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Item 12 of the provisional agenda

REPORT OF THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION ON ITS ACTIVITIES

SUMMARY

The Intergovernmental Oceanographic Commission is required by Article 12 of its Statutes, to prepare regular reports on its activities, which shall be submitted to the General Conference of Unesco. These reports shall also be addressed to the Member States of the Commission as well as to the organizations within the United Nations system which are prepared to contribute to the Commission's Secretariat, to sustain the work of the Commission through the relevant parts of the programmes of such organizations, and to use the Commission for advice and review in the area of marine science (i.e. United Nations, FAO, WMO, IMCO).

The Director-General takes pleasure in commending the attached report to the General Conference.

The Commission, besides undertaking a very heavy programme in marine science during the biennium, has also acted as a joint specialized mechanism for discharging certain of the responsibilities of the ICSPRO agencies in the field of marine science.

It will be noted that this report is divided into three main parts:

(i) Ocean Science Programmes under the Long-term and Expanded Programme of Oceanic Exploration and Research, covering regional marine scientific research programmes, the Ocean and Climate Programme, the Global Investigation of Pollution in the Marine Environment and the General Bathymetric Chart of the Oceans;

(ii) Ocean Services, covering the Integrated Global Ocean Station System, International Oceanographic Data Exchange and the Tsunami Warning Systems in the Pacific;

(iii) Training, Education and Mutual Assistance in the marine sciences.

Amongst the Ocean Science programmes of the Commission, co-operative activities are being developed successfully in many parts of the world's oceans, in particular in the Caribbean and adjacent regions, in the North and Central Western Indian Ocean, in the Western Pacific off the west coast of South America (to study the phenomenon known as "El Niño"), and in the Southern Oceans. Marine Pollution research and monitoring activities have been expanded, in co-operation with the United Nations Environment Programme. Excellent progress has been made with the General Bathymetric Chart of the Oceans and world coverage of the basic series is now expected to be complete in 1982.

Under the Ocean Service activities the Integrated Global Ocean Station System General Plan and Implementation Programme 1977-1982 has been further implemented jointly with the World Meteorological Organization. The network of centres comprising the world system of International Oceanographic Data Exchange has been further refined; the types of data being handled have been extended and their availability improved. The Aquatic Sciences and Fisheries Information System, a joint FAO-IOC activity, is being broadened and various products are now being issued. The new Marine Environmental Data Information Referral System (MEDI) is now offering services to meet the needs of Member States.

Each Science and Service project has now a component in Training, Education and Mutual Assistance in the marine sciences (TEMA). The Voluntary Assistance Programme (VAP) has further improved the financial and material support available for these projects. It is expected that TEMA will become the key programme of the Commission in the years to come.

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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

BIENNIAL REPORT FOR 1978-1979
(PREPARED IN ACCORDANCE WITH IOC STATUTES, ARTICLE 12)

PREFACE

1980 marks the 20th anniversary of the Intergovernmental Conference on Oceanographic Research (Copenhagen, July 1960). Here, in the wake of the enthusiasm generated by the International Geophysical Year, 36 nations gathered to consider how they could best pool their research skills and technology to better explore the oceans for the benefit of mankind. Their deliberations culminated in the establishment of the Intergovernmental Oceanographic Commission, the first session of which was held at Unesco Headquarters in October 1961 with 40 founding Member States present.

Much has been accomplished in the intervening two decades as the Commission, through the concerted efforts of its Member States, has pursued the challenge presented by the international marine science community.

Regional scientific investigations have been undertaken in many of the major oceanic areas, and the IOC can point with pride to the increased scientific knowledge acquired in the Indian Ocean (through the International Indian Ocean Expedition), the Caribbean (through the Co-operative Investigations of the Caribbean and Adjacent Regions, CICAR), the tropical Atlantic (through the International Co-operative Investigations of the Tropical Atlantic, ICITA), North-west Africa (through the Co-operative Investigations of the Northern part of the Eastern Central Atlantic, CINECA with ICES and FAO) and the North-west Pacific (through the Co-operative Study of the Kuroshio and adjacent regions (CSK), to name a few.

During the same period the Commission has been in the forefront in organizing and maintaining international systems for providing ocean services covering such various aspects as the acquisition, storage and retrieval (dissemination) of data and information on the main oceanographic parameters, as well as in the provision of real-time data and their related products.

In more recent years, the Commission has engaged in marine pollution research and monitoring, regionally and globally. In carrying out these activities, the Commission has placed paramount importance on the need of its Member States to develop their marine scientific capabilities and their human resources. Working in close collaboration with the Unesco Division of Marine Sciences, the IOC has contributed actively to increasing the potential of its Member States to participate effectively in regional and global marine research. The training, education and mutual assistance components of IOC programmes are considered as the cornerstone of the Commission.

The emergence of a new ocean regime within and outside the context of the United Nations Conference on the Law of the Sea, and the ever-increasing need for all forms of technical assistance envisaged in the United Nations Conference on Science and Technology for Development, place upon the Commission new and heavy demands. As a unique body within the United Nations system, and as a specialized mechanism for the co-ordination of certain of the marine programmes of various United Nations agencies, it is called upon to catalyse the efforts of its 103 Member States.

Its major lines of work will now centre on the development of programmes of ocean science in relation to climate changes, living resources and non-living resources, as well as a continuing review of the state of health of the oceans.

To underpin these programmes, the Commission will continue to develop the services now provided through its Integrated Global Ocean Station System, in collaboration with WMO, and its International Oceanographic Data Exchange, with a view to setting up a World Ocean Watch analogous to the WMO's World Weather Watch. Related to this is the service provided by the General Bathymetric Chart of the Ocean (GEBCO) in collaboration with the International Hydrographic Organization. To underpin the continuing review of the state of health of the oceans, the Commission has a Marine Pollution Monitoring Programme (MARPOLMON) through which not only data and information will be provided, but also specialized advice to Member States on methods, standards and intercalibration.

These developments have ramifications beyond individual disciplines, scientists or nations. The challenge presented by the new ocean regime will require a massive assistance effort if the Member States are to be able effectively to investigate and manage the seas and the sea bed under their jurisdiction. The path to successful attainment of these goals must continue, as it began two decades ago, through international co-operation.

It may be that the mode of co-operation changes with the circumstances, and the IOC has anticipated this by providing for the creation of regional associations. Member States concerned by similar problems may find interaction at the regional level and, eventually, after due maturation, through subcommissions of the IOC, to be their most effective mode of collaboration.

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INTRODUCTION

1 During the biennium the Intergovernmental Oceanographic Commission (IOC), an independent unit within the Natural Science Sector of Unesco (doc. 18 C/86), continued to "promote scientific investigation with a view to learning more about the nature and resources of the ocean through the concerted action of its members", pursuant to Article 1.2 of its Statutes. The Commission continued its Long-term and Expanded Programme of Oceanic Exploration and Research (LEPOR), including programmes and projects under the International Decade of Ocean Exploration (IDOE) which will come to an end on 31 December 1980.

2 The Commission's activities fall into two main categories: Ocean Science and Ocean Services.

3 There are three global and six regional programmes under Ocean Science. The global programmes are: the General Bathymetric Chart of the Oceans (GEBCO); the Ocean and Climate, including a contribution to the Global Atmospheric Research Programme (GARP, of WMO/ICSU); and the Global Investigation of Pollution in the Marine Environment (GIPME). The regional programmes cover: the Mediterranean; the Southern Oceans (SOC); the Caribbean (IOC Association for the Caribbean and adjacent regions - IOCARIBE); the south-east Pacific, mainly off the coasts of Peru and Ecuador (study of the phenomenon known as "El Niño"); the region off the East African coast (Co-operative Investigation in the North and Central Western Indian Ocean - CINCWIO); and the western Pacific (WESTPAC).

4 Under the Ocean Services programme, the following three activities were continued: the Integrated Global Ocean Station System (IGOSS), International Oceanographic Data Exchange (IODE), and the IOC Tsunami Warning System in the Pacific (ITSU).

5 Underlying the Commission's activities is the programme of Training, Education and Mutual Assistance in the marine sciences (TEMA), an element of which is the Voluntary Assistance Programme (IOC-VAP).

6 To facilitate its regional co-operation, the Commission made increasing use of its regional units: the Operational Unit for the Mediterranean in Monaco; the IOCARIBE Regional Secretariat, which was first set up in Trinidad, and is now in Costa Rica; and the International Tsunami Information Center (ITIC), in Honolulu.

7 The Commission has continued to co-operate closely with the United Nations and the United Nations Environment Programme, and several United Nations Specialized Agencies. Matters of mutual concern to the IOC, United Nations, FAO, Unesco, WMO and IMCO are discussed regularly in the Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO).

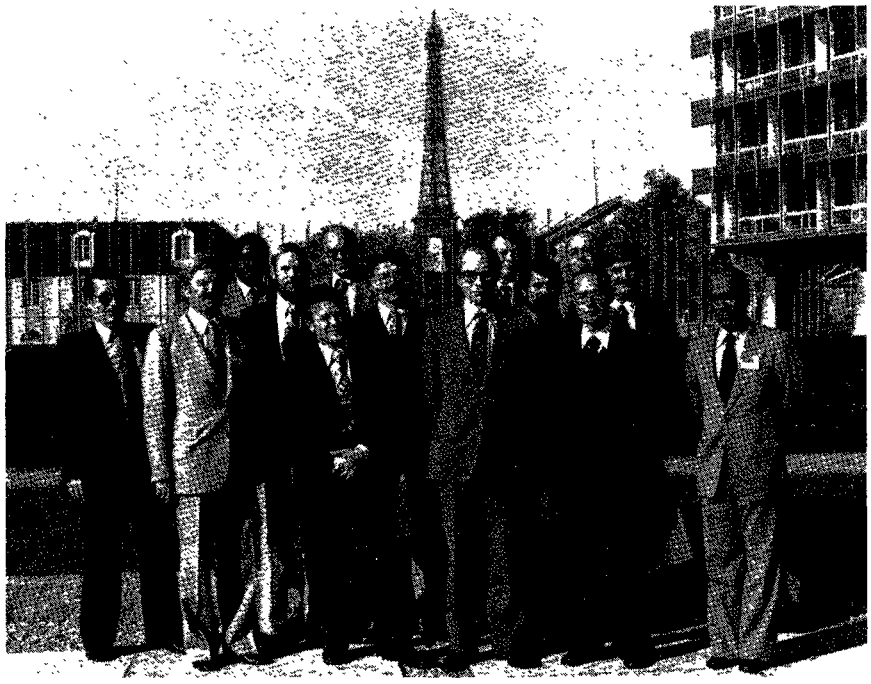
8 The Commission has also co-operated with other intergovernmental and non-governmental global and regional organizations in marine sciences: the International Council for the Exploration of the Sea (ICES); the International Commission for the Scientific Exploration of the Mediterranean Sea (ICSEM); the Permanent Commission for the South Pacific (Comisión Permanente del Pacífico Sur, CPPS); the Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP) and the Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (CCOP/SOPAC) of the Economic and Social Commission for Asia and the Pacific; the Commission for Marine Geology (CMG) of the International Union of Geological Sciences (IUGS), and the Tsunami Committee of the International Union of Geodesy and Geophysics (IUGG).

9 The advisory bodies of the Commission are: the Scientific Committee on Oceanic Research (SCOR), the Engineering Committee on Oceanic Resources (ECOR), and the Advisory Committee on Marine Resources Research (ACMRR, of FAO). They have continued to provide valuable scientific advice on the Commission's programmes.

10 The IOC Assembly held its Eleventh Session (IOC-XI) in Paris, from 15 October to 3 November 1979; the IOC Executive Council met in Rome, from 19 to 23 June 1978 (Tenth Session, EC-X); in Mexico City, from 26 February to 3 March 1979 (Eleventh Session, EC-XI); and in Paris, from 22 to 24 October 1979 (Twelfth Session, EC-XII).

11 The Summary Report of the Eleventh Session of the IOC Assembly is available as document SC/MD/65.

12 Mr. Desmond P.D. Scott, who was Secretary of the Commission from October 1972 until December 1979, retired. Dr. Albert Tolkachev, who was Assistant Secretary until December 1979, also left the Secretariat. The exceptional photograph below shows the past (Dr. K. Fedorov), the then present (Mr. D.P.D. Scott), and the then future (Dr. M. Ruivo) Secretaries of the Commission with the professional staff, at the time of the Eleventh Session of the Assembly.



Photograph 1

The IOC professional staff at the Eleventh Session of the IOC Assembly, on 1 November 1979.

From left to right are: Klaus Voigt, Ray C. Griffiths, George Kitaka, Wojciech Slaczka, Leif Andren, Desmond P. D. Scott, Gunter Giermann, Steve Tibbitt, Mario Ruivo, Albert Tolkachev (behind), Greg Withee, Mazhar Haq.

OCEAN SCIENCE PROGRAMMES UNDER THE LONG-TERM AND EXPANDED PROGRAMME OF OCEANIC EXPLORATION AND RESEARCH (LEPOR)

13 Since the foundation of the Commission in 1960, great advances have been made in all branches of oceanography. Many of these advances have taken place in the last ten years under the International Decade of Ocean Exploration (IDOE) 1971-1980, which is generally recognized as the acceleration phase of the Long-term and Expanded Programme of Oceanic Exploration and Research (LEPOR), which in turn was "designed to assist in a better understanding of the marine environment through science ..." (United Nations General Assembly, resolution 2424 (XXIII), 17 December 1968).

14 This international decade is coming to an end, and planning for the 1980s has been a major task of the Commission during the past two years. Special emphasis will be put on improving the capability of all IOC Member States to undertake oceanographic research, on stimulating the acquisition of scientific knowledge of the oceans, particularly "its contents and the contents of its subsoil, and its interfaces with the land, the atmosphere and the ocean floor and to improve understanding of processes operating in or affecting the marine environment, with the goal of enhanced utilization of the ocean and its resources for the benefit of mankind".

15 Under LEPOR, the Commission has set up several subsidiary bodies to develop, recommend and co-ordinate long-term marine scientific activities directed towards the study of a particular geographic region or a natural oceanic phenomenon. Furthermore, the vigorous development and application of new techniques in the investigation of the ocean, deserves special attention and close co-operation with the Commission's advisory bodies.

16 The Commission's ocean science programmes, which are developed and implemented through the concerted action of IOC Member States and in close collaboration with interested international organizations, are described below.

GLOBAL OCEAN SCIENCE PROGRAMMES

General Bathymetric Chart of the Oceans (GEBCO)

17 During the biennium, two sessions of the Joint IOC/IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO) took place: the Fifth Session in Ottawa (24-26 April 1978) and the Sixth Session, also in Ottawa (21-23 May 1979). The terminology of undersea features and digitizing of bathymetric data were the two most important matters discussed. Figure 1 illustrates the advance of bathymetric charting. There are 18 sheets in the GEBCO 5th Edition - 16 are on Mercator projection on a scale of 1/10 million at the equator; the two polar sheets are on Polar Stereographic projection on a scale of 1/6 million at 75° latitude. By the end of 1980, 10 of the 18 sheets should have been published (5.01, 5.02, 5.03, 5.04, 5.05, 5.06, 5.11, 5.12, 5.17 and 5.18). It is planned that the remaining eight sheets (to complete the series) will be published by April 1982.

