Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean

Second Session

Arusha, Tanzania, 7-11 December 1987

Unesco

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1. OPENING

1 The Chairman of the Regional Committee, Professor Abdi Msangi, called the Session to order at 1015 on 7 December 1987, at the Arusha International Conference Centre. He invited the Director of the Institute of Marine Sciences, Professor Alfeo Nikundiwe, to address the Regional Committee on behalf of the Local Organizing Committee.

2 Professor Nikundiwe welcomed the participants and invited them to make known to the Local Organizing Committee their needs during their stay in Tanzania; he gave some information on the local facilities and arrangements for the Session.

3 The Chairman then called on Mr. Samuel Allela, Third Vice-Chairman of IOC, to address the Regional Committee.

4 Mr. Allela expressed the regrets of the Chairman of the Commission, Professor Ulf Lie, at not being able to attend this Session. The Chairman had asked him to speak on his behalf. Mr. Allela thanked the Government of Tanzania for having so generously offered to host this Second Session of the Committee. He stressed the importance of IOC regional subsidiary bodies as a key mechanism in the implementation of regional components of IOC global programmes, as well as regional projects of interest to the Member States of the western Indian Ocean. He emphasized the importance of defining TEMA needs for each project and of identifying the precise interest of the concerned Member State institutions in the various projects that the Regional Committee might adopt. He felt it was desirable to concentrate on a few feasible projects, rather than be overly ambitious.

5 He reminded the Committee of the need to seek extrabudgetary funding for regional projects under the Unesco-IOC Comprehensive Plan to Enhance the Marine Science Capabilities of Developing Countries, and for greater co-operation between Member States in such matters as the joint use of research vessels, and the participation of scientists from the region in major scientific expeditions in the region.

6 The Chairman then made a short statement to the Regional Committee. He referred particularly to his experience since IOCINCWIO-I which was held at the Unesco Regional Office for Science and Technology for Africa in Nairobi in October 1982. At that time, it was understood that the IOCINCWIO Sessions would be held at a frequency of every two years, so that, according to that understanding, IOCINCWIO-II should have been held in October 1984 or thereabouts. There are several reasons to explain this delay, the most important of which arose from the many constraints that Unesco has been under in recent years and these constraints are continuing. He invited the IOC Senior Assistant Secretary to elaborate on this.

7 The Chairman reminded the Regional Committee that, of the several programmes that were mapped out during IOCINCWIO-I, for execution during the intersessional period, only a few were implemented in the way intended. The most important reason for this shortcoming is that there was minimal participation by IOCINCWIO Member States in the execution and implementation of these programmes, owing to the lack of scientific expertise within the

region and of the necessary infrastructure and equipment, especially a suitable research vessel for such work.

8 The Chairman believed that there were two important lessons to be learned: (i) that, if the Member States want to participate meaningfully in marine scientific research and in the development and rational exploitation of marine resources in the IOCINCWIO region, including their EEZs, they must, as a matter of great priority and urgency, develop a competent scientific capability in the marine sciences. The region must itself have highly qualified scientists and technologists in all the main areas of marine science and technology. The Chairman stressed the view that, without developing such a capability, the Member States in the region will remain mere "passengers" in marine scientific research carried out under the auspices of developed countries; and (ii) that only through their own efforts can the Member States of the region ever hope to be able to make a meaningful contribution to the development of marine science and technology in the IOCINCWIO region. In working out co-operative programmes for the next phase of IOCINCWIO activities, the Member States should place more emphasis on the development of their own indigenous capability in marine science and technology and on self-reliance within this region than has been the case hitherto.

9 The Chairman then invited the honourable Ndugu Hassan Dyamwalle, Deputy Minister of Lands, Natural Resources and Tourism, to deliver his opening speech and kindly open the Second Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean.

10 The Deputy Minister expressed his great pleasure at having been invited to officiate, on behalf of the Tanzania government, at this important Second Session of the IOC Regional Committee for Co-operative Investigation in the North and Central Western Indian Ocean. On behalf of the Tanzania government and on his own behalf, the Deputy Minister extended to all the visitors from outside his country, a warm and cordial welcome and best wishes for a happy and enjoyable stay in the city of Arusha. He expressed the hope that they would take some time off to see and enjoy something of the tourist attractions of Tanzania, with which there are not so many things in the world to compare.

11 The Deputy Minister said that, in his view, the Regional Committee had set itself a very important and a very relevant task in so far as the socio-economic development of the countries of the region is concerned. Although not a marine scientist himself, the Deputy Minister said he recognized that the ocean holds within its waters and in the underlying sea-bed, vast living and non-living resources, which we are at present only minimally exploiting. With the new UN Convention on the Law of the Sea, which has placed under national jurisdiction vast areas of the ocean, as "Exclusive Economic Zones", these resources have become even more important and the need for their rational exploitation to facilitate rapid socio-economic development, even more urgent. Under the New Ocean Regime, Tanzania, with a coastline of about 800 kilometres (500 miles) has an "Exclusive Economic Zone" of about 256 000 sq. km (or 100 000 sq. miles). The Deputy Minister reminded the Regional Committee that, if the living and non-living resources of this vast area of the ocean and its underlying sea-

bed were fully and rationally exploited, the rate of Tanzania's socio-economic development would be increased by leaps and bounds. The coastal States of this continent could therefore be rightly described as living in poverty yet abounding in underexploited natural resources. This is the great dilemma of our time and something must be done about it. The most important problem, which has placed us in this dilemma, is the lack or shortage of scientific and technological know-how in regard to the marine environment. The countries of the region do not have the necessary manpower and material resources to be able to exploit the marine resources fully and rationally. The Deputy Minister said he believed that there are no universities in tropical Africa, including the IOCINCWIO region, that offer the full complement of marine science subjects or a full course of ocean engineering. The reason for this discrepancy is that the universities are still struggling to satisfy basic needs for high-level manpower in the key sectors of the economy: education, administration, agriculture, medicine and public health etc. Marine sciences, with the exception of fisheries and aquatic biology, have until very recently, not been regarded as high- priority areas for advanced study. This attitude has been encouraged by the high demand of marine scientific research for expensive facilities and equipment such as research vessels and sophisticated instruments; but, if the countries of the IOCINCWIO region are to develop a capability of exploiting their marine resources rationally (that is, without causing irreparable damage to the resources themselves and the marine environment on which they depend), advanced studies and research in marine science and technology are essential and must be approached with great determination: science and technology, here as in other fields, constitute the key to achieving this goal.

