Karlsruhe.	Germ.		Méditerr., Océan Indien, Mer de Chine.
1933	Isbjorn.	Oxford	University Expedit.	Spitzberg.
1933	Roussanov.	U.R.S.S.		Iles arctiques.
1933	Cheliuskine.	U.R.S.S.		Arctiq. Sibérienne.
1933-34	Challenger.	Br.	Hydr. Br.	Labrador.
1933	Ormonde.	Br.	Hydr. Br.	SW. Portugal.
1933	Investigator.	Inde	Hydr. Ind.	Détroit de Torres-Colombo.
1933	Gannet.	U.S.A.	U.S. Hydr. Office.	Eaux de l'Alaska.

Year Année	Name of Vessel Nom du Navire	Natio- nality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1933	Dana.	Dan.	Océanogr.	Asie Orientale.
1933	Dempo.	Ned.		Détroit Bab-el-Mandeb.
1933	Pourquoi-pas?	Fr.	Dr. J.-B. Charcot.	Scoresby Sound.
1933	USS Argonne.	U.S.A.		I. Aléoutiennes.
1933	USS Vega.	U.S.A.		
1933	Polarbjörn.	Norv.		Groenland Oriental.
1933-34	Caroline.	U.S.A.	Johnson Smithsonian Deep Sea Exped. P. Bartsch.	Atlantique Nord. Fosse de Puerto Rico.
1933	Misago Maru.	Jap.		Mers de Chine.
1933	Alva.	U.S.A.		Méditerr., Oc. Indien.
1933	Köln.	Germ.		Méditerr., Oc. Indien Austral.
1933	Saint-George.	Br.	Fish. Br.	Atlantique Nord.
1933	Kivok.	Dan.		Atlantique Nord.
1933	Hannibal, Gannet.	U.S.A.		Pacifique N.E.
1933-34	Endeavour.	Br.	Hydr. Br.	Méditerr., Mer d'Arabie, Océan Indien.
1934	Herald.	Br.	Hydr. Br.	Malaisie, Bornéo.
1933-34	Fresnel.	Fr.	Gravim. Fr.	Méditerranée.
1933-34	Faneffjord.	Norv.	Ellsworth Expedition.	Antarctique.
1933-35	Bear.	U.S.A.	Woods Hole Oceanogr. Inst.	Pacifique N.E.
1933-35	K. XVIII.	Ned.	Gravim. Holl.	Oc. Atlantique. Oc. Indien Sud-Austral.
1934	Yermak.	U.R.S.S.	brise-glace.	Rivière Lena.
1934	Présid. Théodore- Tissier.	Fr.	Océanogr. Fr.	Atlantiq. N.-Manche.
1934	Columbus.	Germ.	Lloydampfer.	Pacifique Sud.
1934-35	Flandre.	Fr.		Atlantique Nord.

Year Année	Name of Vessel Nom du Navire	Natio- nality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1934	Beautemps - Beau- pré.	Fr.	Hydr. Fr.	Maroc.
1934	Gen. von Steuben.	Germ.		Atlantique Nord.
1934	Thorshavn Signal- horn.	Norv.	Baleiniers Norv.	Antarctique, Arctique.
1933	George Bligh.	Br.	John Murray Expedit.	Oc. Indien Occident.
1933-34	Mabahiss.	Br.	Expl. Ocean. Br.	Mer Rouge, Oc. Indien, Occidental.
1934	San Francisco, Bushnell, Boni- ta, Oglala, Quail, Astoria.	U.S.A.		Océan Pacifique N.E.
1934	Flandre.	Fr.		Atlantique Nord.
1934	New Orleans.	U.S.A.		Atlantique Nord.
1934	Cutter Chelan.	U.S.A.	U.S. Coast Guard.	Mer de Bering.
1934	Ingolf.	Dan.	Ocean. Dan.	Atlantique Nord.
1934-35	Thor.	Dan.	Ocean. Dan.	Atlantique Nord.
1935	K. XVIII.	Ned.	Gravim. Holl.	Atlantique N. & S. Méditerr., Oc. Indien.
1935	Thorshavn.	Norv.	Consul Lars Christensen.	Antarct.-Terre Enderby.
1935	Korsvik.	Norv.	Explor. Norv.	Atlantiq. N.-Détr. Davis
1935	Armauer-Hansen.	Norv.	Explor. Norv.	Atlantique Nord.
1935	Bagaud.	Fr.		Côtes de Provence.
1935	Colombie, Champlain.	Fr.		Atlantique Nord.
1935-37	Sadko.	U.R.S.S.		Mers Arctiques.
1935	Pourquoi-pas ?	Fr.		Groenland Oriental.
1935	Mc-Lean.	Can.	Geodetic Survey Canada.	Arctique, Ile de Baffin.
1935	Penola.	Br.	Brit. Graham Land Exp.	Antarctique.
1935	Moresby.	Austr.	Hydr. Austral.	Océan Indien.
1935	Barracuda.	U.S.A.	Sous-marin.	Antilles.