Ocean and Climate

18 The Intergovernmental Oceanographic Commission has, since its inception, recognized that the oceans play a major role in climatic changes and variability.

The WMO-ICSU Global Atmospheric Research Programme (GARP)

19 The Global Atmospheric Research Programme (GARP) is a joint undertaking of the World Meteorological Organization (WMO) and the International Council of Scientific Unions (ICSU); it is one of the most ambitious and complex co-operative international geophysical studies ever undertaken. Its potential impact on the well-being and productivity of mankind is profound.

20 The First GARP Global Experiment (FGGE), also called "The Global Weather Experiment", is, likewise, the largest one of its kind that has ever been attempted. Although having principally meteorological objectives, it has many oceanographic aspects, and promises to be of great value to the oceanographic and atmospheric sciences. The FGGE Operational Year began on 1 December 1978, and continued until 30 November 1979.

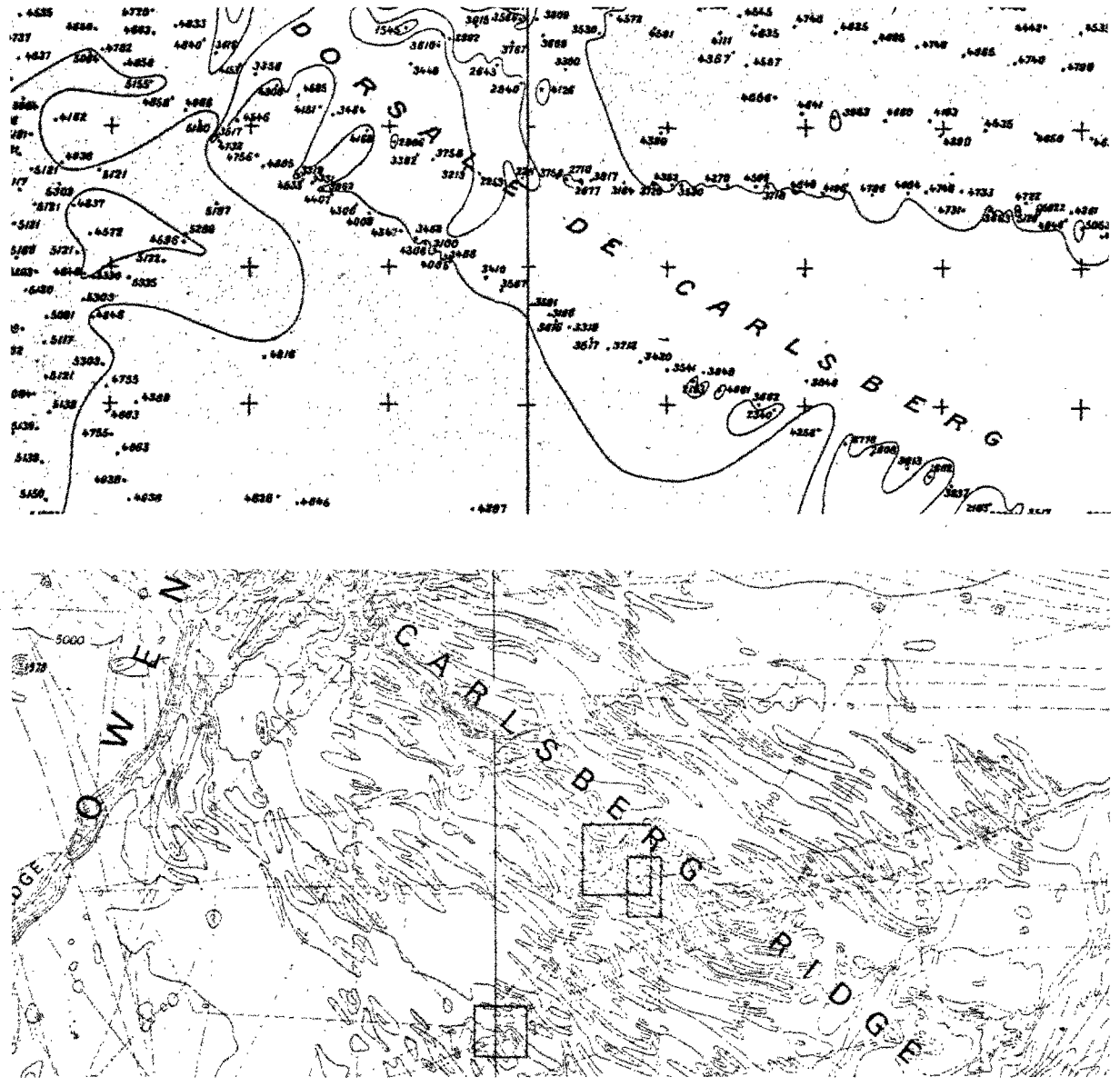


Figure 1.
A General Bathymetric Chart of the Oceans was first published in 1903 by Prince Albert of Monaco. The upper picture shows a portion of the 1938 edition for the Indian Ocean just east of Somalia (1,400 X 900 km). This chart was still in use at the beginning of the International Indian Ocean Expedition in 1959. The 1975 edition (lower) shows the same area as now charted. The Carlsberg Ridge is now seen to run into the Owen Fracture Zone. Contours are at 1,000 m spacings; ship's tracks are marked lightly.

21 The benefits to be expected from GARP are the improvement of atmospheric and oceanic forecasting and climatological models, resulting from a better understanding of oceanic processes. In particular, the First GARP Global Experiment, in which work was concentrated in the Equatorial, Indian and Southern Ocean areas, will support many IOC science activities by providing unprecedented data for the study of the many oceanic processes linked to atmospheric forcing and feedback.

22 Because of the potential importance of FGGE to the world oceanographic community, IOC, in close collaboration with WMO, played a major role in oceanographic data management and in documenting and planning all oceanographic aspects of the experiment. These activities involved many of the Commission's science and service programmes. The IOC Secretariat was an active link between the scientists taking part in the experiment and the governments of coastal States, facilitating the granting by Member States of permission for foreign research ships to work in waters under national jurisdiction.

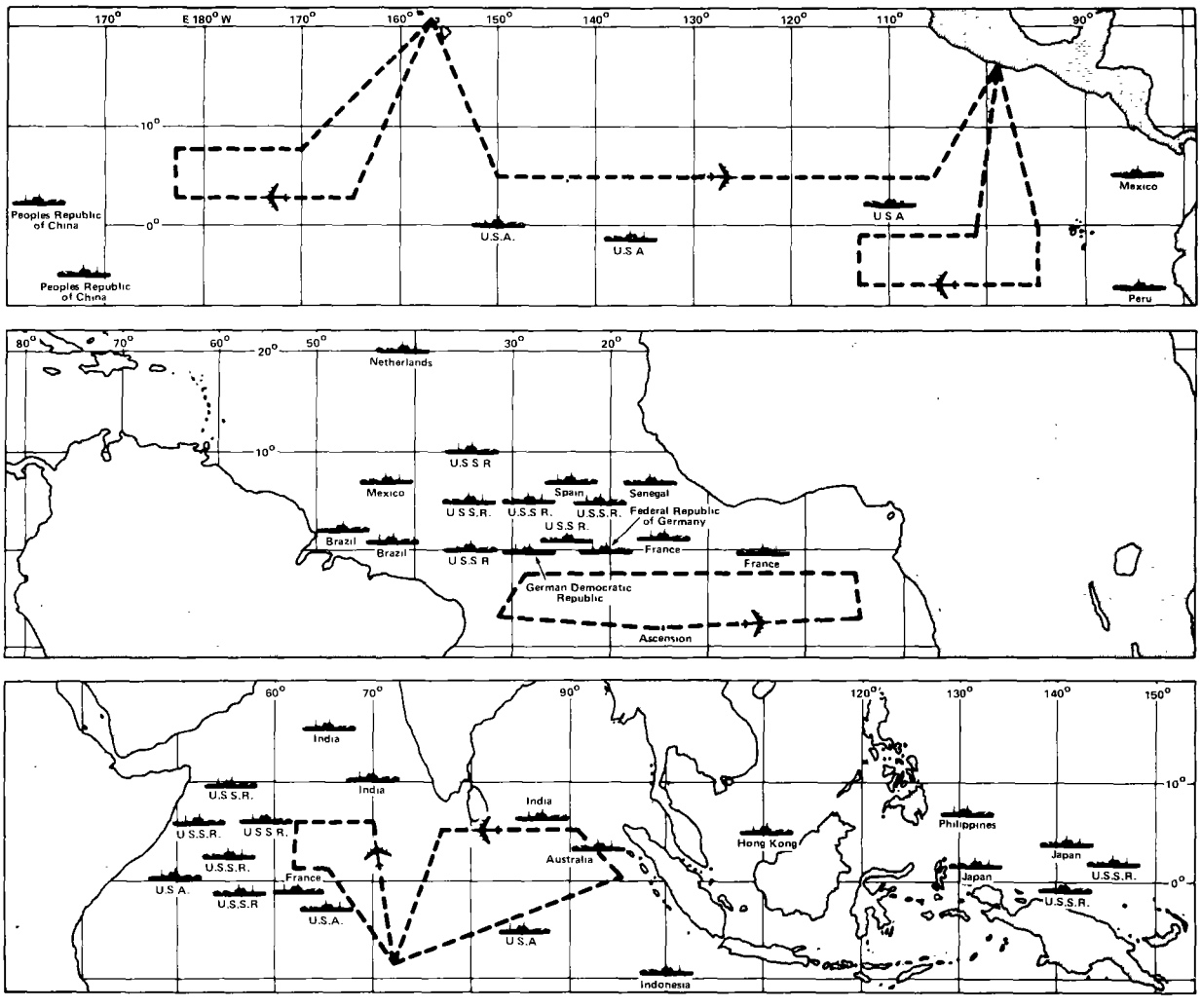


Figure 2. Ship and aircraft deployment during the Global Weather Experiment

23 In all, some 55 ships from 23 countries participated in the various oceanographic activities of the FGGE. Virtually all of these ships took oceanographic observations, and many reported their temperature, salinity and current data through the IGOSS BATHY/TESAC Programme (see Figure 2).

24 The scientific oceanographic effort during FGGE was co-ordinated by SCOR Working Group 47 on Oceanographic Programmes in Support of FGGE. The Working Group was divided into three Panels, one of which co-ordinated the oceanographic activities in the tropical zones of the Indian, Pacific and Atlantic Oceans. IOC hosted meetings of the Atlantic and Indian Ocean Panels. The IOC Secretariat attempted to identify elements of IOC programmes, particularly IODE and IGOSS, that would be helpful to the scientists of SCOR Working Group 47, and would also be helpful to a significant part of the world oceanographic community at large.

25 Data collected within 48 hours of observation were primarily IGOSS BATHY/TESAC data and will be used by various Member States to prepare IGOSS products.

26 The Deutsches Hydrographisches Institut, Hamburg, Federal Republic of Germany, served as an FGGE Specialized Oceanographic Data Centre (SODC) and was responsible for collecting all real-time BATHY/TESAC reports, for performing some quality checks on the data, and for sending these data to the Specialized Oceanographic Data Centre (SODC) in the United States of America.

27 The SODC in the United States, located in the Fleet Numerical Weather Centre, was responsible for collating BATHY/TESAC data received from the SODC in the Federal Republic of Germany, with other telecommunicated and non-real-time data.

28 Data collected after three months of observation were physical, chemical, biological and geological data which will be inventoried by the Responsible National Oceanographic Data Centre for the FGGE Operational Year (RNODC-FOY).

29 In response to a request by the Commission to Member States to provide data management services for oceanographic data collected during the First GARP Global Experiment (FGGE), the Environmental Data and Information Service of NOAA (EDIS) served as a Responsible National Oceanographic Data Centre for the FGGE Operational Year (RNODC-FOY). In this capacity, and in co-ordination with oceanographic data centres in France and Japan, EDIS will: (i) develop a global inventory of all ocean data collected during the year; and (ii) create a global ocean climate data base of selected physical oceanographic parameters. All data will be exchanged through normal international exchange channels.

30 The Commission continued to support the development of the highly successful Southern Hemisphere Drifting Buoy System, an FGGE Special Observing System.

31 The Commission invested a major effort in the co-ordination and promotion of the IGOSS BATHY/TESAC Programme in relation to the Global Weather Experiment. Briefly, 17 IGOSS products in support of the FGGE were prepared and issued by five Member States. Also, although complete information was not available at the time of this report, during the first Special Observing Period of the FGGE, the BATHY/TESAC reports available from the tropics increased by a factor of ten over previous years.

32 Although there existed only a short time in which to identify donor Member States to support requests for expendable bathythermographs, the Secretariat arranged for the United States to provide XBT equipment to Mexico to enable Mexican scientists to participate in the oceanographic programme during the FGGE. It is understood that the probes were used on two Mexican ships, that valuable data were obtained, and that most of these data were transmitted as BATHY reports under the IGOSS BATHY/TESAC Programme.

33 IOC, in co-operation with WMO, co-ordinated the arrangements for scientists from developing countries to work on board oceanographic vessels during the FGGE. Scientists from Kenya and Somalia participated on British and United States ships in the Indian Ocean. Also, a scientist from Bangladesh was funded to work at the MONEX Centre in Bombay during the summer of 1979.

34 After the FGGE, the IOC will continue to support the activities of the RNODC-FOY, and the realization of the Global Ocean Data Inventory and Global Ocean Climate Data Base for oceanographic data collected during the FGGE. Also, it is proposed that IOC continue to support the participation of developing-country scientists in the research and analytical work following FGGE.

35 The Commission also continued to co-ordinate and provide direct support to GARP Regional Experiments, such as the Monsoon Experiment (MONEX) and the Alpine Experiment in the northern Mediterranean (MEDALPEX).

SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO)

36 Following the adoption of the "World Climate Programme" (WCP) by the Eighth World Meteorological Congress, the Commission decided to co-sponsor the SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO) which held its first meeting in Miami, Florida, United States, from 8 to 10 October 1979. This Committee of eminent marine scientists established several panels to develop oceanographic programmes that will support and strengthen meteorological programmes, particularly on the theory and modelling of ocean dynamics related to problems of climate research, on sea-ice variations (including the effects of bottom-water formation), on the palaeoclimate of the ocean (concentrating particularly on the last few hundred years), and on climate and marine biology. These oceanographic programmes are being developed keeping in mind the IOC programmes that relate to climate studies ("El Niño", IGOSS, IODE, WESTPAC, in particular).

37 The Committee has also recommended the development, by CCCO and the Joint Scientific Committee (JSC) for the World Climate Research Programme, of a Pilot Ocean Monitoring Study (POMS) comprising standard oceanographic sections and various long time-series of measurements, and using a variety of new techniques for observing the ocean, especially with automatic sensing devices.