12 It is obvious, therefore, that, if the Member States try to solve their marine science and technology problems on an individual national basis, their poor economies would not be of sufficient help and they would probably not make much headway. The strategy suggested by the name of this Regional Committee - co-operation at the regional level - is most appropriate. The Deputy Minister therefore hoped that the Regional Committee would come up with concrete and practicable recommendations on action that should be taken at the national, regional and even at the international level, in order to increase substantially regional capability in all aspects of marine science and technology. He also hoped that the Regional Committee would discuss how the Member States could take advantage of the UN Convention on the Law of the Sea to improve the situation concerning marine science and technology and the rational exploitation of marine resources in the region. The Deputy Minister also suggested that the Regional Committee consider the question of self-reliance in marine science and technology within the region.

13 He then declared the Second Session of the IOC Regional Committee open.

14 The Chairman then invited the IOC Senior Assistant Secretary, Mr. Ray C. Griffiths, who was Technical Secretary for the Session, to speak on behalf of the Secretary of the Commission, Dr. Mario Ruivo. The Senior Assistant Secretary explained to the Regional Committee that the Secretary was unfortunately unable to be present, owing to pressing commitments at Headquarters. However, the Secretary expressed the Commission's sincere appreciation to the Government of Tanzania for its invitation to host the

Second Session of this IOC Regional Committee. This was a particular personal pleasure for the Secretary in view of the close personal collaboration he has maintained for many years with the Vice-President and Prime Minister of Tanzania, Dr. Joseph Warioba, in numerous fora in which international co-operation in marine science and ocean affairs in general have been discussed, not the least being the Third UN Conference on the Law of the Sea.

15 In his address, the Secretary noted that international co-operation is not always easy, particularly in regions, such as the Western Indian Ocean, in which there is a wide diversity of cultures and scientific and technological capacities. It is one of the main purposes of the Intergovernmental Oceanographic Commission to facilitate such co-operation, in the marine sciences and the related ocean services, by providing a forum for the planning, promotion and co-ordination of co-operative scientific investigations. These investigations and the related mechanisms for their implementation require adequate resources. The main resources made available to the Commission are allocated by the Commission's parent body, Unesco, backed up by contributions to the IOC Trust Fund by Member States. The budgetary and staffing constraints to which Unesco has been subject in the last few years have had their effect on the functioning of the Commission. The prospects for the development of regional marine scientific studies are positive, however, because there is an increasing need to know more about the ocean and its effects on climate and on its living resources, and from this increased knowledge to predict the variations that arise to perturb the terrestrial as well as the marine environment.

16 The Secretary briefly reviewed the Commission's co-operative actions with, for example, the World Meteorological Organization and the International Council of Scientific Unions in implementing the Study of Tropical Oceans and Global Atmosphere (TOGA) and in the planning of the World Ocean Circulation Experiment (WOCE). It co-operates closely with FAO in the Programme of Ocean Science in Relation to Living Resources (OSLR), and with the United Nations in the Programme of Ocean Science in Relation to Non-living Resources (OSNLR), with particular emphasis on the coastal zone, as an area of intensive use and exchange of energy and materials. Also, the preparation of International Bathymetric Charts for selected ocean regions, including IOCINCWIO, is highly relevant to OSNLR and other programmes.

17 While marine pollution continues to constitute a serious regional problem, the Secretary noted that it also requires relatively sophisticated capabilities to monitor it on a regional basis, and offered the Commission's support in the form of the best available technical advice to Member States on the most suitable methodology. He referred particularly to the close co-operation with the UN Environment Programme and FAO in assessing marine pollution in the region with a view to determining the state of health of the ocean and to monitor the long-term trends.

18 The Secretary reminded the Regional Committee that, at its First Session, it had made it quite clear that its basic need was for Training, Education and Mutual Assistance in the Marine Sciences, and, to the extent that the Commission's resources have allowed, the Secretary has tried to provide opportunities in the context of each of its main programmes, and will continue to do so. This can be done in the light of the projects the

Regional Committee decides to adopt and in the light of the Unesco-IOC Comprehensive Plan for a Major Assistance Programme to Enhance the Marine Scientific Capabilities of Developing Countries. This may require the development of regional or sub-regional technical assistance projects for which extrabudgetary funding, through, for example, UNDP or other international funding sources, will be required.

19 The Secretary recalled that the recent Congress of African Scientists in Brazzavile, and CASTAFRICA-II, here in Arusha, were manifestations of a serious intention by the African scientific community to promote science, including marine science, in Africa. This Regional Committee is a key mechanism for pursuing this goal, and this Session is an early opportunity to do so.

20 The Secretary wished the Regional Committee every success in this Second Session and in the forthcoming intersessional period.

21 The List of Participants is given in Annex V, hereto.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

22 The Regional Committee decided to add an Item, 6.1.1, on the Requirements for, and Improved Uses of, Research Vessels, as an Item separate from general TEMA matters.

23 With this amendment, the Regional Committee adopted the Agenda for the Session; it is attached as Annex I, hereto.

2.2 DESIGNATION OF THE RAPPORTEUR

24 Following prior consultations with Delegations, the Chairman proposed Mr. Mika Odido, of Kenya, to act as Rapporteur for the Session. Mr. Odido accepted and the Regional Committee accordingly designated him Rapporteur.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

25 The Technical Secretary reviewed the arrangements for the Session and suggested that the Regional Committee take the Agenda Items in their present order unless logistical constraints (e.g., timely availability of documents) dictated otherwise. He reminded the Regional Committee that four draft project proposals had been considered during the ad hoc Preparatory Expert Consultations immediately prior to the Session, and that these would be introduced under the corresponding Agenda Items.

26 He then briefly reviewed the Provisional List of Documents and their present availability.

27 The Recommendation of the Regional Committee is given in Annex II: the List of Working Documents is given in Annex VI and the List of Acronyms is given in Annex VII, hereto.

3. REPORT OF THE SECRETARY ON INTERSESSIONAL ACTIVITIES

28 The Technical Secretary delivered the Report of the Secretary. He reminded the Regional Committee that it had adopted seven projects for implementation by the Member States at its First Session (ROSTA, Nairobi, 4-9 October 1982). Owing to a combination of reduced resources - budgetary and human - affecting the Commission, as well as local difficulties, the implementation of these projects by Member States of the region had not been as fast as originally expected, mainly owing to the lack of suitable research vessels and equipment in the majority of these countries, and, generally, the critical mass of the resources available for each project has not been achieved. It had been generally agreed that, in all the fields of work covered by the Regional Committee, it is necessary to create scientific manpower and infrastructure on a long-term basis.