Year Année	Name of Vessel Nom du Navire	Natio- nality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1935	Wisconsin.	Fr.		
1935	Mirror.	Br.	C. Br.	Oc. Indien, Pacif. N.E.
1935-36	Norseman.	Br.	C. Br.	Océan Indien.
1935-36	Columbus.	Germ.		Atlantique Nord.
1935-36	Cambria.	Br.	C. Br.	Méditerr., Oc. Indien.
1935-36	Hejmdal, Hvidbjornen.	Dan.	Fish. Dan.	Islande-Groenland.
1935-36	Nokomis.	U.S.A.		Colombie.
1935-36	Hannibal.	U.S.A.		Pacifique.
1935-36	Oglala.	U.S.A.		I. Aléoutiennes.
1935-36	Bushnell.	U.S.A.		Divers.
1935-36	Tofiño.	Sp.	Hydr. Spn.	Maroc.
1935-37	Veslekari.	Norv.	Miss Louise A. Boyd.	Spitzberg, Groenland, Arctique.
1935-37	Discovery II. William Scoresby.	Br.	Banzar Expedit.	Austral, Antarctique.
1936	General Greene.	U.S.A.	U.S. Coast Guard.	Labrador, Groenland.
1936	Normandie.	Fr.		Atlantique Nord.
1936	Challenger.	Br.	Hydr. Br.	Antilles, Atlant. Nord.
1936	Winnipeg.	Fr.		Atlantique Nord. Pacifique N.E.
1936	Wyoming.	Fr.		
1936	Sedov, Nerpa.	U.R.S.S.		Arctique.
1936-38	Savorgnan de Braz- za, Rigault de Ge- nouilly, Amiral Charner.	Fr.		Austral.
1937	Cyrus Field.	Br.	C. Br.	Pacifique N.E.
1937	Atlantis.	U.S.A.	Woods Hole Ocean. Ins.	G. du Mexique - Ber- mudes.
1937	M.S. Tanimbar.	Ned.		Oc. Indien méridional.
1937	Fridtjof Nansen.	Norv.	Fish. Norv.	Septentrion.

Year Année	Name of Vessel Nom du Navire	Nationality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1937	Endeavour.	Br.	Hydr. Br.	New Zealand.
1937	Herald.	Br.	Hydr. Br.	Mers de Chine-Malaisie.
1937	Emden.	Germ.		Mers de Chine et Austr.
1937	Aramis.	Fr.	Cie Mess. Maritimes.	Mers de Chine.
1937-38	Investigator.	Ind.	Marine Survey of India.	Bombay.
1937, 1939	Stork.	Br.	Hydr. Br.	Ceylan, Siam, Mers de Chine.
1938	Meteor.	Germ.		Oc. Atlantique Nord.
1938	Hood.	Br.		Méditerranée.
1938	E.W. Scripps.	U.S.A.		Océan Pacifique.
1938-39	Atlantis.	U.S.A.	Woods Hole Ocean. Ins.	Antilles.
1938-39	Schwabenland.	Germ.		Oc. Glacial du Sud.
1938-39	Discovery II.	Br.		Cape Town (Banc de la Discovery).
1939	Aranda. Nautilus.	Fin.	Inst. Thalassogr. Finl.	Centre Baltique.
1939	Nordkapp. Johan Hjort.	Norv.	Norges Svalbard og Ishavs-Undersokelser.	Spitzberg.
1939	Malygin, Polliarnik, Nerpa, Tsirkul.	U.R.S.S.		Mer de Kara.
1939	Nord, Torose, Papanine, Sud.	U.R.S.S.		Arch. Nordenskjold.
1939	Ost.	U.R.S.S.		Mer de Laptev.
1939	Sadko.	U.R.S.S.		Nouvelle Sibérie.
1939	Milwaukee.	U.S.A.		Oc. Atlantique.
1939	Herald.	Br.	Hydr. Br.	Mers de Chine.
1939	Northland. Bear of Oakland.	U.S.A.	U.S. Coast Guard. Am. R.E. Byrd, U.S.A. Antarctic Expedit.	Antarctique.
1939	North Star.	U.S.A.	Office des Pêches.	Antarctique.
1940	General Greene.	U.S.A.	U.S. Coast Guard Patrol.	Mer du Labrador.