Global Investigation of Pollution in the Marine Environment (GIPME)

38 For all its complexities and sophistication, in principle and practice, GIPME has advanced appreciably during the biennium.

Working Committee for GIPME

39 The Working Committee held its Third Session in Malta from 28 May to 1 June 1979. The main thrust of this session was the improvement of the Committee's mechanisms for carrying out its work. It recommended to the IOC to disband its (intergovernmental) Task Team on Marine Pollution Monitoring, and to increase the size and scope of its existing Group of Experts on Methods, Standards and Intercalibration. The Assembly (Eleventh Session) accepted the disbandment of the Task Team, for which the support of the Member States had been insufficient, but retained the GIPME Group of Experts on Methods, Standards and Intercalibration in its present form.

40 Another important matter taken up by the Committee was the clarification of the roles of the IOC Working Committee for GIPME and the Joint IOC/WMO Working Committee for IGOSS.

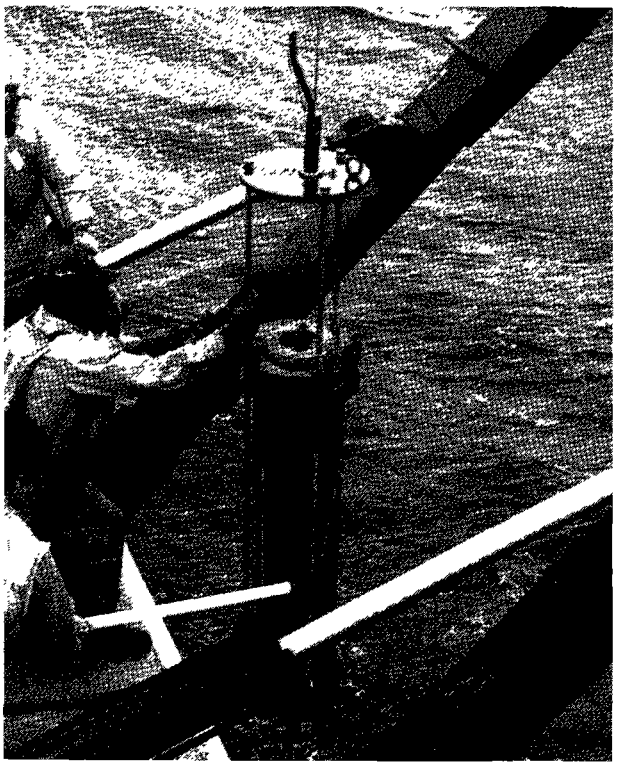
GIPME Task Team on Marine Pollution Monitoring

41 The Task Team held its Third (and last) Session in Bergen, Norway, from 25 to 28 April 1978. It reviewed regional GIPME activities, including IOC participation in the UNEP Co-ordinated Mediterranean Pollution Monitoring and Research Programme (MEDPOL), that had a monitoring component, the IGOSS Pilot Programme on Marine Pollution Monitoring (MAPMOPP) and the IOC/WMO/UNEP Pilot Project on Monitoring Background Levels of Selected Pollutants in Open-Ocean Waters.

GIPME Group of Experts on Methods, Standards and Intercalibration

42 The Group of Experts held its Second Session in Bergen, Norway, from 1 to 4 May 1978. It drew up analytical procedures for chlorinated hydrocarbons and trace metals. It assessed certain difficulties with the ultra-violet spectrofluorimetric method used in the IGOSS Marine Pollution (Petroleum) Monitoring Pilot Project for the analysis of dissolved/dispersed petroleum hydrocarbons. The question of the availability of analytical standard solutions (reference standards) was carefully considered. Preliminary preparations for an intercalibration exercise under the Pilot Project on Monitoring Background Levels of Selected Pollutants in Open-Ocean Waters were made (see below).

Pilot Project on Monitoring Background Levels of Selected Pollutants in Open-Ocean Waters



Photograph 2.

Lowering a sample during the Intercalibration Exercise in Bermuda.

43 A programme was first drawn up by the IOC, WMO and UNEP Secretariats in 1976 and submitted to the IOC Executive Council at its Eighth Session but no progress was possible until the full support of the two collaborating organizations had been assured. The Chairman of GEMSI and the Assistant Secretary IOC directly responsible for the project visited the Bermuda Biological Station for Research in July 1978 to discuss the possibility of using the Station as a base from which to conduct a workshop on the intercalibration of sampling and sample-treatment procedures, and of analytical procedures for certain trace-metals and chlorinated hydrocarbons. (The photograph shows one aspect of this exercise.)

44 Besides the contribution from the Bermuda Biological Station, the U.S. National Oceanic and Atmospheric Administration (NOAA) agreed to provide a research vessel (R.V. George B. Kelez) and related support for the intercalibration exercise.

45 In September 1978, IOC Member States were asked to declare their interest in participating in the Pilot Project, and to nominate National Co-ordinators therefor. In October 1978 an IOC/WMO/UNEP Inter-secretariat Meeting was held to formulate a Plan of Action. IOC documents INF-364 and INF-390 describe this evaluation.

46 In view of the considerable experience of the International Council for the Exploration of the Sea in Intercalibration, particularly in the North Atlantic region, the close collaboration of ICES was sought.

47 A core group of GEMSI met in Monaco from 12 to 14 March 1979 to draw up a first, detailed plan of operations for the intercalibration Workshop. An experienced scientist, who had fully participated in previous ICES exercises, participated in this meeting.

48 A Steering Committee for the Workshop on the Intercalibration of Sampling Procedures (a complete intercalibration of analytical procedures not being yet possible until appropriate reference samples had been prepared, for which appreciable additional funding was required) met in Bermuda in October 1979 to complete the detailed planning.

49 The main objectives were: comparison of three types of sampling bottles and three types of hydrographic wire, and the analysis of seawater from the open Atlantic from 1,200-m depth at which the oceanographic conditions were highly stable and the levels of the pollutants of interest were very low (background).

50 The Workshop took place on schedule (January 1980) and all the key objectives were achieved. A report on the Workshop will be issued in July 1980, and a detailed report on the analytical results will be issued in September or October 1980.

International Workshops on Marine Pollution

51 An IOC/FAO/WHO/UNEP International Workshop on Marine Pollution in the Gulf of Guinea and Adjacent Areas was held in Abidjan, Ivory Coast, from 2 to 9 May 1978. Seven Pilot Projects were proposed (IOC Workshop Report No. 14) and have been incorporated into a UNEP Action Plan for the region.

52 A CPPS/FAO/IOC/UNEP International Workshop on Marine Pollution in the South-east Pacific was held in Santiago de Chile from 6 to 10 November 1978. A Pilot Project for this region was prepared, with guidelines for co-ordinating all marine pollution research and monitoring in the region.

53 Preparations are being made for an IOC International Workshop on Marine Pollution in the South-west Atlantic, to be held in Montevideo, Uruguay, in late August or early September 1980.

54 The Third IOC/WMO Workshop on Marine Pollution Monitoring will be held in New Delhi from 11 to 15 February 1980.

Marine Pollution Elements of IOC Regional Programmes

55 The IOC Regional Programmes contain projects in Marine Pollution Research and Monitoring:

IOCARIBE has a project on oil pollution monitoring which is regarded as a contribution to the GIPME (formerly IGOSS) Marine Pollution (Petroleum) Monitoring Pilot Project, and follows the guidelines therefor;

WESTPAC has two such projects: Marine Pollution Research and Monitoring, using Commercially Exploited Shellfish as Determinants; and Coastal Transport of Pollutants.

UNEP Regional Action Plans

56 The IOC has continued to co-ordinate two Pilot Projects under the UNEP Co-ordinated Mediterranean Pollution Monitoring and Research Programme (MEDPOL). MED-I (Baseline Studies and Monitoring of Oil and Petroleum Hydrocarbons in Marine Waters) and MED-VI (Problems of Coastal Transport of Pollutants) have been extended until March 1981.

River Inputs to Ocean Systems (RIOS)

57 This study is a long-standing element of GIPME but its development has been made the responsibility of a SCOR/ACMRR/IAHS/Unesco/CMG/ECOR Working Group on River Inputs to Ocean Systems. A Review and Workshop was held by SCOR, with the assistance of the IOC Secretariat, at FAO, in Rome, from 26 to 30 March 1979. For this meeting several regional reviews of research on RIOS were prepared, and approximately 30 contributions were presented on the subject. The Proceedings, including the SCOR Working Group's Recommendations, will be published in 1980.

In February 1979 two IOC consultants visited China to learn about ongoing research in this field there. They were joined by the Secretary IOC in discussions with Chinese scientists on various possible co-operative research projects on RIOS in China. The photograph shows the group of scientists with the visitors.

Photograph 3.

The Secretary IOC, Mr. D.P.D. Scott, in the middle between Mr. Luo Chuanwei (Chief of the Division of the Ocean Science and Technology Data Centre in Tianjin), to his right, and Mr. Wang Don (Director of the Institute of Information, National Bureau of Oceanography in Tianjin), to his left, and, on either side, respectively, Dr. Jean-Marie Martin and Dr. Doeke Eisma, accompanied by other Chinese scientists.

REGIONAL OCEAN SCIENCE PROGRAMMES

Mediterranean

58 In 1979, the IOC Assembly decided to abolish the International Co-ordination Group for the Co-operative Investigations in the Mediterranean (CIM), but to maintain its Operational Unit in Monaco, calling upon the Unit to co-operate with other organizations such as UNEP and ICSEM in the execution of ongoing research programmes in the Mediterranean region, as well as any such programmes that may be developed in the future.

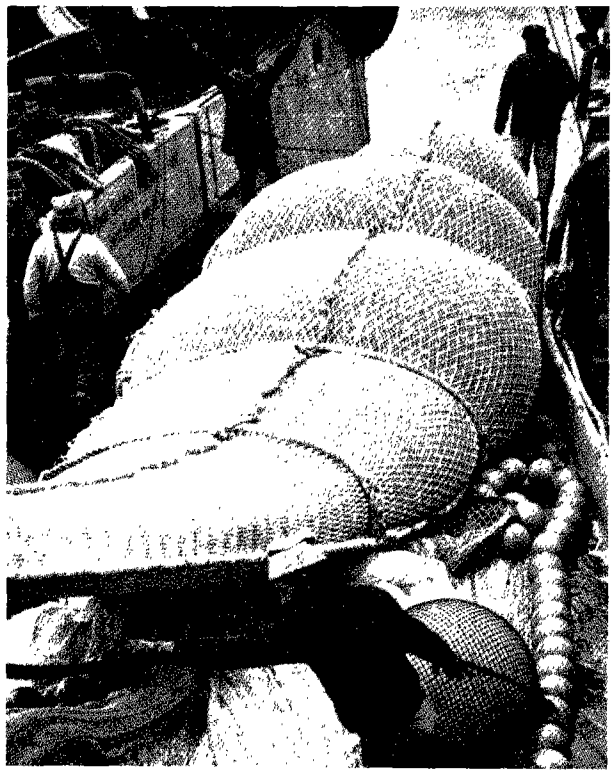
59 The Fifth (and final) Session of the ad hoc Group of Experts on the International Bathymetric Chart of the Mediterranean (IBCM) was held in Leningrad from 12 to 15 June 1978. The Group completed its work on 31 December 1978. It was replaced by an Editorial Board which was set up to give guidance and advice to the Editor, Dr. Victor Faleev (USSR Hydrographic Office, Leningrad).

60 The First Session of the Editorial Board took place in the International Hydrographic Bureau in Monaco from 11 to 14 June 1979. Publication of the Chart is foreseen for early 1981.

61 The Assembly decided to support the development of an oceanographic programme in the Mediterranean Sea during the GARP Alpine Experiment (ALPEX), scheduled for October 1981 to September 1982.

Southern Oceans

62 The Commission encouraged the Scientific Committee on Antarctic Research (SCAR) to continue scientific planning of the programme for the Biological Investigation of Marine Antarctic Systems and Stocks (BIOMASS) and contribute to increasing the oceanographic data base during FGGE. BIOMASS is sponsored by SCOR, SCAR, IABO (International Association of Biological Oceanography) and ACMRR. The Commission was represented at the fifteenth meeting of SCAR (Chamonix, France, 24 May 1978), and at the meeting of the BIOMASS sponsors' Group of Specialists on the Living Resources of the Southern Oceans (Kiel, Federal Republic of Germany, 31 May-3 June 1978) which discussed the planning of the First BIOMASS Experiment (FIBEX, 1980-1981) and at which several subsidiary groups were formed to plan the programme. Support was given to an Argentine expert, Dr. Aldo Tomo, to participate in a Krill Acoustic Calibration Exercise organized in Horten, Norway, from 10 to 21 September 1979. The photograph shows a Krill catch by a trawler.



Photograph 4.

A 25-ton catch of Krill being hauled onto the deck of FFS *Walther Herwig.*

63 The IOC Secretariat, with the assistance of the IDOE International Southern Oceans Studies (ISOS), gathered information on research cruise plans during 1978-1979 and 1979-1980, and issued "Southern Oceans Information Circular" no. 1 in November 1978, and no. 2 in October 1979.

Caribbean and adjacent regions

64 Following the Co-operative Investigations of the Caribbean and Adjacent Regions (CICAR) from 1968 to 1975, the IOC Association for the Caribbean and Adjacent Regions (IOCARIBE) was launched in July 1976 in Caracas, Venezuela, for a six-year trial period to assess the feasibility of locally organized regional activities of the Commission.

65 In collaboration with the UNDP/FAO Western Central Atlantic Fishery Commission (WECAFC) Project, the headquarters of which are in Panama, a mission visited the Lesser Antilles, Puerto Rico, and the Bahamas (9 April-2 May 1978) to encourage their participation in IOCARIBE's programmes. Following relevant recommendations of the FAO/IOC Panel on the Aquatic Sciences and Fisheries Information System (ASFIS) and the First Session of IOCARIBE, an ASFIS Survey Team visited six countries of the region (2-25 June 1978) and recommended the establishment of a Regional ASFIS Centre in the Universidad Nacional Autónoma de México to strengthen the national components of the Association's documentation and information network.

66 The Second Session of the Association (San José, Costa Rica, 7-11 August 1978) adopted the scientific programmes recommended by three previous workshops which considered marine pollution, studies in support of fisheries projects, and environmental geology of the coastal area, respectively. As the first step towards the implementation of the proposed projects, the meeting recommended early nomination of the project managers, and an expression by Member States of their commitments to participate and support these activities. Upon the election of Dr. Manuel M. Murillo of Costa Rica as the new Chairman of IOCARIBE, the Regional Secretariat moved to Costa Rica on 24 April 1978.

67 A joint IOC/UN(OETB)/Unesco/UNU Workshop on Coastal Area Development and Management in Central America was held in Mexico City, from 24 September to 5 October 1979.

68 Material was compiled for a Directory of Marine Research Centres in the Caribbean and Adjacent Regions to be published by the United Nations Environment Programme (UNEP). Two issues of the IOCARIBE Newsletter were published during the period. The second issue contained a comprehensive list of IOCARIBE National Associates (NA) and National Training Contacts (NTC) in the Member States of the region.