29 Nevertheless, several activities have been developed. Assistance received through IOC, as well as the Unesco Division of Marine Science (OCE) has been mainly in the form of training fellowships and courses, support to attend relevant scientific workshops and seminars, consultant services, and provision of literature and equipment. In addition, there are other activities that have been undertaken in the framework of IOC global programmes, but which are pertinent to the regional activities.

30 In the field of Ocean Dynamics and Climate, scientists in Mozambique carried out a preliminary study of the hydrography of the Mozambique Channel, using mainly foreign vessels operating in the area and the results were published in English in 1982.

31 Within the framework of the global programmes in the field of Ocean Dynamics and Climate, the Indian Ocean Climate Studies Panel of the Joint SCOR-IOC Committee on Climatic Changes and the Ocean met three times (Paris, 21-23 March 1983; Delhi, India, 28-31 January 1985; and Vacoas, Mauritius, 6-10 April 1987) to consider the problems of data collection for the development and testing of models useful for predicting climate change in the Indian Ocean. The IOC sponsored two Training Courses on Sea-level Measurements and Data Reduction which were organized, at the invitation of the Institute of Oceanographic Sciences, in Bidston, UK (12-30 September 1983; 25 June - 12 July 1984) during which one scientist each from Kenya, Madagascar and Tanzania, and two from Mauritius were trained in this important method of ocean monitoring. The IOC also published a Manual on Sea-Level Measurement and Interpretation (IOC Manuals and Guides N° 14)

32 Scientists from Tanzania and Mauritius were among 17 participants supported by IOC and the Unesco Division of Marine Sciences (OCE) to attend the Joint Oceanographic Assembly in Halifax, Canada, 1982.

33 In the context of the IOC-FAO Programme of Ocean Science in Relation to Living Resources (OSLR), an IOC Regional Training Course on Marine Living Resources in the Western Indian Ocean, with emphasis on identification and distribution of fish eggs and larvae, was held in Mombasa, Kenya, 27 August-22 September 1984. Scientists from Kenya (7), Madagascar (4), Mauritius (2), Tanzania (5), Somalia (1) were supported to attend the Course (IOC Training Course Report N° 8). This Training Course was made possible by support from the Federal Republic of Germany.

34 Oceanographic equipment worth US 6 000 was provided, under the IOC Voluntary Co-operation Programme, to the Kenya Marine and Fisheries Research Institute in support of the Training Course and to strengthen the Institute

35 The conceptual basis of the International Recruitment Programme (IREP) was developed at the IOC-FAO Workshop on the IREP Component of the IOC Programme on Ocean Science in Relation to Living Resources (OSLR) (Halifax, Canada, September 1983). A conceptual basis for the study of tropical, high-diversity ecosystems was developed at the IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities (Ciudad del Carmen, Mexico, 21-25 April 1986). It provides a framework for the development of an IOCINCWIO regional component of OSLR under the Regional Committee.

36 It has not proven feasible, so far, to develop an IOCINCWIO regional component of the IOC-UN Programme of Ocean Science in Relation to Non-living Resources (OSNLR). However, a number of relevant scientific meetings have been held (e.g., the First and Second Sessions of the IOC-UN Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resource (Paris, January 1985 and June 1987, respectively)) to develop scientific and regional components of OSNLR.

37 Nevertheless, the Regional Committee decided, at its First Session, to undertake the preparation of the International Bathymetric Chart of the Western Indian Ocean (IBCWIO) and, to this end, an expert in ocean mapping, Prof. Werner Bettac, of the Federal Republic of Germany, visited Mauritius, Madagascar, Kenya and Tanzania (24 July - 9 August 1985) to advise the Member States on the requirements of the project. As a result of this mission, a Training Course on Bathymetric Charting was organized, with the support of the Federal Republic of Germany and of Madagascar, at the Centre National de Recherches Océanographiques, at Nosy Bé, Madagascar, from 10 June to 2 July 1987, with shipboard training on the Federal Republic's RV METEOR, from 22 June to 1 July 1987. Trainees from Kenya (1), Madagascar (3), Mauritius (1), Somalia (1) and Tanzania (1), as well as from other IOC Member States, took part, and an echosounder worth $ 11 000 used for the Course was handed over to CNRO, Nosy Bé, under the IOC Voluntary Co-operation Programme.

38 The Federal Republic of Germany also offered, through IOC, opportunities for participation of scientists from the coastal and island States of the Indian Ocean in the RV METEOR's general oceanographic programme in the region which started in 1986 and ended in 1987, with the Training Course in Bathymetric Charting mentioned above. Scientists from IOC Member States in the Indian Ocean region were invited to join relevant legs of the cruise. However, owing to difficulties in arranging convenient ports of call, it was not possible to put any trainees from IOCINCWIO Member

States on board for general oceanographic studies or training. Nevertheless, oceanographic equipment with about $ 7 000 was given to the Centre National de Recherche Océanographique, Nosy-Bé, by the Federal Republic of Germany in addition to the aforementioned echosounder.

39 The First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean is planned for mid-1988.

40 The scientific and technical basis for a regional programme of Marine Pollution Research and Monitoring in the region is still weak. However, experts of the region associated with the work of the Commission, FAO and UNEP have undertaken an assessment of the state of marine pollution in the western Indian Ocean, in the context of the UNEP Action Plan for the East African Region, as input to a continuing IOC-UNEP review of the state of health of the ocean.

41 Although the Regional Committee has recognized the desirability of building up the IOC-WMO Integrated Global Ocean Services System (IGOSS) in the region, a basis for the System still needs to be developed. However, the Commission has been gradually developing regional components of the IOC Global Sea-level Observing System (GLOSS), as well as assisting interested Member States, under the IOC-VCP or through bilateral arrangements, with the installation and operation of local tide gauges. Tide gauges have been provided by the USA (University of Hawaii) to Madagascar, Seychelles, Mauritius, Kenya and Tanzania; Portugal is assisting Mozambique in the operation of tide gauges; and China has offered two gauges for stations in Somalia. The building up of a regional component of GLOSS in the IOCINCWIO region will be considered by the Regional Committee.

42 The Regional Committee, also at its First Session, endorsed the establishment, by Member States, of an infrastructure for the exchange of Oceanographic Data and Information Exchange (IODE) and some progress has been observed. A project for Regional Co-operation in Scientific and Technical Information Exchange in the Western Indian Ocean (RECOSCIX-WIO) has been developed under the Kenya-Belgium Project in Marine Science and a proposal to extend it to other interested Member States in the region, under the auspices of the IOC and the Unesco Division of Marine Sciences, in the framework of ASFIS, will be considered by the Regional Committee.