Year Année	Name of Vessel Nom du Navire	Nationality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1940	Oceanographer.	U.S.A.	U.S. Coast and Geod. Survey.	South Carolina.
1940	Lydonia.	U.S.A.	» »	North Carolina.
1940	Gilbert.	U.S.A.	» »	Nantucket Sound.
1940	Hydrographer.	U.S.A.	» »	G. du Mexique.
1940	Explorer.	U.S.A.	» »	Aléoutiennes.
1940	Pioneer.	U.S.A.	» »	Aléoutiennes.
1940	Guide.	U.S.A.	» »	Mer de Béring.
1940	Discoverer.	U.S.A.	» »	Alaska.
1940	Surveyor.	U.S.A.	» »	Alaska.
1940	E. Lester Jones.	U.S.A.	» »	Alaska-Aléoutiennes.
1940	Westdahl.	U.S.A.	» »	Alaska.
1946	Acadia.	Can.		Rivières et lacs - Canada.
1946	Will. J. Stewart.	Can.		Océan Pacifique.
1946	Chaco.	Argent.		Iles Orcades du Sud.
1946	Malaspina.	Sp.	Hydr. Sp.	Côte Ouest d'Afrique.
1946	Xauen.	Sp.	Inst. Esp. Océanogr.	d° (Banco Concepcion).
1947	Bellona.	N.Z.	Expl. Nouv.-Zélande.	Pacifique Sud.
1947	Challenger.	Br.	Hydr. Br.	G. Persique.
1947	Sharpshooter.	Br.	Hydr. Br.	Malaisie.
1947	Beautemps - Beaupré.	Fr.	Hydr. Fr.	Maroc-Agadir.
1947-48	Albatross.	Sve.	Expl. Suéd. Bathymétr. Hans Pettersson.	Autour du Monde.
1947-48	John Biscoe.	Br.	Falkland Is. Dependencies Survey.	Antarctique.
1947-48	Malaspina.	Sp.	Inst. Eßpagn. Océanogr.	Cap Juby-Pointe Durnford.
1947-49	Xauen.	Sp.	Inst. Eßpagn. Océanogr.	Maroc-Mer d'Alboran. (Banc Xauen).
1948	Dumont d'Urville.	Fr.	Explor. Fr.	Pacifq. Sud - Marquises.
1948	Sub. Talent.	Br.	Geod. & Geophys. University of Cambridge.	Manche.
1948	Sabella.	Br.	Marine Biological Assoc.	Plymouth.
1948	Dampier.	Br.	Hydr. Br.	Malaisie.

Year Année	Name of Vessel Nom du Navire	Nationality	Comd. or Institution Cdt ou Institution	Area explored Lieu d'Exploration
1948	Siboney.	U.S.A.	Hydr. U.S.A.	Oc. Atlantique Nord.
1949-50	Cdt Charcot.	Fr.	Explor. Polaire Fr.	Antarctique-Iles Baleny.
1949-50	Manihine.	Br.	British Museum.	Golfe d'Aqaba.
1949-50	Francis-Garnier.	Fr.		Pacifique Sud - Banc Clark-Fosse Kermadec.
1950	Malaspina.	Sp.		Côte Occid. d'Afrique.
1950	Tofiño et S-m. G-7.	Sp.	Comm. Geodes. Inst. Geogr. Cadastral.	Cadiz-Iles Canaries.
1950	Br. Exped.	Gravim.	Royal Society	Méditerran. Orientale.
1950	William Barentz.	Ned.	Fish. Ned.	Iles South Sandwich.
1950	William Scoresby.	Br.	Explor. Br.	Sud Afrique-Oc. Indien.
1950	Discovery II.	Br.	Explor. Br.	Oc. Indien-Austral.- Pacifique Sud.
1950-52	Galathea.	Dan.	Explor. Dan.	Autour du Monde.
1950-51	Dalrymple.	Br.	Hydr. Br.	G. Persique-Méditerr.
1950-51	Owen.	Br.	Hydr. Br.	G. Persique-Méditerr.
1950-51	Dampier.	Br.	Hydr. Br.	Bornéo-Malaisie.
1950-51	Challenger.	Br.	Explor. Océanogr.	Atlantique-Pacifique (Fosse des Mariannes Fosse de Kermadec).
1950-51	Chiriguano.	Argent.		Antarctique.
1950-51	Sanaviron.	Argent.		Antarctique.
1951	Cdt Charcot.	Fr.	Expéd. Antart. Franç.	Terre Adélie.
1951	Lotus.	Fr.		Arch. des Tuamotu.
1951	Angamos.	Chil.		} Antarctique.
1951	Lientur.	Chil.		
1951	Lautaro.	Chil.		
1951	Pathfinder.	U.S.A.	Hydr. U.S. Coast Guard.	} Iles Aléoutiennes.
	Explorer.	U.S.A.	»	
	Pioneer.	U.S.A.	»	
	Surveyor.	U.S.A.	»	
	Patton.	U.S.A.	»	
	Lester Jones.	U.S.A.	»	