Western Pacific

69 Following nearly 12 years of work the Co-operative Study of the Kuroshio and adjacent regions (CSK), the Fourth and Terminal CSK Symposium was held in Tokyo, Japan, from 14 to 17 February 1979, and provided a thorough review of the results of the scientific research on the Kuroshio current system, its seasonal, annual and longer-term variability, and its physical, chemical and biological structure. The environmental conditions and the productivity of the region, including the South China Sea, were also investigated.

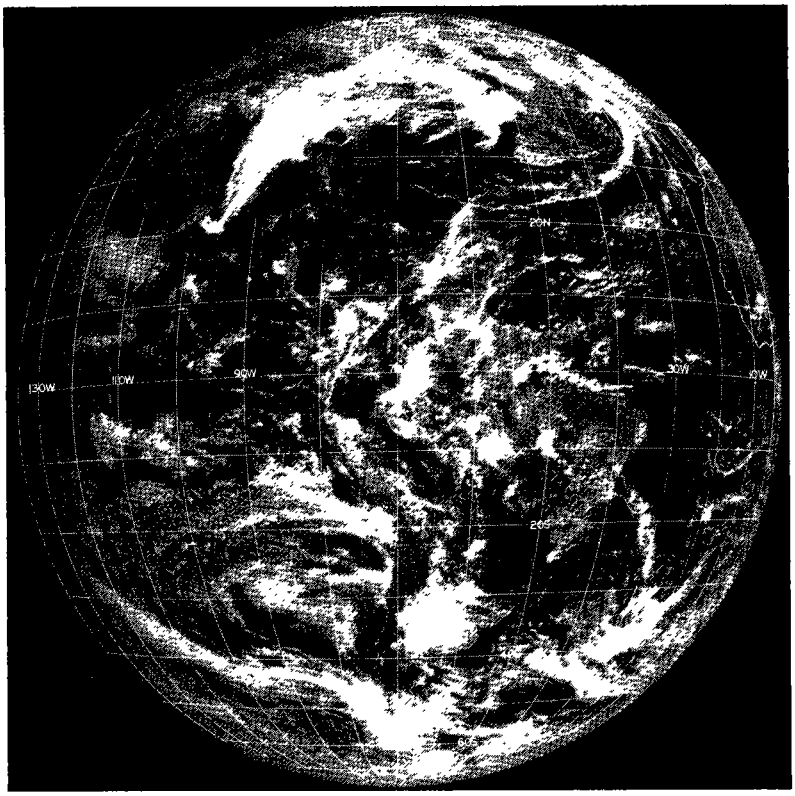
70 As a result of the evaluation of the CSK, the Commission decided to establish a Programme Group for the Western Pacific (WESTPAC) which held its First Session in Tokyo, Japan, from 21 to 24 February 1979, and adopted programmes of physical oceanography, including monitoring, marine biology, marine pollution, and marine geology and geophysics, for the region. To develop these programmes with special emphasis on new scientific and training projects, the Programme Group recommended the formation of Task Teams and the holding of several Workshops. The Workshop on Marine Geoscience Problems of the North-west Pacific will be held in Tokyo, in March 1980. The second International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific, organized jointly with CCOP/SOPAC, will be held in Nouméa, in 1980. The Workshop on Coastal Transport of Pollutants will be held in Tokyo, in 1980. A Workshop on Marine Biological Methodology is also planned. The Task Teams are: (i) on Marine Pollution Research and Monitoring Using Commercially Exploited Shellfish as Determinants; and (ii) on Ocean Monitoring in the WESTPAC region. The WESTPAC Programme Group also affirmed its interest in the work of the Joint CCOP-IOC Working Group on IDOE Studies on East Asia Tectonics and Resources (SEATAR) which held its Fourth Session in Singapore, 26 October 1978, in conjunction with the Fifteenth Session of the Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP), and its Fifth Session in Bandung, from 7 to 8 September 1979, in conjunction with the Sixteenth Session of CCOP. The Second CCOP-IOC Workshop on IDOE Studies of East Asia Tectonics and Resources was held in Bandung, from 17 to 21 October 1978; its task was to review and update the SEATAR programme.

71 The SEATAR Working Group expressed the strong wish to continue its work in the coming decade and therefore recommended the adoption of a revised mandate for the period following the International Decade of Ocean Exploration (IDOE) which ends on 31 December 1980. This recommendation was endorsed by CCOP, at its Sixteenth Session, and the endorsement of the IOC Executive Council, at its Twelfth Session, in June 1980, is also sought.

72 The Working Group for WESTPAC, in implementing its scientific programme, will pay particular attention to the management of data, through its Responsible National Oceanographic Data Centre in Japan, to the collection and sorting of biological samples, and to training, education and mutual assistance.

"El Niño"

73 The phenomenon known as "El Niño", essentially a cessation of the normal wind condition that affects upwelling along the west coast of South America, has a drastic impact on the normally abundant anchovy stock and brings higher-than-normal rainfall in northern Peru and Ecuador. It has not yet been possible to predict accurately or even to say precisely why the phenomenon



Photograph 5.

Global image of the earth showing weather patterns taken by a geostationary satellite (ATS-3) having a subpoint of 3.0° S, 70.0°W.

occurs. Scientists now believe that "El Niño" is a local manifestation of oceanic and atmospheric processes occurring over at least the whole of the eastern tropical Pacific, and possibly over much larger areas of the globe. The sudden decline of the anchovy stock influences the world fish and soya bean markets and, indirectly, the production of fertilizer, which is strongly dependent on the guano produced by the birds feeding on the anchovy. The photograph shows the earth, photographed from a satellite, and particularly the South American continent and its cloud cover.

74 Following the decision of the Tenth Session of the IOC Assembly, and with the concurrence of the World Meteorological Organization and the Comisión Permanente del Pacífico Sur (CPPS), the First Session of the Joint IOC/WMO/CPPS Working Group on the Investigations of "El Niño" was held in Callao, Peru, from 16 to 20 October 1978, at the invitation of the CPPS Secretary-General, Ambassador J.M. Bákula. The Regional Study on the "El Niño" Phenomenon (ERFEN) is a multisectoral and multidisciplinary investigation sponsored by CPPS which has been supported by IOC. The Member States of the region, as well as the Comisión Permanente, are supporting the Study and are making the necessary link with global programmes, such as the Integrated Global Ocean Station System (IGOSS) and the World Climate Research Programme. The Commission, at its Eleventh Session (October-November 1979) invited the Members (United Nations, FAO, Unesco, WMO and IMCO) of the Inter-secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) to continue their support for the Study, particularly the training, education and mutual assistance (TEMA) elements. The World Meterological Organization organized in Quito, Ecuador, from 26 to 30 November 1979, an Implementation Co-ordination Meeting related to "El Niño" Investigations; the Second Session of the Joint IOC/WMO/CPPS Working Group on the Investigations of "El Niño" will be held in Ecuador in the last quarter of 1980 to consider the co-ordination of extra-regional support and to review the scientific work and collection and dissemination of data for the "El Niño" investigations.

North and Central Western Indian Ocean

75 There is increasing evidence linking sea-surface anomalies of this region off the east coast of Africa and the Arabian peninsula with rainfall over India and neighbouring countries. The Asiatic monsoon, the strongest, large-scale, long-period, variable force that the atmosphere exerts on the Indian Ocean and its current system (the Somali current), is related to the variability of physical, chemical and biological processes that affect the development and management of the coastal resources of the region, especially the fisheries.

76 In collaboration with the Unesco Regional Office for Science and Technology for Africa (ROSTA), Nairobi, Kenya, the Commission convened a meeting of its Member States of the region at ROSTA, from 5 to 9 March 1979, to develop further the Co-operative Investigation in the North and Central Western Indian Ocean (CINCWIO). The meeting adopted a large part of the scientific programmes recommended by the Scientific Workshop to initiate planning for a Co-operative Investigation in the North and Central Western Indian Ocean held in Nairobi in 1976, and made, among others, a specific recommendation to the Commission and the countries of the region, on the establishment of an effective co-ordinating mechanism for CINCWIO in the region. By Resolution XI-9, the Commission, at the Eleventh Session of its Assembly (Unesco, Paris, 15 October-3 November 1979) endorsed the recommendations of the above-mentioned meeting, and decided to establish a Programme Group and a Technical Advisory Group for CINCWIO. By the same Resolution, the Commission invited the Director-General of Unesco to investigate the possibilities of strengthening ROSTA by the addition of a marine science expert to assist in the planning, co-ordination, and execution of the programme.

77 In 1979, some research scientists from the region were sponsored by the Commission to receive further training on board R.V. RESEACHER (United States) and R.R.S. DISCOVERY (United Kingdom) during the ships' operations in the Indian Ocean under the First GARP Global Experiment (FGGE).

Eastern Central Atlantic

78 Jointly with the International Council for the Exploration of the Sea (ICES) and the FAO Fishery Committee for the Eastern Central Atlantic, the Commission held a symposium on the upwelling and the living resources of the Canary Current, in Las Palmas, Gran Canaria, Spain, from 11 to 14 April 1978. This meeting terminated a series of internationally co-ordinated expeditions during which research vessels from various countries studied the waters off north-west Africa with a view to developing a general description of the Canary Current region between Gibraltar and 10° N, and to analysing the upwelling and its biological consequences in the area, which is one of high biological productivity. The results of this work will contribute to a major programme of the Commission on oceanographic studies of marine ecological conditions in relation to fish stocks, which the Assembly of the IOC, at its Eleventh Session (Paris, 15 October-3 November 1979) decided to develop in collaboration with FAO.

79 An important step in this development will be the organization, in collaboration with Unesco, of a Workshop on Marine Science Co-operation on the Atlantic Coast of Africa.

GLOBAL AND REGIONAL OCEAN SERVICES

THE INTEGRATED GLOBAL OCEAN STATION SYSTEM (IGOSS)

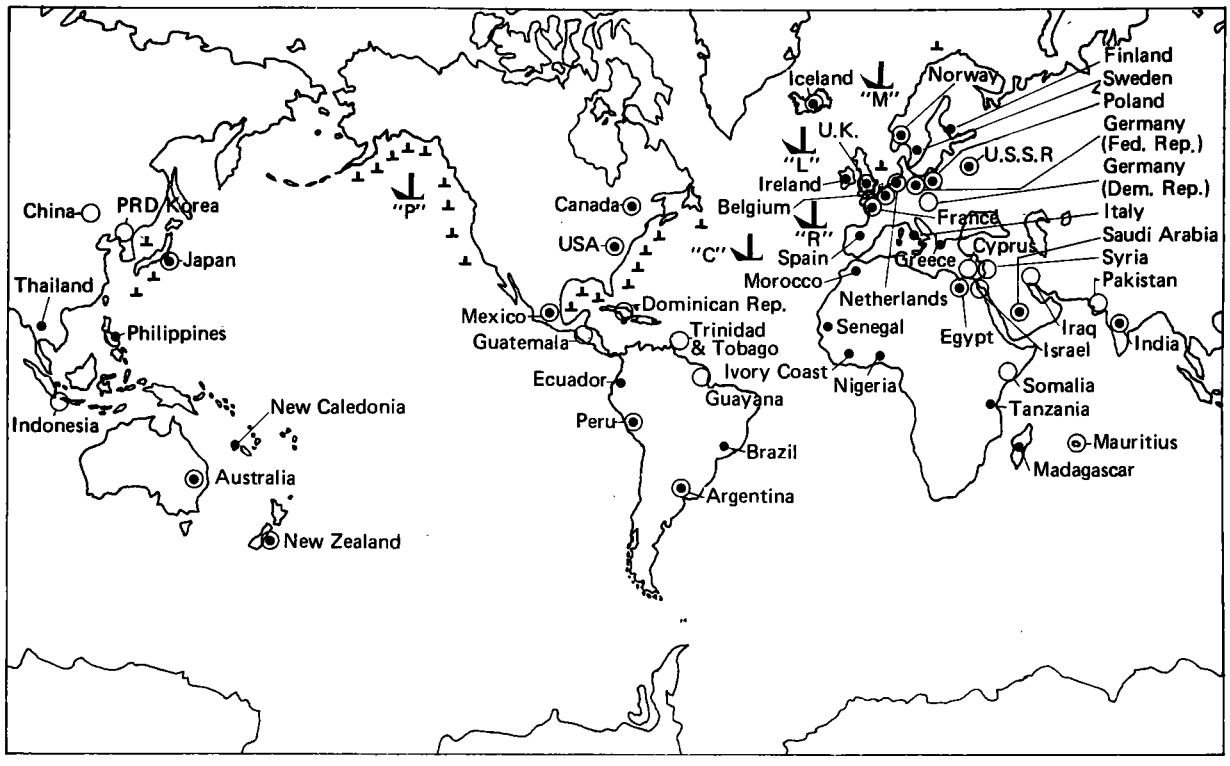
80 The Integrated Global Ocean Station System (IGOSS) is a Joint IOC/WMO, world-wide, operational service programme providing information on the state of the oceans for various marine users. The purpose of IGOSS is to develop, promote and co-ordinate the international machinery necessary for the timely global acquisition and exchange of ocean data; and the provision of oceanographic products and services to governmental, commercial, academic and private interests. Analyses and predictions of important ocean features are all available to users on a timely basis. These users are concerned with exploration and exploitation of biological and mineral resources of the ocean, shipping, weather and climate, recreation, search and rescue operations, oceanic and offshore engineering, harbour control and pollution abatement and control. The information is also used in the support of meteorological and oceanographic research.

81 The IGOSS General Plan and Implementation Programme for 1977-1982 (IOC Technical Series No. 16, WMO Publication No. 466) is a guide for the further development of IGOSS in the manner desired by participating nations. It contains guidelines for the development of the following basic components: the IGOSS Observing System, the IGOSS Data Processing and Services System; IGOSS telecommunications; research in support of IGOSS; and training and education related to IGOSS. The Plan and Implementation Programme for 1982-1985 is presently in preparation. A general brochure on IGOSS was published in November 1979 by IOC and WMO with co-operation from the United States.

82 The First Session of the Joint IOC/WMO Working Committee for IGOSS was held in September 1978. It recommended the establishment of a unique national contact point: "National Representatives for IGOSS". As of 31 December 1979, over 30 nations had nominated such National Representatives (see Figure 3).

Figure 3.

Participation of Member States of IOC and WMO in the Operational Programme for the Collection and Exchange of Oceanographic Data (BATHY/TESAC)



83 The Working Committee also established three subgroups of experts:

(i) Subgroup of Experts on Operations and Technical Applications;

(ii) Subgroup on Scientific Matters related to IGOSS; and

(iii) Subgroup of Experts on Marine Pollution Monitoring.