43 Besides the specific TEMA components under each of the main IOC programmes or projects, an IOC-FAO Workshop on Improved Uses of Research Vessels was held, with the support of NORAD, in Lisbon, May/June 1984. The recommendations of the Workshop are being implemented including further examination of the use of nationally owned research vessels for regional co-operative marine scientific investigations. As a follow-up to the Workshop, a Manual on the Improved Use of Research Vessels is in preparation, together with a related Training Course, as a project financed by the International Centre for Ocean Development (ICOD).

44 A Regional Training Workshop on Ocean Engineering and its Interface with Marine Sciences, organized by IOC jointly with the Unesco Division of Marine Sciences with the support of the Department of Ocean Development, Government of India, and held at the Ocean Engineering Centre, Indian Institute of Technology, Madras, India, 17 March to 5 April 1986.

was attended by 19 participants from 14 countries, including Madagascar, Mauritius and Tanzania. The Workshop was supported by the Federal Republic of Germany, France, India, Norway and the UK.

45 The USSR authorities also provided one month of shiptime on board the SRV GEORGI USHAKOV from 22 July to 28 August 1987. The Commission arranged for scientists from Madagascar (2), Mauritius (1) and Mozambique (1) to take part; two others from Somalia took part under direct bilateral arrangements with the USSR. The cruise covered a broad range of oceanographic studies.

46 The Regional Committee considered that the Secretary's Report on Intersessional Activities reflected developments satisfactorily. It thanked the Secretary of IOC and the staff for the efforts they had made during the intersessional period to arrange various TEMA activities. It recognized the various difficulties it was facing in developing an effective programme and stressed the importance of active participation by its Member States in the various fields. It expressed its appreciation of the technical assistance received from interested IOC Member States from outside the region, but stressed the need for an increased effort of self development through participation.

4. OCEAN SCIENCE IN THE WESTERN INDIAN OCEAN

4.1 DEVELOPMENT OF A REGIONAL COMPONENT OF OCEAN SCIENCE IN RELATION TO LIVING RESOURCES (OSLR)

47 The Technical Secretary recalled that the IOC-FAO Programme of Ocean Science in Relation to Living Resources (OSLR) is aimed at obtaining a better understanding of the relationships between fish stocks and ocean environmental variability, to provide an improved scientific basis for fishery development and management. Variations in recruitment have been identified as a major cause of fluctuations of fishery resources; these variations are most often attributed to environmental fluctuations. This consideration led to the development of an International Recruitment Programme (IREP) as one of the primary initial research thrusts of OSLR, with two main components: one relates to experiments to be done in regions presenting pelagic species complexes; the other deals with coastal demersal resources of the intertropical belt, where knowledge is at present limited, especially as regards environmental processes controlling recruitment and, therefore, their exploitation and management are inadequate.

48 Professor Alfeo Nikundiwe, Director of the Institute of Marine Research, in Zanzibar, then introduced the results of the discussion, at the ad hoc Preparatory Expert Consultations, of a Proposal for a Project on Co-operative Investigations of the Oceanography and Pelagic Living Resources of the Western Indian Ocean. He drew attention to a number of changes introduced into the Proposal as originally put to the Preparatory Expert Consultations.

49 Some Delegates thought that too little attention had been paid to the inshore area, including sea-grass beds and mangroves. One Delegation

felt that the Proposal could have a stronger marine chemistry component. Several Delegates felt that the lack of suitable ocean-going research vessels, other than those visiting the region from elsewhere, would necessarily favour inshore studies at this stage. Some Delegates also expressed concern over the data-handling aspects and the general lack of equipment and trained manpower. The financial implications of active participation were also of considerable concern to some Delegates.

50 The Delegate of Mauritius pointed out that his country's fisheries are not, like those of most of the other countries of the region, artisanal, but are centred on the banks between Mauritius and Seychelles. He noted that no plans for studying the oceanography of the bank region were included in the Proposal.

51 The Regional Committee noted the Recommendations of the IOC-FAO Guiding Group of Experts on OSLR (Summary Report of the Second Session: Document IOC-FAO:GGE-OSLR-II/3) and of the IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities (IOC Workshop Report N° 44). It considered in detail the Proposal for a Regional Project on Oceanographic Conditions in Relation to Living Resources in Western Indian Ocean Coastal Waters (Document IOCINCWIO-II/8 Annex 1). It agreed that the Project, although ambitious from the operational standpoint, was feasible in the long term and responded to the interests of the Member States in general. It decided to adopt the Proposal in principle. However, the Regional Committee noted that no single Member State of the region alone could carry out effectively a full complement of the proposed observations. This fact therefore strengthens the need and desire for co-operation. However, the Regional Committee observed that basic physical parameters of the ocean which need to be measured for the purposes of this Project, could be measured by biologists, a category of scientific manpower which is readily available in the region. However, it recognized that the need for physical oceanographers remains.

52 The Regional Committee noted that, since the implementation of proposed research programmes is predicated on the availability of a research vessel (including the funds to run and maintain it), it would not be wise to ignore such a severe limitation. Nevertheless, the Regional Committee decided to adopt a strategy of implementing those parts of the Project that could be carried out without a research vessel (e.g., coastal zone observations using small boats as platforms). The Regional Committee, while recognizing that the required investigations should be carried out largely in the coastal waters, taking advantage, however, of foreign research vessel that come to the region to conduct open-ocean studies (as had been the case, for example, of the RV METEOR (of the Federal Republic of Germany) and the RV GEORGI USHAKOV (of the USSR) in 1986-87), recommended that the organizers of cruises of foreign vessels be informed of the needs of the region and that these needs be reflected in the planning and execution of the cruises in which scientists of the region should be fully involved. Furthermore, scientists of the region who participate in collecting data on board foreign vessels should be invited to analyse the data later. It requested the Secretary of IOC to so inform the IOC Member States of this desiraderatum. The Regional Committee decided that the research-vessel problem was common to other ocean-going projects or activities it might decide to undertake,

and that it should be considered as a separate issue under Agenda Item 6.1.1, below.

53 The Regional Committee decided that the guidelines on requirements for research staff, basic equipment and related training courses, outlined in the Proposal were basically acceptable and called on the marine research institutions of the region to asses their needs, in terms of qualified scientists, equipment and materials required to conduct the various studies under the Project. Regarding data management, the Regional Committee decided that the effective exchange, pooling and treatment of data was a subject common to other projects the Committee might adopt and that it should be dealt with independently of the present Project, under Agenda Item 5.2, below. Nevertheless, it accepted the general guidelines laid down in the Project Proposal.

54 Regarding co-ordination of the implementation of the Project, the Regional Committee accepted the idea of entrusting this activity to a network of institutions/scientists directly interested and involved in the Project. It urged Member States to inform the Secretary IOC, in due course, of those national institutions/scientists that wished to participate actively in the implementation of the Project. It also urged concerned institutions/scientists to inform the Secretary IOC of their respective commitments, in terms of human and material resources, and requested the Secretary IOC to take steps to inform the Member States of the names of the institutions and scientists wishing and agreeing to take part in the Project. in the general context of on-going institutional and/or national programmes. The Regional Committee called on its Chairman, in consultation with the Secretary IOC, to invite a small number of these scientists to constitute an Expert Steering Group (operating under the IOC guidelines applying to Groups of Experts) and one of them to take the special responsibility of leading the Group as Project Co-ordinator. The Regional Committee adopted the Terms of Reference for the Group given in Annex III, hereto. It requested the Secretary IOC to arrange, as far as resources available would allow, opportune meetings of the Expert Steering Group (besides the two formal meetings called for in Section 7.1) and in general to promote communication between its members in the interest of Project implementation, and to review developments during 1988 (including TEMA activities - see (iii), below), with a view to identifying hampering factors and possible solutions for consideration by the Assembly at its Fifteenth Session.

55 Pending the formation of the Expert Steering Group, the Regional Committee invited the Director, Institute of Marine Sciences, Zanzibar (Tanzania), to assume the interim responsibility for Project co-ordination.

56 The Regional Committee called on the IOC to address the related TEMA needs as a matter of priority. It requested the Secretary IOC to take whatever steps were necessary and feasible to arrange appropriate training and/or technical assistance for scientists from the region, in the light of requirements identified by Member State marine scientific institutions participating in the Project, once they had fully assessed these needs.

4.2 DEVELOPMENT OF A REGIONAL COMPONENT OF OCEAN SCIENCE IN RELATION TO NON-LIVING RESOURCES (OSNLR)

57 The Technical Secretary reminded the Regional Committee that the IOC-UN Programme of Ocean Science in Relation to Non-living Resources is intended to develop a sound scientific basis for the exploration and exploitation of non-living marine resources, particularly in the coastal zone (regarded as a resource in its own right) and in relation to placer deposits over the continental shelf.

58 The IOC-UN Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources (OSNLR), at its First Session (Paris, 14-18 January 1985), drew up a general framework for the relevant studies under the Sub-programme entitled Sea-level Changes, Environments and Tectonics during the Past Million Years (SETMY) since somewhat modified by the Guiding Group at its Second Session (Paris, 26-31 January 1987) to Sedimentary Environments, Eustatic Sea-level Changes, Tectonics and Resources (SETR). At its Second Session, the Guiding Group stressed the development of the OSNLR Programme at the regional level, including the necessary TEMA components.

59 The Technical Secretary also recalled that the Regional Committee, at its First Session, recognized the great importance of bathymetric and geomorphological charts of nearshore and offshore areas, inside or beyond limits of Exclusive Economic Zones, as a basis for many disciplinary and inter-disciplinary marine research investigations and for mineral resource exploration and it decided to undertake, under the aegis of the IOC, the preparation of an International Bathymetric Chart of the Western Indian Ocean (IBCWIO) within the framework of IOCINCWIO.

60 Being aware that the Federal Republic of Germany might be prepared to consider favourably a request to assist in the preparation and publication of such a chart, as a form of mutual assistance under TEMA, the Regional Committee requested the Secretary of IOC to invite the Government of the Federal Republic of Germany to assist the Regional Committee in the production of IBCWIO by assuming responsibility for final drafting and printing of the Chart.

61 To develop activities, an Expert Mission to the region was carried out on behalf of IOC by Prof. Werner Bettac, Deutsches Hydrographisches Institut, Hamburg, in July/August 1985, to ascertain interest in the proposed project. To stimulate activity, a Regional Training Course on Bathymetric Charting in the Western Indian Ocean was held, with the collaboration of the Federal Republic of Germany, in July 1987 at the Centre National de Recherches Oceanographiques, in Nosy Be, Madagascar and aboard the RV METEOR, of the Federal Republic.

62 The Delegate of the Federal Republic of Germany informed the Regional Committee of the preparatory activities he had undertaken with a view to presenting a proposal to the Editorial Board for IBCWIO on the extent of the Chart and the number and distribution of the component sheets. He distributed charts of the proposed sheet array to interested participants.

63 The Regional Committee noted the Summary Report of the Second Session of the IOC-UN Guiding Group of Experts on OSNLR and welcomed developments in this field. However, the Regional Committee did not consider it was prepared to define needs for regional co-operation under this IOC global programme at this stage, but would welcome any relevant advice that the IOC-UN Guiding Group of Experts might wish to make available to it or to the Member States of the region.

64 The Regional Committee urged those of its Member States that had not already done so to inform the Secretary IOC of the names and/or institutions of those national marine geologists/geophysics most directly concerned with the OSNLR field (excluding ocean mapping; see below). It called on the IOC-UN Guiding Group of Experts to communicate with the aforementioned scientists and/or institutions with a view to determining what aspects of OSNLR would be the most susceptible to regional co-operative investigations, with a view to bringing one or more regional or sub-regional proposals to the attention of the Member States concerned and, in due course, to the Regional Committee for consideration at its Third Session (probably in the first half of 1990). The Regional Committee invited interested institutions in the region also to inform the Secretary of IOC of their current needs for training and/or technical assistance to enable them to participate in OSNLR activities relevant to the IOCINCWIO region that might be developed by the IOC-UN Guiding Group of Experts.

65 The Regional Committee reaffirmed its interest in the preparation of an International Bathymetric Chart of the Western Indian Ocean (IBCWIO) and urged Member States to respond promptly to the invitation of the Secretary IOC to designate appropriate qualified experts to become Members of the IOC Editorial Board for IBCWIO. The Regional Committee welcomed the information provided on the preparatory work being undertaken on the Chart.

66 The Regional Committee thanked the Federal Republic of Germany for having kindly offered to take the lead in the preparation of the Chart through the IOC Editorial Board to be set up to guide and co-ordinate this preparation. It urged its Member States to participate actively and co-operatively in and with the Editorial Board, particularly by early designation of national experts to serve thereon and by assembling the available national bathymetric data and identifying other known sources of data for consideration by the Board, in due course, as to their suitability for use in drafting the Chart which is expected to be on a 1:1 000 000 scale in conformity with the Guidelines on the Preparation of IOC International Bathymetric Charts and in the light of advice provided by the IOC Consultative Group on Ocean Mapping.