84 In 1978-1979 major efforts were concentrated on implementation of the following activities:

The IGOSS Observing System

85 The first co-ordinated global observation system established by IGOSS was the BATHY/TESAC Operational Programme. The Programme comprises the world-wide collection, exchange and processing of BATHY (bathythermograph) data (profiles of ocean temperature with depth) and TESAC data (temperature/salinity/current profiles with depth). Instructions and forms are available for recording standardized observation, message coding, and data transmission, so that data from each participating nation can be exchanged rapidly and accurately around the globe. Ships, and moored and drifting buoys (photograph 6) from many co-operating nations contribute IGOSS data, and the global distribution of data improves each year (Figure 4). Real-time data exchange in the BATHY/TESAC programme has increased by 500 per cent since 1972 (Figure 5). Global, regional and national environmental groups use the BATHY/TESAC Operational Programme as a basis for their in situ ocean monitoring. For example, POLYMODE, a multinational research programme in the western North Atlantic, organized to study the role of large-scale fluctuating currents in the oceanic circulation, made considerable use of IGOSS support. Because the IGOSS telecommunications and data analysis functions were already operational, they proved very useful for POLYMODE. The IGOSS Programme collected BATHY data from all participating ships and returned preliminary analyses for timely planning of subsequent phases of the experiment.

86 The IGOSS BATHY/TESAC Programme similarly served as a basic oceanographic data collection scheme for the Global Weather Experiment in 1979. Data exchanged within the IGOSS programme were used during the experiment to form the oceanographic data base, to aid in preliminary analyses and survey planning, and to provide the basis for timely analytical products for various ocean regions (Figure 6). These products were distributed to analytical centres, made available to ships participating in the experiment via radio-facsimile broadcasts, and, where telecommunication means were not available, were mailed to users.

87 Other activities in support of the BATHY/TESAC Operational Programme include:

Updating of a Manual on Operational Instructions for the Reporting of Oceanographic Data (BATHY and TESAC) (IOC/INF-398) December 1979.

Co-sponsoring with WMO of an Informal Planning Meeting on Drifting Buoy Programmes, Geneva, December 1979.

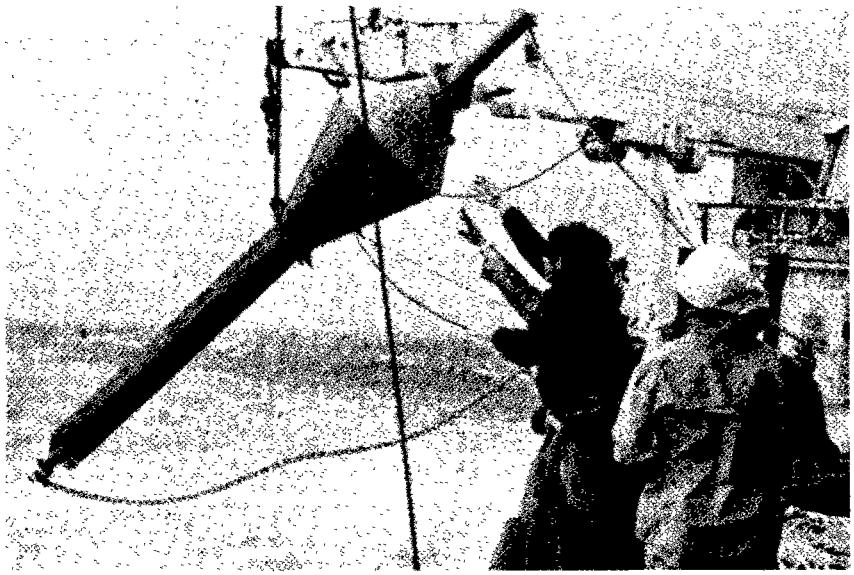
Preparation and distribution of the third issue of the Regular Information Service Bulletin on Ocean Data Buoys, October 1979.

Specialized IGOSS activities in support of many global and regional activities, including the Pilot Ocean Monitoring Study (POMS), WESTPAC, COST-43, and the Flemish Cap International Experiment started during the reporting period.

Finally, during 1979, the United States seconded a full-time IGOSS Operations Officer to assist in the day-to-day development of the BATHY/TESAC Programme.

The IGOSS Data Processing and Services System (IDPSS)

88 The organizational structure of the IGOSS Data Processing and Services System consists of World Data Centres for Oceanography in Moscow and Washington, and National and Specialized Oceanographic Data Centres in participating Member States. This structure provides a co-ordinated global system for the preparation and exchange of oceanographic analysis and prediction products. Data from all co-operating nations are combined in standard formats at the World Data Centres, and then used as input to global and hemispheric analyses for improved weather forecasting, global climate studies, and a variety of products for oceanographic research uses. These global analyses are also used as guidance in the preparation of products



Photograph 6.
Drifting buoys for following ocean currents

Figure 4.
Distribution of BATHY and TESAC reports for 1978. Each black dot represents one report.

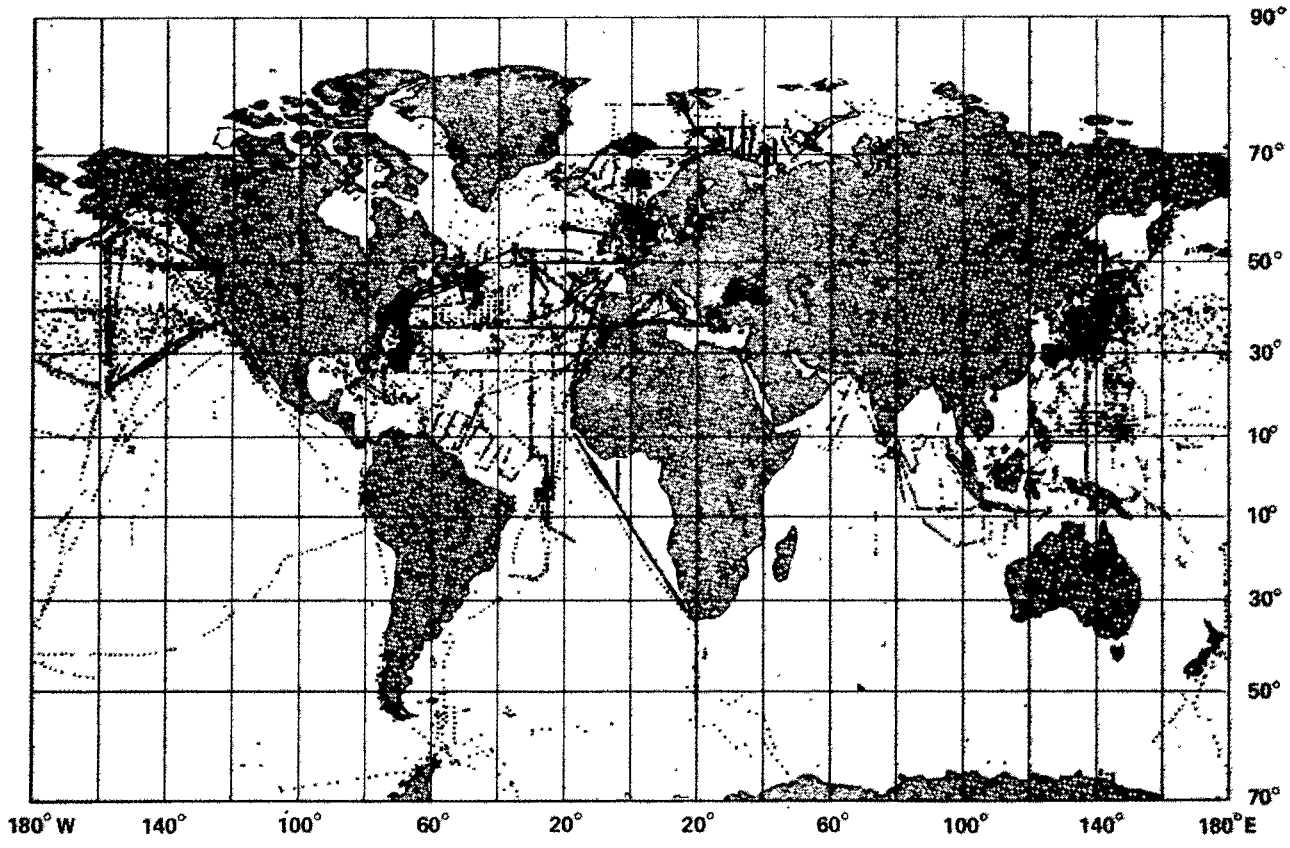


Figure 5.

Number of BATHY and TESAC Observations Exchanged Annually in the IGOSS Programme.

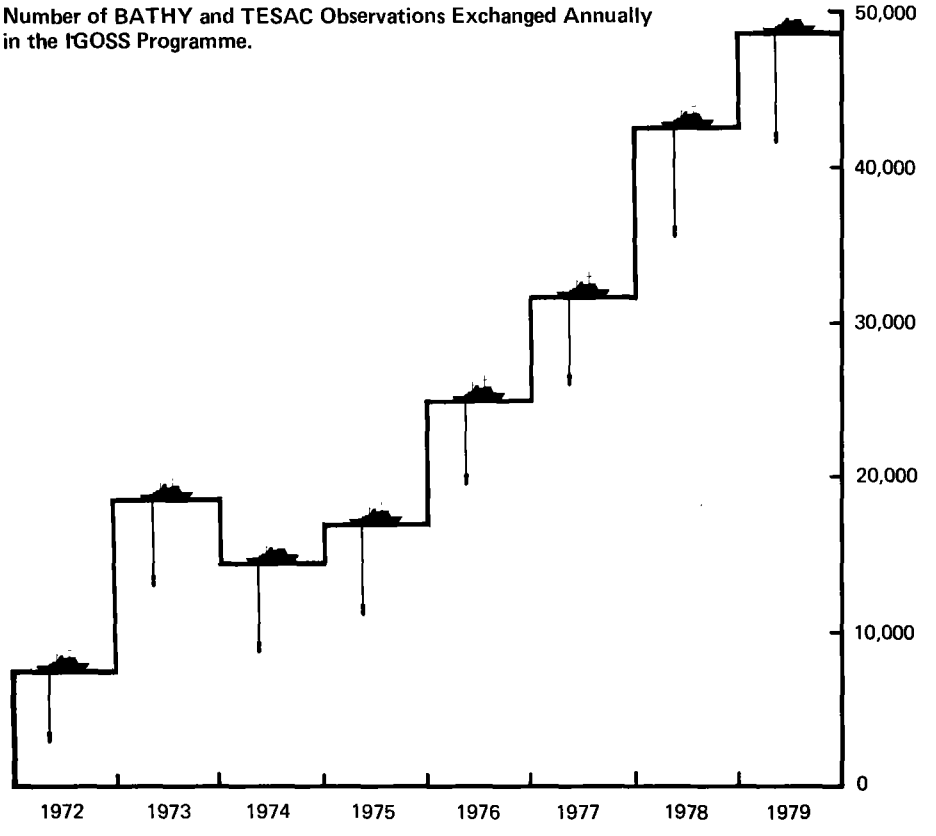
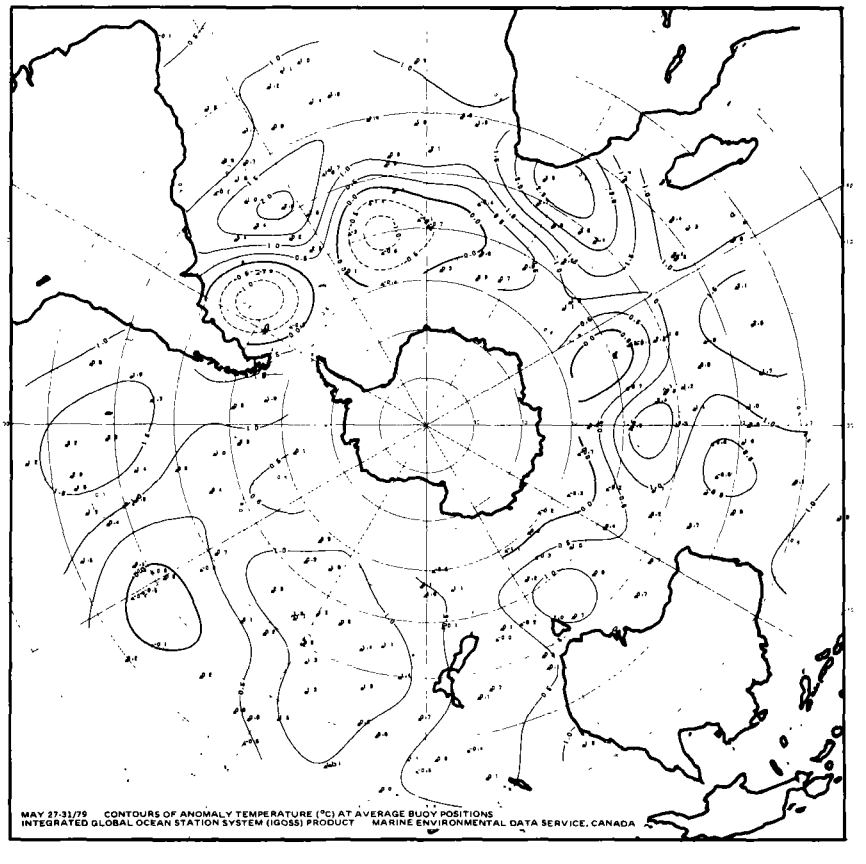


Figure 6.

Sea surface temperature anomalies computed from data from drifting buoys by the Marine Environmental Data Service of Canada.



of a more local scope in the national centres. The National Oceanographic Data Centres provide strict quality control for data from their country entering the global exchange system, and develop products in response to the needs of the national user.

89 The concept of regional programmes, supported by Specialized Oceanographic Data Centres, is becoming increasingly important in IGOSS. In this way, problems and products unique to a given region can receive special focus in data acquisition, product development, and training designed and co-ordinated by the nations most closely involved.

90 The Joint IOC/WMO Seminar-Workshop on Oceanographic Products and IGOSS Data Processing and Services System (IDPSS) (Moscow, 2-11 April 1979) considered the requirements of marine user groups for oceanographic services. The workshop identified types of guides and supporting documentation needed for the development of IDPSS, and formulated specific recommendations on the content of the Guide to the IDPSS (first draft to be completed in 1980).

91 Other activities related to IDPSS included:

The Joint IOC/WMO meeting of governmental experts on IDPSS (Hamburg, 6-10 March 1978).

Publication of the IGOSS products in support of the FGGE.

Publication of the first issue of a regular information service bulletin on oceanographic products, issued by national centres.

The IGOSS Marine Pollution (Petroleum) Monitoring Pilot Project (MAPMOPP)

92 The main activity under IGOSS concerned with marine pollution monitoring is the IOC/WMO Marine Pollution (Petroleum) Monitoring Pilot Project (MAPMOPP) which, since its inception four years ago, has been given considerable support by the United Nations Environment Programme (UNEP). This has allowed extensions of the project as need arose. The main objective of MAPMOPP was to test the feasibility of establishing a global marine pollution monitoring system; secondary objectives were to collect data for an eventual preliminary assessment of oil pollution in the oceans, and to create an organizational machinery and gain the experience necessary for a possible transformation of the Pilot Project into a fully-fledged global marine pollution monitoring programme.

The four main observational elements of the project are:
oil slicks and other floating pollutants;
floating particulate petroleum residues (tar balls);
tar on beaches; and
dissolved/dispersed petroleum hydrocarbons in ocean surface waters (1 metre depth).