4.3 DEVELOPMENT OF A REGIONAL COMPONENT OF OCEAN DYNAMICS AND CLIMATE (ODC) AND PARTICIPATION IN RELEVANT ASPECTS OF WCRP/TOGA

67 The Vice-Chairman of the IOC Technical Committee on Ocean Processes and Climate, Mr. S. Ragoonaden (who was also the Delegate of Mauritius to the Session) outlined the study of the Tropical Ocean and Global Atmosphere (TOGA) and the World Ocean Circulation Experiment (WOCE) under the WMO-ICSU World Climate Research Programme (WCRP), as well as the proposed supporting ocean-observing systems such as the IOC-WMO IGOSS XBT

Ship-of-Opportunity Programme, and Drifting-Buoy Co-operation (for oceanographic and meteorological purposes), and the IOC Global Ocean-Observing System (GLOSS) (see Sections 5.1.1 and 5.1.2, below).

68 After describing the general atmospheric circulation pattern, Mr. Ragoonaden recalled that a number of major interannual climate variations occur in the countries of the western Indian Ocean; notably, droughts and variation of coastal upwelling which influences the fisheries off the coast of Somalia. The understanding of, and the ability to predict, such events is of crucial importance for these countries. To develop such predictive models it will be necessary to monitor oceanographic and meteorological events within the national waters of western Indian Ocean countries and offshore. TOGA is expected to cover the decade 1985-1995 and, for its success, requires the participation of as many countries, institutions and scientists as possible.

69 An Implementation Plan for the World Ocean Circulation Experiment (WOCE) is also being prepared under WCRP, and the Indian Ocean will be given particular attention. Hydrographic sections and special survey areas will be proposed; the Somali Current and monsoon-driven circulation are phenomena that will be given particular attention, together with the Indian Ocean/Atlantic Ocean exchange and the Algulhas Current.

70 The Chairman of the SCOR-IOC CCCO Indian Ocean Climate Studies Panel, Dr. Michèle Fieux (who was also the Delegate of France), then described some of the results already obtained under TOGA from the western Indian Ocean and the studies that French marine research institutions plan to undertake in the western Indian Ocean. She showed, inter alia, the major currents and their variations (particularly the rapid current reversals in the vicinity of the equator) as observed by drifting buoys (one of which had survived for about three years). Other observations have shown the rapid response time of the ocean at the Somali coast to changes in wind stress. Dr. Fieux stressed the invitation of the French institutions to scientists from the region to participate fully in the proposed WOCE activities at all stages.

71 The Technical Secretary reminded the Regional Committee of IOC's role as the intergovernmental body responsible for the co-ordination of the oceanographic components of the WMO-ICSU World Climate Research Programme (WCRP).

72 The Regional Committee thanked the Delegate of Mauritius for his detailed introduction on the structure of TOGA and WOCE and their particular relevance to the IOCINCWIO region. It also thanked the Delegate of France for her presentation of some results within the framework of TOGA so far obtained and of French plans for further studies under the WOCE programme. It welcomed the offer of the Delegate of France to invite the participation of interested scientists of the region in the French WOCE activities in the region. The Regional Committee recognized the great significance for the region of these major global studies, in terms of greatly increased predictability of major climatic phenomena (El Niño-Oscillation, rains, drought, monsoons) that determine the direction of such human activities as agriculture, forestry, fisheries, navigation, coastal engineering, as well as erosion and sedimentation.

73 The Regional Committee noted the information provided by the Delegate of the USA on the main outcomes of the Ninth Session of the JSC-CCCO Scientific Steering Group for WOCE, particularly that the Draft Implementation Plan for WOCE would be circulated widely to the Member States in 1988 for comment and, later at the WOCE International Scientific Conference in 1988. The Regional Committee urged interested institutions and scientists of the IOCINCWIO region to study this Draft Plan carefully and to inform the Joint SCOR-IOC Committee on Climatic Changes and the Ocean (CCCO), through the Secretary of IOC, of specific national interests, including the question of data management (archiving, exchange and analysis) relative to the Plan, so that these could be taken into account in its further development and thus considered specifically at the WMO-ICSU-SCOR-IOC WOCE International Scientific Conference. The Regional Committee welcomed the convening of this Conference and requested the IOC and Unesco to support the attendance at the Conference of concerned scientists from the IOCINCWIO region. The Regional Committee also offered to support a JSC-CCCO WOCE Regional Workshop, planned for the first half of 1989, to inform scientists and administrators in the region of the state of WOCE planning and define in appropriate detail the involvement of the relevant institutions of the Member States of the region in WOCE in the western Indian Ocean. It acknowledged with thanks the tentative offer of the Delegate of Mauritius to host the WOCE Regional Workshop in his country if the relevant Mauritian authorities approved the invitation. It strongly urged its Member States to pursue the development, at the national and regional levels, of the relevant capabilities to allow full participation in the Indian Ocean components of WOCE, and to increase their involvement in TOGA activities in the region.

74 The Regional Committee urged its Member States, when studying the WOCE Implementation Plan and when identifying potential participating national institutions, to identify likely training needs so that some of them, if not all, could be met in advance of formal participation. It also urged Member States to consider further the TOGA Implementation Plan, with a view to determining TEMA needs the satisfaction of which could enhance their participation in TOGA.

75 The Regional Committee welcomed the proposal of WMO to provide six-month Training Courses in Marine Meteorology and Physical Oceanography at the WMO Regional Meteorological Training Centre in Nairobi.

4.4 DEVELOPMENT OF A REGIONAL COMPONENT OF MARINE POLLUTION RESEARCH AND MONITORING (GIPME/MARPOLMON)

76 The Technical Secretary recalled that, under its Global Investigation of Pollution in the Marine Environment (GIPME) and the Marine Pollution Monitoring System (MARPOLMON), which is being implemented on a regional basis, the IOC is developing plans to establish regional networks of laboratories/experts to undertake co-operative marine pollution research and monitoring. Contacts have shown that one priority is the need for training and assistance in this field, and an assessment of the various levels of sophistication required by participating laboratories to enable them to initiate corresponding activities, with a view to developing the scientific basis required for the monitoring of selected pollutants.

77 Professor William Kudoja, of the Faculty of Chemistry, University of Dar-es-Salaam, who had lead the discussions during the Preparatory Expert Consultations, introduced the Project Proposal. He noted that one of the main interests in the region was to be able to determine as far as possible the origin of oil in the seas and on the coasts of the countries in the region. There was, therefore, considerable interest in using crude-oil standards, even if chrysene standards were appropriate for data intended to provide a global picture of marine petroleum pollution. For those laboratories with appropriate capabilities, there was also an interest, for similar reasons, in monitoring trace elements (notably vanadium and selenium) that are known to be tracers of oil sources (by the presence or absence, and by the relative proportions, of such trace elements). There was also an interest, expressed at the Preparatory Expert Consultations, in monitoring petroleum in marine benthic organisms, particularly those of commercial interest in the region.

78 The Delegate of Mauritius reminded the Regional Committee of his country's considerable dependence on tourism and therefore its high vulnerability to a major oil spill. His country was interested in developing contingency plans and called on the IOC to assist in this respect.

79 The Delegate of Tanzania pointed out that his country and others in the region had extensive mangrove areas which were also highly vulnerable to oil spills. He joined the Delegate of Mauritius in his appeal for assistance.

80 The Regional Committee recalled that the concerns it had expressed on regional marine pollution problems remained valid: petroleum at sea and agricultural pesticide run-off were still the main problems along the coasts of most IOCINCWIO Member States. The Regional Committee recognized that the need to monitor petroleum pollution with a view to determining the source of the oil, and thereby probable carriers, had become stronger as the problem had grown. Moreover, it recognized that the island States in the region whose economy depends heavily on tourism (notably Mauritius and the Seychelles) were in a particularly difficult position if a serious oil spill occurred in their coastal areas; those countries such as Kenya and Tanzania with extensive mangroves are also highly vulnerable to oil spills. The Regional Committee noted, however, that the question of oil-spill contingency planning should be addressed to the International Maritime Organization, and requested the Secretary of IOC to draw this need to IMO's attention. The Regional Committee welcomed the collaborative efforts of IOC, FAO and UNEP to assess the state of health of the western Indian Ocean in the context of the UNEP Action Plan for the East African Region, as input to the long-term IOC-UNEP review of the state of health of the oceans.

81 The Regional Committee studied carefully a Project Proposal it had received from the ad hoc Preparatory Expert Consultations prior to its Second Session. It took the view that the proposal was a sound one and feasible in the region, and decided to implement it as a regional component of GIPME/MARPOLMON, with a view also to providing appropriate input to the relevant components of the UNEP Action Plan for the East African Region. The Regional Committee recognized that oil pollution was a particular danger to the abundant mangrove areas in the region, and stressed that a long-term

objective of the Project was to lay the basis for a long-term regional marine pollution monitoring (MARPOLMON) system, as well as enhance the general marine pollution research capabilities. It decided to include in the Project the monitoring of oil in appropriate benthic organisms, particularly mussels and other species of commercial interest. It requested the Secretary of IOC to produce a revised version of the Project Proposal, incorporating the modifications recommended by the ad hoc Preparatory Expert Consultations, and circulate it widely to relevant institutions in the region for use as a guide in the implementation of Project activities.

82 The Regional Committee invited those Member States that so wished to monitor trace elements such as vanadium and selenium, as tracers of the sources of the oil found in the marine environment of the region.

83 The Regional Committee requested the RNODC-MARPOLMON to assume responsibility for the relevant data exchange for the IOCINCWIO region for the time being.

84 The Regional Committee urged its Member States, and particularly the institutions directly concerned with marine pollution, to work out national sampling sites and/or arrays and to commence sampling and subsequent analysis. It also urged them, at the same time, to identify needs for training of monitoring and/or analytical staff, for equipment and reagents, for analytical reference standards, etc. and/or related data management. The Regional Committee stressed the importance of so-called "hands-on" training, and requested the Secretary of IOC to arrange such training as far as possible, as and when Member States of the region make their needs known to him. It called on the GIPME Group of Experts on Methods, Standards and Intercalibration to study the need for relevant exercises, particularly in the form of a Training Workshop, in the IOCINCWIO region. It also called on the GIPME Group of Experts on Standard and Reference Materials to advise relevant institutions in the region on the availability of chrysene and crude oil standards for use in regional monitoring activities.

5. OCEAN SERVICES IN THE WESTERN INDIAN OCEAN

5.1 OCEAN OBSERVING SYSTEMS

5.1.1 Regional Component of the Global Sea-level Observing System (GLOSS)

85 The Vice-Chairman of the IOC Technical Committee on Ocean Processes and CLimate, Dr. S. Ragoonaden, who was also the Delegate for Mauritius, briefly described the general objectives and structure of GLOSS and its particular configuration for the IOCINCWIO region. He indicated that nine stations were already operating in the IOCINCWIO region; two (one in Mauritius and one in Tanzania) are expected to be installed soon, and three have been proposed for the Seychelles (1) and Somalia (2). Dr. Ragoonaden suggested that two more stations on the west coast of Madagascar would be highly desirable so as to monitor the flow through the Mozambique Channel. He also stressed the importance of data submission to the relevant

international centres: the TOGA Sea-level Centre, in Hawaii, for hourly and daily mean values, and the Permanent Service for Mean Sea Level, in the United Kingdom, for monthly means. Dr. Ragoonaden stressed the importance of nominating National Contact Points for GLOSS and a Regional Co-ordinator.

86 Dr. Graham Alcock, of the Permanent Service for Mean Sea Level, who was also the Delegate of the United Kingdom, explained the principal applications of sea-level data. At the local level, they were useful for controlling such activities as harbour operations, navigation and coastal engineering work. At the regional level, they would allow description and prediction of oceanic phenomena, such as currents and the related effects, the onset of monsoons, and even facilitate assessment of tectonic movements. At the global level, for GLOSS as a whole, mean sea-level data would allow assessment of long-term trends in sea level as a function of such parameters as the total volume of sea water (to be related to recession or growth of polar ice caps) and deformations of the geoid.

87 The Technical Secretary reminded the Regional Committee that the IOC Assembly, at its Thirteenth Session, had urged Member States to participate in the implementation of the Global Sea-level Observing System by: (i) maintaining, up-grading, re-activating, and establishing sea-level stations; (ii) providing assistance and support to developing countries through TEMA activities and/or bilateral and multilateral assistance mechanisms, in the installation, operation, and maintenance of tide gauges, and in the analyses of data therefrom; and (iii) submitting sea-level data in accordance with the requirements of the Global Sea-Level Observing System. It had also requested the regional subsidiary bodies of the Commission, as well as other co-operating regional bodies, to give priority to the implementation of Sea-level Observing Networks in their respective ocean regions.