93 The Joint IOC/WMO Subgroup of Experts on the Pilot Project, at a meeting in Washington D.C., from 13 to 17 February 1978 considered progress to be generally satisfactory, though the flow of some types of data was still limited.

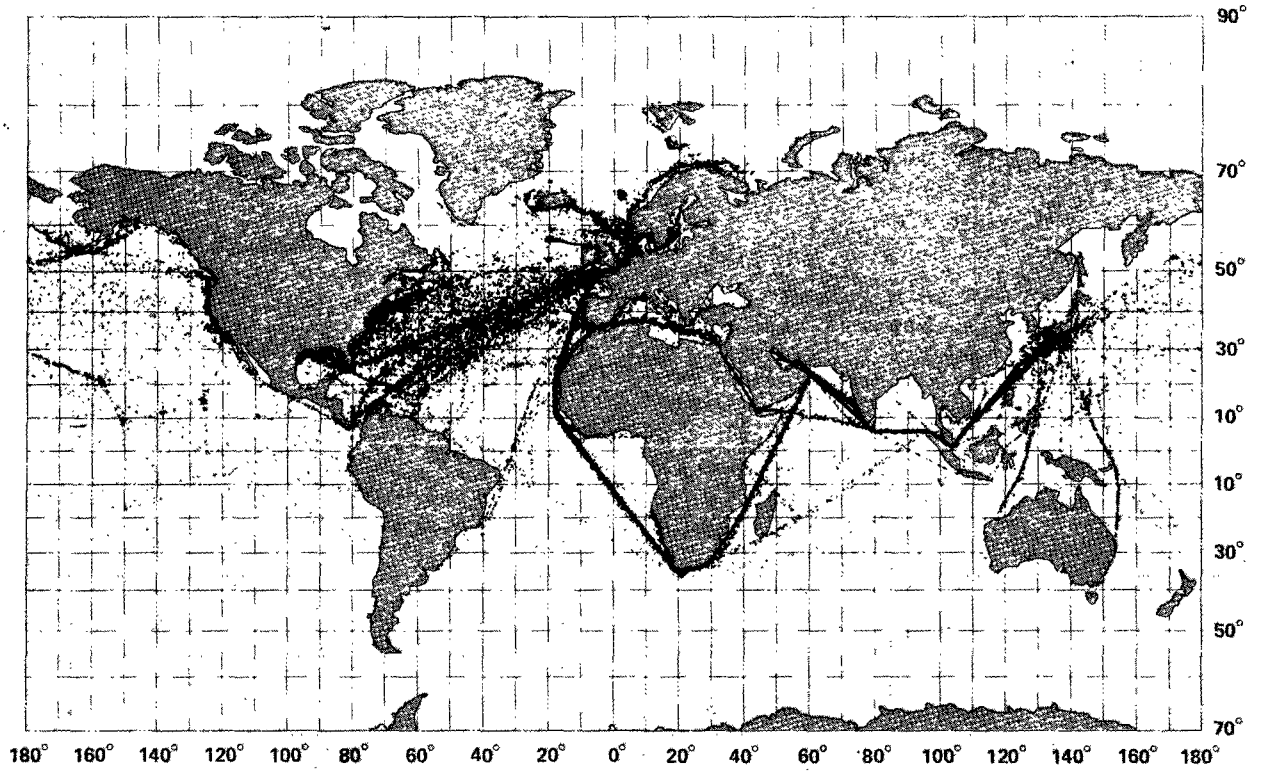
94 The Joint IOC/WMO Working Committee for IGOSS, which met in Paris from 18 to 27 September 1978, recommended the continuation of the Pilot Project pending development of a quasi-permanent Marine Pollution Monitoring Programme (MARPOLMON) which could eventually include pollutants other than oil. It recommended that the Third IOC/WMO Workshop on Marine Pollution Monitoring address this question, among others, with the full participation of the Working Committee for GIPME; one such other question was on the feasibility of discriminating petroleum and biotic hydrocarbons.

95 An ad hoc Group of Experts on the Evaluation of the Marine Pollution (Petroleum) Monitoring Pilot Project met in Tokyo from 9 to 13 July 1979 to evaluate the results of the Pilot Project to date. By then, about 40 countries were participating, and a considerable body of observations (over 100,000 on oil slicks) had been built up (Figure 7). The Group considered that the more important ambiguities of the methods had been resolved by scientists participating in the project, and that the four marine observational aspects were ready for inclusion in an operational monitoring programme.

96 A subproject aimed at ensuring comparability of data from spectrofluorimetric analyses (intercomparison exercise) in different countries has been extended and will continue until June 1980. An increasing number of laboratories is joining this exercise as capabilities for analysis by spectrofluorimetry are developed in several regions.

Figure 7.

The IGOSS Marine pollution monitoring effort has accumulated over 100,000 co-operative observations since 1975 from many areas of the world's oceans. Black dots on the map show positions of reports of whether or not a pollutant was present, and, if so, what kind.



97 The two National Oceanographic Data Centres designated as RNODCs for the project (those in Washington and Tokyo) have continued to render essential services related to exchange and storage of data. In addition, the Deutsches Ozeanographisches Datenzentrum (DOD), Hamburg, has given valuable assistance in validating data and preparing data products needed for the project's evaluation.

98 The IOC Association for the Caribbean and adjacent regions (IOCARIBE) has started a regional petroleum monitoring programme (CARIPOL) based on the MAPMOPP operational plan, and with some support form the MAPMOPP project.

99 The IOC, at its Eleventh Session, recognizing the considerable involvement of the Working Committee for GIPME required for the determination of which pollutants other than oil should be monitored globally, and the need to limit overlap between the work of the Working Committees for IGOSS and GIPME, decided to assign all responsibility for marine pollution monitoring programmes to the Working Committee for GIPME.

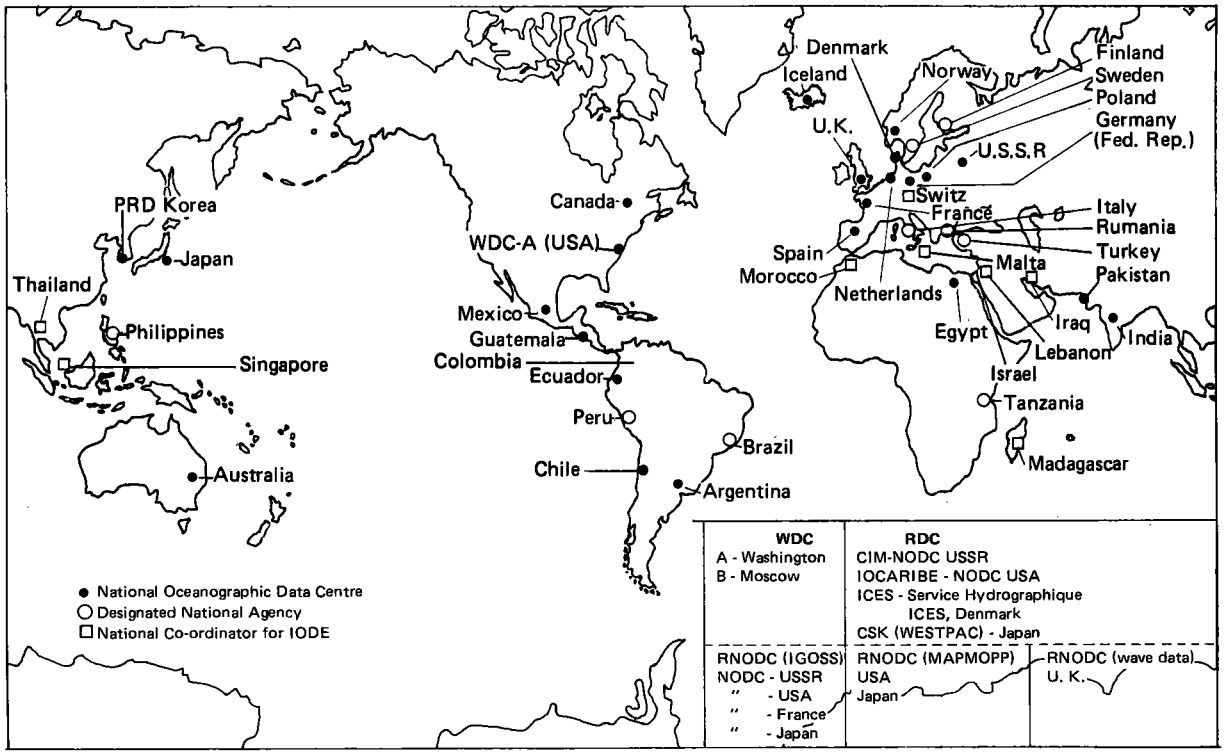
100 The IOC Assembly also decided that, subject to a positive recommendation from the Third IOC/WMO Workshop on Marine Pollution Monitoring in February 1980, the Pilot Project should be converted to a monitoring programme (MARPOLMON) by 1 July 1980.

INTERNATIONAL OCEANOGRAPHIC DATA EXCHANGE (IODE)

101 This programme promotes the exchange and archiving of oceanographic data and information resulting from, or relating to, global, regional and national oceanographic programmes.

102 At present, the IODE network consists of: World Data Centres A and B (Oceanography); three Regional Data Centres (RDCs, for the Caribbean, Mediterranean and North-east Atlantic); several Responsible National Oceanographic Data Centres (RNODCs) which deal with specific data or projects (e.g. for IGOSS, MAPMOPP/MARPOLMON, FGGE, Wave data and WESTPAC); 25 National Oceanographic Data Centres (NODCs) and eight Designated National Agencies (DNAs). Thirty-nine Member States have designated National Co-ordinators for IODE (Figure 8). Additional NODCs are presently being established by several Member States.

Figure 8. International Oceanographic Data Exchange System



103 Support of the IODE system by IOC Member States continues to be noteworthy. A recent analysis by the Director of the WDC-A (Oceanography) shows that the annual flow of data of all types into the WDCs during the 1970s has remained at more than twice the pre-IODE level. The annual flow of oceanographic station data has more than quadrupled since the IODE was started (Figures 9 and 10). However, the analysis also shows that although a great volume of data from programmes other than Declared National Programmes (DNPs) is voluntarily being submitted to the WDCs, less than half of the data that could be expected from Declared National Programmes is actually received. The WDCs (Oceanography) now hold more than 1,300,000 observations and 20,000 scientific articles, reports and publications contributed by 75 countries. All data and information held by the WDCs are available to Member States.

Figure 9.

Total number of observations exchanged (all types)

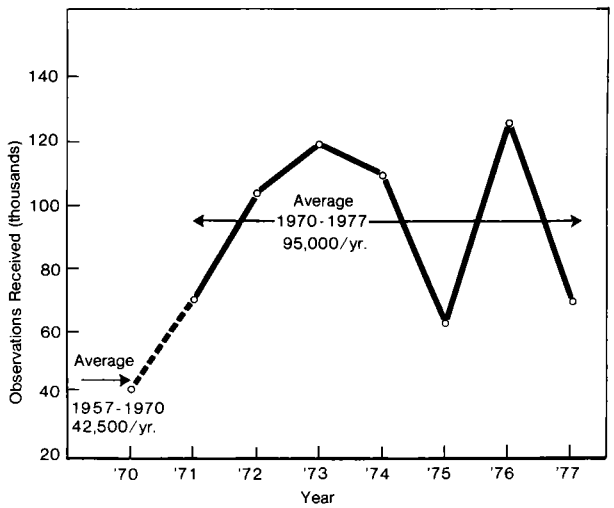
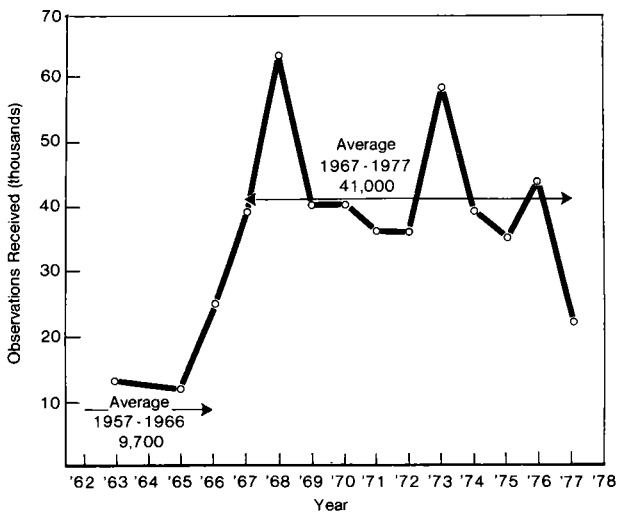


Figure 10.

Number of oceanographic serial stations exchanged



104 RNODCs deal either with data from specific programmes (e.g. IGOSS) or with a specific discipline (e.g. instrumented wave data) or, where Member States so agree, with a specific region (as is being proposed for IOCARIBE). The IOC has published a brochure on RNODCs.

105 The Working Committee on International Oceanographic Data Exchange was established in 1961 to guide the development of the entire international oceanographic data exchange system and to establish standard processing procedures and standard formats for data to be exchanged and archived.

106 Under the Working Committee, various Task Teams and Rapporteurs are working on the data exchange aspects of programmes in marine biology, remote sensing, marine pollution, joint marine meteorological and oceanographic experiments, instrumented wave measurements, information management, marine geology and geophysics. Groups of Experts advise the Commission on the development of standard data formats, the RNODC system, the Marine Environmental Data Information Referral System (MEDI) and the Joint IOC/FAO/UN(OETB) Aquatic Sciences and Fisheries Information System (ASFIS).

107 The Working Committee on IODE has continued to develop standard exchange arrangements and formats for marine biological data. The immediate task, in collaboration with the SCAR/SCOR/ACMRR/IABO group concerned with BIOMASS, is to provide data management support to FIBEX.

108 A high priority task before the Working Committee is the adaptation of data-exchange arrangements to meet the anticipated needs of the Climate Programme. In this, it is actively collaborating with the SCOR/IOC Committee on Climatic Changes and the Ocean, and with WMO.

109 IODE, jointly with IGOSS, has provided effective guidelines for the oceanographic data-management component of FGGE, and has contributed data processing and data indexing support, notably through the RNODC-FOY (see paras. 28 and 29 above).

110 User experience with earlier versions of an IOC standard data format (General Format - Version 2) has contributed to the development of a more versatile General Format - Version 3 (GF-3). Detailed instructions for the use of this format will be published in early 1980.

111 To encourage more Member States to submit Declared National Programmes (DNPs) and National Oceanographic Programmes (NOPs), several circular letters and a brochure entitled "NOPs/DNPs" have been widely distributed. Consolidated reports of DNPs have also been prepared.

112 Past IODE contributions to TEMA have been reviewed, and with the assistance of an IODE-TEMA co-ordinator, new IODE-TEMA projects in data and information exchange are being formulated.

The Marine Environmental Data Information Referral System (MEDI)

113 IODE and the IOC Secretariat, with the assistance of UNEP, are continuing to accelerate the implementation and operation of the Marine Environmental Data Information Referral System. MEDI is the marine science sectoral focal point of the United Nations Environment Programme's International Referral System, INFOTERRA. MEDI provides information on the availability, characteristics and location of marine environmental data, including data held by repositories affiliated with, or relating to, programmes of FAO, WMO, IHO, IAEA, ICES, UNEP and IMCO. MEDI is presently being co-ordinated by the IOC MEDI Co-ordination Centre, in co-operation with FAO, WHO, IHO, IAEA, ICES, UNEP and EUROCEAN. Among significant accomplishments pertaining to MEDI are the compilation and publication of a comprehensive MEDI Catalogue, a streamlined MEDI Input Registration form, and a descriptive, non-technical brochure aimed at the widest possible readership.

114 All MEDI input received by 31 December 1979 has been processed and added to the computerized information bank.

115 MEDI Catalogue I (IOC Manuals and Guides No. 10) has been published and distributed to contributing national centres and international centres and organizations, with a request to provide MEDI with updatings of their holdings.

The FAO/IOC/UN(OETB) Acquatic Sciences and Fisheries Information System (ASFIS)

116 The development of the FAO/IOC/UN(OETB) Aquatic Sciences and Fisheries Information System (ASFIS) was promoted during the biennium through a FAO/IOC/UNEP project, which ended in

Photograph 7.

Damage on Sumbawa Islands (Indonesian Archipelage) due to a tsunami in August 1977; the effects of the tsunami were felt as far away as Perth, Australia (Photo Credits Associated Press, Jakarta, Indonesia)

December 1979. Over a four-year period $250,000 had been allocated through this project to enlarge the subject coverage of the system, advance certain aspects of computerization, develop a definitive thesaurus, produce various instructional materials related to the system, and organize appropriate training seminars.

117 An ASFIS Training Seminar/Workshop was hosted by the Government of Colombia in Cartagena, from 3 to 14 December 1979, with the joint participation of FAO, IOC and UNEP. The purpose of the Workshop was to familiarize participants from the Caribbean, and adjacent regions with modern information storage and retrieval systems, in particular the UNEP "INFOTERRA", MEDI and the various modules of ASFIS. A systems overview and a practical training course on MEDI operations and procedures was conducted. Detailed training on input preparation and the use of ASFIS products is expected to increase the participation of regional institutions in the system.

THE TSUNAMI WARNING SYSTEM IN THE PACIFIC (ITSU)

118 The Sixth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) was held in Manila, from 20 to 25 February 1978. The Group adopted an action plan requesting Canada and the United States to investigate the use of satellites in the Tsunami Warning System, and requesting all Member States of the Group to review the communication facilities between their tide gauges and the Pacific Tsunami Warning Centre in Honolulu. The Group was of the opinion that the goal of the Tsunami Warning System should be to verify the existence of a tsunami within one hour of the time of generation, so as to allow early warning. The Group further gave high priority to an educational programme to increase public awareness of the dangers of tsunamis. Member States were invited to undertake one pilot educational programme within each country. The Director of the International Tsunami Information Center (ITIC) was requested to prepare and distribute a catalogue of emergency evacuation plans for each Member State, as well as an inventory of all public educational material. It was agreed that progress be reviewed at the Seventh Session of the International Co-ordination Group which will be held in Viña del Mar, Chile, from 3 to 7 March 1980. The photograph 7 shows damage on Sumbawa Island due to a tsunami.

TRAINING, EDUCATION AND MUTUAL ASSISTANCE IN THE MARINE SCIENCES (TEMA)

119 As a joint specialized mechanism of the United Nations system, the Commission is responsible for the evaluation of national needs in Training, Education and Mutual Assistance in the marine sciences. It is responsible for recommending, developing and co-ordinating programmes to satisfy those needs through the concerted action of the Member States and other international organizations. The Commission stimulates national mechanisms to develop or strengthen marine science and technology organizational structures, and to establish comprehensive national ocean policies.

120 The recommendations of the Second Session of the Working Committee for TEMA (New York, 18-23 July 1977) were mainly aimed at improving the identification of the needs of the developing countries through Workshops and through the subsidiary bodies of the Commission concerned

with various programmes (IGOSS, GIPME, IODE, etc.), and providing assistance from the Commission's own resources as well as through improved co-ordination with other international organizations particularly the members of the Inter-secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO).

121 To provide guidelines for infrastructure development in marine sciences in developing countries two Workshops were held.

122 The Workshop on Training of Marine Technicians was held at the Atlantic Oceanographic and Meteorological Laboratories (AOML), NOAA, Miami, United States (22-26 May 1978). The report, giving full details of the syllabus approved, and recommendations made by the Workshop, was published as Unesco Report in Marine Sciences No. 4 "Syllabus for training marine technicians", 1979. Support will be provided to a training course for marine technicians in South-East Asia, of one month's duration, which will be held in June 1980 at the Australian Institute of Marine Sciences, Townsville, Australia. Similar courses are being planned for other regions.

123 The Workshop on the "Preparation of a Syllabus for Introducing Oceanography and the Marine Environment into Secondary Schools Curricula" was held at the United College of the Atlantic, St. Donat's Castle, Llantwit Major, South Wales, United Kingdom, from 5 to 9 June 1978. The report, giving the agreed format of a syllabus, along with recommendations of the Workshop, was published as Unesco Report in Marine Sciences No. 5 "Marine science syllabus for secondary schools", 1979.

124 During the biennium, shipboard training was provided to scientists from Bangladesh, Ecuador, Fiji, India, Indonesia, Somalia, Kenya and Tonga. Study grants were provided to marine scientists from Algeria, Cameroon, Egypt, India and Peru.

125 The IOC, under agreements with the University of Rhode Island (URI) and with Oregon State University (OSU), awarded four fellowships in the Master of Arts in Marine Affairs Programme of URI to candidates from Ghana, Nigeria and Thailand, and two fellowships for the Marine Resources Management Programme of OSU to candidates from Somalia and Mauritius. In each case, the IOC provided a yearly stipend of $4,000 to each fellow and the University provided tuition to each fellow.

126 To assist marine institutions in developing countries to develop their textbook and reference materials in marine sciences, the IOC has decided to revise its "Annotated Bibliography of Textbooks and Reference Materials in Marine Sciences" with the help of specialists. The new edition is expected to be published by the end of 1980.

127 In accordance with recommendation TEMA-II.2, TEMA co-ordinators have been appointed for various programmes of the Commission: for IGOSS, IODE, GIPME, IOCARIBE, WESTPAC and the Investigations of "El Niño". They will serve as the focal points for the development and implementation of appropriate TEMA activities of their subsidiary bodies and are required to work closely with the IOC Secretariat and with appropriate representatives of interested ICSPRO Agencies and other international bodies. Steps have been taken to strengthen TEMA activities on the main programmes of the Commission. These are summarized below.

TEMA-GIPME

128 The IOC Assembly at its Eleventh Session decided that the TEMA component of GIPME should concentrate on training for marine pollution baseline studies, in laboratories that would be prepared to provide training. A document on the problems of TEMA in GIPME is in preparation.

TEMA-IGOSS

129 The First Session of the Joint IOC/WMO Working Committee for IGOSS (Paris, 8-27 September 1978) recommended that consultant missions be sent to various regions with a view to expanding IGOSS activities and to using the services of TEMA co-ordinators for IGOSS. A training course in marine pollution (petroleum) monitoring is being organized in selected institutions of the Indian Ocean region with the support of UNEP. In relation to MAPMOPP, spectrofluorimeters have been provided to Argentina, Kenya, Mexico and Thailand and further assistance to other countries participating in this project is planned.

TEMA-IODE

130 A mission from CNEXO, France, supported by IOC, was sent to Venezuela to advise on, and initiate, arrangements for the establishment of a National Oceanographic Data Centre in that country. Under the IODE programme, the Secretariat is considering requests from some developing countries for on-the-job training in data handling and processing in institutions of developing countries. As part of the series of regional ad hoc TEMA meetings convened in the past to assess the training needs at the regional level, the sixth such meeting, for the countries of the North Indian Ocean, was held in Karachi, Pakistan, from 11 to 16 March 1978. The meeting adopted 12 recommendations.

TEMA-IOCARIBE

131 The TEMA component of the IOCARIBE scientific and technical programmes is generally well developed, particularly as regards the possibilities for obtaining advanced degrees in marine science, and donation or loan of equipment and scientific instruments.

132 The major activity during the period was the holding of the Workshop on Coastal Area Management in the Caribbean Region from 24 September to 5 October 1979, hosted by the Government of Mexico. The Workshop was jointly organized by IOCARIBE and the Ocean Economics and Technology Branch of the United Nations, and was financially supported by IOC, Unesco, UNEP and UNU. Thirty-two scientists from the region and observers from Indonesia and from other governmental and non-governmental institutions participated in the Workshop. IOCARIBE scientists were also provided cruise training on board Soviet research vessels.

TEMA-ERFEN(1)

133 Following a recommendation of the First Session of the Joint IOC/WMO/CPPS Working Group on the Investigations of "El Niño" (Callao, Peru, 16-20 October 1978), a mission was sent to the region (south-east Pacific) to formulate a TEMA component for ERFEN, in consultation with the participating institutions. This is now being implemented jointly with WMO and CPPS.

TEMA-WESTPAC

134 TEMA priorities for WESTPAC have been closely linked with priority programmes approved by the Workshop on the Western Pacific, Tokyo, February 1979. A short-term expert will visit countries in the region to provide training in field methods of collection, analysis and interpretation of data on coastal transport of pollutants. Support was also given to scientists of some Member States of the region to participate in the Fourth CSK Symposium and the WESTPAC Workshop.

TEMA-CINCWIO

135 In a meeting of the countries of the region, held in Nairobi, Kenya, from 5 to 9 March 1979, special emphasis was given to TEMA aspects of the CINCWIO programmes. In recognition of the fact that a strong TEMA component is essential for the success of CINCWIO, it was decided to consider the basic requirements of each participating country. The TEMA component will be fully developed when the detailed operational plan for CINCWIO has been drawn up and approved.

IOC-VAP

136 The IOC Assembly at its Tenth Session established a Voluntary Assistance Programme (IOC-VAP), which is based on the principle of mutual assistance between the donor Member States and the developing Member States. The purpose of this scheme is to assist the Member States to develop their marine science infrastructure so that they are better able to participate in the programmes of the Commission. The 11 requests so far approved have been circulated to donor Member States for assistance. Ways and means are being developed to improve efficient handling of all requests at various levels so that IOC-VAP can be developed into an effective instrument for implementing TEMA activities.

Inter-Agency Co-operation

137 Under the umbrella of the ICSPRO agreement, two meetings of the ICSPRO officers concerned with Training, Education and Mutual Assistance in the marine sciences (TEMA) were held. The main conclusions were as follows:

(1) Estudio Regional del Fenómeno "El Niño" (ERFEN).

(i) In view of the limited funding available to IOC for its TEMA programme, the United Nations agencies should support the activities recommended by TEMA-II, or those brought to their attention by the Secretary IOC, so as to enhance their effectiveness and reduce costs.

(ii) The IOC should provide major policy guidance regarding the training and education needs of Member States, as a prerequisite to direct action by the United Nations agencies to attempt to meet those needs.

(iii) There exists a clear need to assist Member States to develop a scientific and managerial infrastructure to handle the additional tasks deriving from the adoption by a great number of coastal states of an "exclusive economic zone".

(iv) There is a need to collate all the available expertise in education and training, rather than continue with fragmented programmes of agencies working independently.

(v) To assess the manpower and institutional requirements of Member States, the preparation of background documents (country profiles) to cover all aspects of marine affairs was considered indispensible.

(vi) Following the assessment of present levels of manpower and institutional infrastructure, and having identified future requirements, joint programmes should be developed, planned and executed, on global and regional bases, to increase national competence in marine affairs.

ANNEX I

PROGRAMME AND BUDGET OF THE BIENNIUM, 1978-1979

Breakdown of the Unesco Regular Programme funds made available to the Commission under PAD 1978 and PAD 1979
PAD = Programme Activity Details

		US $	
I.	Secretariat Services (Assembly, Executive Council meetings, advisory services to the Commission)	270,000	25%
II.	Under the Long-term and Expanded Programme of Oceanic Exploration and Research (LEPOR):		
	(i) Ocean Science Activities (Regional Co-operative Investigations, GIPME, IDOE projects, GEBCO, Ocean and Climate)	414,000	38%
	(ii) Ocean Services (IGOSS, Data Management, Tsunami Warning)	244,000	22%
	(iii) Training, Education and Mutual Assistance in the marine sciences (TEMA)	163,000	15%
	TOTAL (Operational funds)	1,091,000	(100%)
III.	Staff costs approved under the Unesco Regular Programme	962,700	
		2,053,700	

Breakdown of the 1978-1979 total income (in US $)[1]

	In the form of funding	In kind[2]	Salaries	Total
Unesco	1,091,000	-	962,700	2,053,700
United Nations	-	32,000	-	32,000
UNEP	1,125,500	-	-	1,125,500
FAO	-	8,000	140,000	148,000
WMO	-	-	86,000	86,000
IMCO	-	-	86,000	86,000
Member States et al. through Trust Fund	390,600	(3)	150,000[4]	540,600
TOTAL	2,607,100	40,000	1,424,700	4,071,800

(1) It should be noted that the above financial statement is based partly on assumptions and simplifications, and is, therefore, not an accurate representation of the income.
(2) e.g. for hosting meetings under the ICSPRO agreement.
(3) No estimate attempted.
(4) Salaries for staff seconded by Member States.

ANNEX II

State-Member representatives on the Executive Council
(11 November 1977-3 November 1979)

Dr. A. Ayala-Castañares	Mexico (Chairman)
Dr. N.J. Campbell	Canada (First Vice-Chairman)
Professor Dr. C. Druet	Poland (Second Vice-Chairman)
Mr. O.J. Østvedt	Norway (Third Vice-Chairman)
Capitán de Fragata G. Angel Mejía	Colombia (Fourth Vice-Chairman)
Dr. G.F. Humphrey	(Past Chairman)
Professor F. Vila	Argentina
Mr. D. Rochford	Australia
Contra-Almirante L.C. De Freitas	Brazil
Dr. A.R. Bayoumi	Egypt
Miss M.-A. Martin-Sané	France
Professor Dr. H.U. Roll	Germany (Federal Republic of)
Dr. S.Z. Qasim	India
Dr. N.N. Al-Shawi	Iraq
Professor Dr. N. Nasu	Japan
Mr. P.N. Kamande	Kenya
Mr. E.O. Bayagbona	Nigeria
Professor I.A. Ronquillo	Philippines
Mr. M'Baye Ba	Senegal
Mr. Mohammed Ben Hadj Ali	Tunisia
Dr. E.I. Tolstikov	Union of Soviet Socialist Republics
Dr. P.F.G. Twinn	United Kingdom
Mr. D.H. Wallace	United States of America
Dr. J.A. Galavis Seidel	Venezuela

State-Member representatives on the Executive Council
(from 4 November 1979)

Dr. A. Ayala-Castañares	Mexico (Chairman)
Dr. N.J. Campbell	Canada (First Vice-Chairman)
Professor Dr. C. Druet	Poland (Second Vice-Chairman)
Professor I.A. Ronquillo	Philippines (Third Vice-Chairman)
Dr. A.R. Bayoumi	Egypt (Fourth Vice-Chairman)
Professor F. Vila	Argentina
Contra-Almirante L.C. De Freitas	Brazil
Mr. Luo Yuru	China
Capitán de Navío G. Angel Mejía(1)	Colombia
Miss M.-A. Martin-Sané	France
Professor Dr. H.U. Roll	Germany (Federal Republic of)
Dr. S.Z. Qasim	India
Professor Dr. N. Nasu	Japan
Mr. S.O. Allela	Kenya
Mrs. T.F. Groustra-de Kat	Netherlands
Mr. J.G. Tobor(2)	Nigeria
Dr. Sogui Diouf	Senegal
Sr. J.M. Turnay Turnay(3)	Spain
Professor J.-O. Strömberg	Sweden
Mr. Salem Hadj Ali	Tunisia
Dr. E.I. Tolstikov	Union of Soviet Socialist Republics
Dr. P.F.G. Twinn	United Kingdom
Dr. F. Webster	United States of America
Dr. J.A. Galavis Seidel	Venezuela
Mr. R. Stijelja	Yugoslavia

(1) Resigned on 15 January 1980; replaced by Capitán de Navío A. Martinez Barbosa.
(2) Replaced by Mr. E.O. Bayagbona on 25 June 1980.
(3) Replaced by Dr. Miguel Oliver Massuti on 13 May 1980.

ANNEX III

Member States of the Commission

At the time of the Eleventh Session of the Assembly, 103 countries were Member States of the Commission:

Algeria
*Argentina
Australia
Austria
Bahamas
Belgium
*Brazil
Bulgaria
Cameroon
*Canada
Chile
*China
*Colombia
Congo
Costa Rica
Cuba
Cyprus
Denmark
Dominican Republic
Ecuador
*Egypt, Arab Republic of
Ethiopia
Fiji
Finland
*France
Gabon
German Democratic Republic
*Germany, Federal Republic of
Ghana
Greece
Guatemala
Guyana
Haiti
Iceland
*India
Indonesia
Iran
Iraq
Ireland
Israel
Italy
Ivory Coast
Jamaica
*Japan
Jordan
*Kenya
Korea, Democratic People's Republic of
Korea, Republic of
Kuwait
Lebanon
Libyan Arab Jamahiriya
Madagascar
Malaysia
Malta
Mauritania, Islamic Republic of
Mauritius
*Mexico
Monaco
Morocco
*Netherlands
New Zealand
Nicaragua
*Nigeria
Norway
Pakistan
Panama
Peru
*Philippines
*Poland
Portugal
Qatar
Romania
Saudi Arabia
*Senegal
Seychelles, Republic of
Sierra Leone
Singapore
Somalia
South Africa, Republic of (suspended)
*Spain
Sri Lanka
Sudan
Suriname
*Sweden
Switzerland
Syrian Arab Republic
Tanzania, United Republic of
Thailand
Togo
Tonga
Trinidad and Tobago
*Tunisia
Turkey
Ukrainian Soviet Socialist Republic
*Union of Soviet Socialist Republics
United Arab Emirates
*United Kingdom
*United States of America
Uruguay
*Venezuela
Viet Nam, Socialist Republic of
Western Samoa
*Yugoslavia

* Member States represented on the Executive Council.

ANNEX IV

List of publications[1]

1. Intergovernmental Oceanographic Commission (IOC)

   (a) IOC Technical Series

No. 1[2]	Manual on International Oceanographic Data Exchange. 1965. 28 p. (superseded)
No. 2[2]	Intergovernmental Oceanographic Commission (five years of work). 1966. 39 p. (superseded by No. 20)
No. 3[2]	Radio Communication Requirements for Oceanography. 1967. 19 p.
No. 4[2]	Manual on International Oceanographic Data Exchange (Second Edition) 1967. 49 p. (superseded by IOC Manuals and Guides No. 9)
No. 5[2]	Legal Problems Associated with Ocean Data Acquisition Systems (ODAS). 1969. 40 p.
No. 6[2]	Perspectives in Oceanography. 1968, 1969. 90 p.
No. 7	Comprehensive Outline of the Scope of the Long-term and Expanded Programme of Oceanic Exploration and Research. 1970. 82 p.
No. 8[2]	IGOSS (Integrated Global Ocean Station System), General Plan and Implementation Programme for Phase 1. 1971. 27 p. (superseded by No. 16)
No. 9[2]	Manual on International Oceanographic Data Exchange (Third Edition) 1973. 63 p. (superseded by IOC Manuals and Guides No. 9)
No. 10	Bruun Memorial Lectures (presented at the Seventh Session of the IOC, 1971). 1971. 43 p.
No. 11	Bruun Memorial Lectures, 1973 (presented at the Eighth Session of the IOC Assembly). 1975. 63 p.
No. 12	Oceanographic Products and Methods of Analysis and Prediction. 1977. 172 p. (English only)
No. 13	The International Decade of Ocean Exploration (IDOE) 1971-1980. 1974. 87 p.
No. 14	A Comprehensive Plan for the Global Investigation of Pollution in the Marine Environment and Baseline Study Guidelines. 1976. 42 p.
No. 15	Bruun Memorial Lectures, 1975 (presented at the Ninth Session of the IOC Assembly). 1976. 59 p.
No. 16	Integrated Global Ocean Station System (IGOSS) General Plan and Implementation Programme 1977-1982. 37 p.
No. 17	Oceanographic Components of the Global Atmospheric Research Programme (GARP). 1977. 35 p.
No. 18	Global Marine Pollution: An Overview. 1977. 96 p.
No. 19	Bruun Memorial Lectures, 1977 (presented at the Tenth Session of the IOC Assembly). 1979. 64 p.
No. 20	A Focus for Ocean Research: The Intergovernmental Oceanographic Commission. History, functions, achievements. 1979. 64 p.
n/n	Annotated Bibliography of Textbooks and Reference Materials in Marine Sciences. 1975. 109 p. (quadrilingual)

(1) These publications are available in English, French, Spanish and Russian, except where specified.
(2) These publications are out of stock.

(b)

No. 1[1]	Manual in IGOSS Data Archiving and Exchange. 1974. 69 p.
No. 2[1]	International Catalogue of Ocean Data Stations. 1975. 83 p.
No. 2	- Amendment No. 1. 1976. 100 p. (English only)
No. 3	Guide to Operational Procedures for the Collection and Exchange of Oceanographic Data (BATHY and TESAC). 1975. 39 p.
No. 3	- Amendment 2. 1978. 19 p. (incorporates Amendment 1)
No. 4	Guide to Oceanographic and Marine Meteorological Instruments and Observing Practices. 1975. 62 p. (English only)
No. 5	Guide to Establishing a National Oceanographic Data Centre. 1975. 51 p.
No. 6	Wave Reporting Procedures for Tide Observers in the Tsunami Warning System. 1975. 32 p. (English and Spanish only)
No. 7	Guide to Operational Procedures for the IGOSS Pilot Project on Marine Pollution (Petroleum) Monitoring. 1976. 50 p.
No. 7 Suppl.	Manual for Monitoring of Oil and Petroleum Hydrocarbons in Marine Waters and on beaches. 1977. 20 p. (English and French only)
No. 8[1]	Marine Environmental Data Information Referral Catalogue (MEDI Pilot Catalogue). 1976. 146 p. (English only) (superseded by No. 10)
No. 9	Manual on International Oceanographic Data Exchange (Fourth Edition). 1976. 81 p.
No. 9	Annex I, Part 1. GF-3: The IOC General Magnetic Tape for the International Exchange of Oceanographic Data. 1980. 64 p.
No. 10	Marine Environmental Data Information Referral Catalogue (MEDI Catalogue). 1979. 164 p. (quadrilingual)

(c) IOC Workshop Series

The Scientific Workshops of the Intergovernmental Oceanographic Commission are usually jointly sponsored with other intergovernmental or non-governmental bodies. In each case, by mutual agreement, one of the sponsoring bodies assumes responsibility for publication of the final report.

No.	Title	Publishing Body	Languages
1	Metallogenesis, Hydrocarbons and Tectonic Patterns in Eastern Asia (Report of an IDOE Workshop); Bangkok; Thailand, 24-29 September 1973. CCOP-IOC, 1974. 158 p.	Office of the Project Manager UNDP/CCOP, c/- ESCAP Sala Santitham Bangkok 2, Thailand	English
2	Ichthyoplankton, Report of the CICAR Ichthyoplankton Workshop, Mexico City, 16-27 July 1974 (Unesco Technical Papers in Marine Sciences, No. 20). 47 p.	Division of Marine Sciences, Unesco Place de Fontenoy 75700 Paris, France	English Spanish
3	Report of the IOC/FAO (GFCM)/ICSEM, International Workshop on Marine Pollution in the Mediterranean, Monte Carlo, 9-14 September 1974, 18 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English French Spanish

(1) Out of stock in English.

No.	Title	Publishing Body	Languages
4	Workshop on the Phenomenon known as "El Niño", Guayaquil, Ecuador, 4-12 December 1974. 25 p.	FAO Via delle Terme di Caracalla 00100 Rome, Italy	English Spanish
5	IDOE International Workshop on Marine Geology and Geophysics of the Caribbean Region and its Resources, Kingston, Jamaica, 17-22 February 1975. 30 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English Spanish
6	Report of the CCOP/SOPAC-IOC IDOE International Workshop on Geology, Mineral Resources and Geophysics of the South Pacific, Suva, Fiji, 1-6 September 1975. 53 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English
7	Report of the Scientific Workshop to initiate planning for a co-operative investigation in the North and Central Western Indian Ocean, organized within the IDOE under the sponsorship of IOC/FAO (IOFC)/Unesco/EAC, Nairobi, Kenya, 25 March-2 April 1976. 51 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	Full text (English only). Extract and Recommendations: French, Spanish, Russian
8	Report of the IOC/FAO (IPFC)/UNEP International Workshop on Marine Pollution in East Asian Waters, Penang, Malaysia, 7-13 April 1976. 52 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English
9	Report of the Second International Workshop on Marine Geoscience IOC/CMG/SCOR, Mauritius, 9-13 August 1976. 34 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English French Russian Spanish
10	Report of the Second IOC/WMO Workshop on Marine Pollution (Petroleum) Monitoring, Monaco, 14-18 June 1976. 31 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English French Russian Spanish
11	Report of the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions, Port of Spain, Trinidad and Tobago, 13-17 December 1976. 31 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English Spanish
11 Suppl.	Collected Contributions of invited lecturers and authors to the IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions, Port of Spain, Trinidad and Tobago, 13-17 December 1976. 236 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English Spanish

No.	Title	Publishing Body	Languages
12	Report of the IOCARIBE Interdisciplinary Workshop on Scientific Programmes in Support of Fisheries Projects, Fort-de-France, Martinique, 28 November-2 December 1977. 37 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English French Spanish
13	Report of the IOCARIBE Workshop on Environmental Geology of the Caribbean Coastal Area, Port of Spain, Trinidad and Tobago, 16-18 January 1978. 30 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English Spanish
14	Report of the IOC/FAO/WHO/UNEP International Workshop on Marine Pollution in the Gulf of Guinea and Adjacent Areas, Abidjan, Ivory Coast, 2-9 May 1978. 42 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English French
15	Report of the CPPS/FAO/IOC/UNEP International Workshop on Marine Pollution in the South-east Pacific, Santiago de Chile, 6-10 November 1978. 33 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English Spanish
16	Workshop on the Western Pacific, Tokyo, 19-20 February 1979. 16 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English French Russian
17	Report of the Joint IOC/WMO Workshop on Oceanographic Products and the IGOSS Data Processing and Services System (IDPSS), Moscow, 9-11 April 1979. 41 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English
17 Suppl.	Papers submitted to the Joint IOC/WMO Seminar on Oceanographic Products and the IGOSS Data Processing and Services System, Moscow, 2-6 April 1979.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English
18	Syllabus for training marine technicians, Report of an IOC/Unesco Workshop held in Miami, Florida, 22-26 May 1978. 50 p. (Unesco Reports in Marine Science, No. 4)	Division of Marine Sciences, Unesco Place de Fontenoy 75700 Paris, France	English French Russian Spanish
19	Marine science syllabus for secondary schools, Report of an IOC Workshop held at United World College of the Atlantic, United Kingdom, 5-9 June 1978. 45 p. (Unesco Reports in Marine Science, No. 5)	Division of Marine Sciences, Unesco Place de Fontenoy 75700 Paris, France	English French Russian

No.	Title	Publishing Body	Languages
20	Report and Recommendations of the Second CCOP-IOC Workshop on IDOE Studies of East Asia Tectonics and Resources, Bandung, Indonesia, 17-21 October 1978. 48 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English
21	Second IDOE Symposium on Turbulence in the Ocean, Liège, Belgium, 7-18 May 1979. 13 p.	IOC, Unesco Place de Fontenoy 75700 Paris, France	English French Russian Spanish

(d) Brochures

Intergovernmental Oceanographic Commission (Arabic, Chinese, English, French, Russian, Spanish)

IDOE 1971-1980 International Decade of Ocean Exploration (English, French, Russian, Spanish)

Tsunami Warning System in the Pacific (Chinese, English, French, Russian, Spanish)

Guide to International Marine Environmental Data Services (French, Russian, Spanish - English version to be reprinted mid-1980)

General Bathymetric Chart of the Oceans (English, Russian, Spanish)

Aquatic Sciences and Fisheries Information System (Arabic, English, French, Russian, Spanish)

Pollution in the Marine Environment (Arabic, English, French, Russian, Spanish)

What is MEDI? (English, French, Russian, Spanish)

National Oceanographic Programmes, Declared National Programmes (English, French, Russian, Spanish)

Responsible National Oceanographic Data Centres (English, French, Russian, Spanish)

The Integrated Global Ocean Station System (English only)

(e) Ad hoc publications

International Indian Ocean Expedition (IIOE)

International Indian Ocean Expedition, Collected Reprints, Volumes I to VIII, and Index. Various languages. Unesco (Vol. VIII and Index only in stock)

The Biology of the Indian Ocean, International Indian Ocean Expedition Symposium, Kiel, 31 March-6 April 1971. Edited by B. Zeitschel, Springer Verlag, Berlin, 1971 (Ecological Studies, Vol. 3), English only

Oceanographic Atlas of the International Indian Ocean Expedition, by K. Wyrtki, U.S. National Science Foundation, Washington D.C., 1971, English only.

Meteorological Atlas of the International Indian Ocean Expedition:

Vol. I - The Surface Climate of 1963 and 1964, by C.S. Ramage, F.R. Miller and C. Jefferies
Vol. II - Upper Air, by C.S. Ramage and C.V.R. Raman
A joint U.S. National Science Foundation and Indian Meteorological Department project. U.S. Government Printing Office, Washington D.C., 1972, English only.

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