88 The Regional Committee thanked the Delegates of the Mauritius and the United Kingdom for their clear presentations of the structure and purposes of GLOSS. It recognized the considerable usefulness of the System as a whole and of a regional component in particular. It noted that there were nine gauges already installed in the region and five others had been proposed to complete an IOCINCWIO regional network. It thanked those IOC Member States (China, France, Portugal, Sweden and USA) that had kindly provided tide-gauges and/or the related technical assistance in their installation and calibration. The Regional Committee adopted the Proposal that had been put before it. In doing so, it agreed to the establishment of an IOCINCWIO Regional Co-ordinator for GLOSS and invited Mr. Mika Odido of the Kenya Marine and Fisheries Research Institute to undertake the tasks specified for the Regional Co-ordinator in the GLOSS Proposal it had adopted.

89 The Regional Committee urged its Member States to participate fully in GLOSS and to appoint a GLOSS National Co-ordinator to facilitate liaison with the IOC Secretariat, with the TOGA Sea-level Centre in Hawaii, for hourly and daily mean-sea-level data, and with the Permanent Service for Mean-Sea-level, in Bidston, United Kingdom, for monthly mean-sea-level data. It also urged its Member States to study the advantages of the progressive introduction of automatic data pick-up and transmission systems so as to ensure near-real-time transfer of data to the TOGA Sea-level Centre, to

enable near-real-time data products to be distributed to participating Member States, and to local authorities (e.g., the institution operating the gauge, port authorities, etc.) for immediate national purposes, including those of oceanographic research.

90 The Regional Committee appreciated the opportunities that had been provided, through the IOC, by Member States, notably the UK and China, for training in sea-level measurement, and warmly welcomed the offers of future training and technical assistance from Federal Republic of Germany, France, Portugal, Sweden and the USA. It also recommended to its Member States that they identify their training and technical assistance needs and make them known to the IOCINCWIO Regional Co-ordinator for GLOSS who would then consult with the Secretary IOC, if necessary, on how best to meet these needs.

5.1.2 Development of Future Ocean-Observing Systems in the Region

91 The Technical Secretary recalled that the Assembly, at its Twelfth Session, had adopted the principle of developing a comprehensive ocean monitoring system. Moreover, the IOC Technical Committee for Ocean Processes and Climate, at its First Session, had recommended that, in developing ocean-observing systems in support of the World Climate Research Programme, IOC's main effort in the immediate future be focussed on the following activities: (i) promotion and development of a Global Sea-Level Observing System; (ii) promotion and development of a drifting-buoy programme (jointly with WMO) for oceanographic and meteorological purposes; (iii) promotion and development of ocean sub-surface thermal structure monitoring in the framework of IGOSS.

92 The Technical Committee for Ocean Processes and Climate at its Second Session had also considered the further development of other ocean-observing systems, giving particular attention to: (i) the further development of the IGOSS Ship-of-Opportunity Programme for monitoring the sea surface and the upper layer of the ocean; (ii) the use of fixed buoys (including subsurface floats) and satellites for the monitoring of such parameters as currents, sea-surface topography, and thermal radiation. The Technical Committee had identified the following technology as being suitable for the development of future ocean-observing systems: satellite altimetry and scatterometry missions to determine, respectively, the dynamics of the mean ocean surface and the surface wind stress; active and passive microwave radiometers; moored instruments, especially current meters; specialized systems, such as towed CTDs, acoustic current profilers; and hydrographic and hydrochemical measurements from research vessels.

93 The Technical Committee had also noted that the ocean-observing systems required for TOGA and WOCE call for extremely diverse types of oceanographic observations and that rapid development of new technology for ocean observations makes it possible to establish in the near future a truly global ocean-monitoring system.

94 The Regional Committee noted the development, by IGOSS, of a Ship-of-Opportunity Programme as a means of obtaining data, mainly using expendable bathythermographs (XBTs), on the heat content of the upper layer of the ocean in areas not often visited by research vessels. It invited its

Member States to give assistance, if and when necessary, to ships participating in the programme, and to determine their national possibilities for initiating new lines that could increase coverage of the Indian Ocean in space (routes covering data-sparse areas) or in time (frequency of traverses). It suggested that Member States inform the IOC-WMO IGOSS Co-ordinator (at IOC, Paris) of any intention they might have to participate in the Ship-of-Opportunity Programme, so that expendable bathythermographs (XBTs) could be made available to co-operating vessels.

95 The Regional Committee noted the deployment of drifting buoys in the region as a means of covering, over a relatively long time (several months to a few years), specific parts of the Indian Ocean in which oceanic phenomena (e.g., major currents) occur. Although Member States of the region are not yet deploying drifting buoys themselves, the Regional Committee did believe that such buoys could provide invaluable data for the oceanographic and meteorological communities in the region and throughout the world. However, it expressed concern, in this context as in others, about the availability of data from the buoys to interested institutions in the western Indian Ocean, and called on the WMO-IOC Drifting Buoy Co-operation Panel to address this question. Nevertheless, it requested its Member States to co-operate with those Member States or institutions operating drifting buoys, in the event that a drifting buoy became stranded on their beaches, particularly by informing the operator and assisting in making arrangements for the return of the buoy.

96 The Regional Committee stressed the need to obtain and use relevant satellite data from IOC Member States operating ocean-observing satellites and requested the Secretary IOC to take steps to facilitate the acquisition of satellite data for the countries of the IOCINCWIO region.

97 The Regional Committee recognized that IGOSS was not developing in the region, mainly owing to a shortage of facilities for data acquisition and handling, and possibly to an insufficient demand for IGOSS data products. Believing that this may be due to insufficient information on the advantages to be gained by its Member States from IGOSS, it requested the Secretary of IOC to make a special effort to provide detailed information on IGOSS to the Member States of the western Indian Ocean. It invited its Member States, and particularly their marine research institutions, to assess the advantages of active participation in IGOSS and to act accordingly. In particular, the Regional Committee called on its Member States to identify any training and technical assistance needs they might have which, if met, could greatly enhance participation.

5.2 DEVELOPMENT OF OCEANOGRAPHIC DATA AND INFORMATION SYSTEMS IN THE REGION

98 The Technical Secretary recalled that, for more than two decades, the IOC has encouraged and assisted interested Member States to establish National Oceanographic Data Centres (NODCs) in the framework of the IOC International Oceanographic Data and Information Exchange (IODE) System. IOC Manuals and Guides N° 5 provides guidance to Member States on establishing NODCs and on their functions. At present, only Tanzania has a Designated

National Agency (a fore-runner of an NODC) and Madagascar has nominated a National Co-ordinator for IODE.

99 The IOC Technical Committee on IODE, at its Twelfth Session, recommended that, to promote awareness of IODE activities and to assess the needs for infrastructure development and the possibilities for regional co-operation, an IODE mission be planned for the region. Plans for such a mission to interested Member States of the region are now being developed.

100 The Regional Committee agreed that oceanographic data exchange within the region and between the region and the rest of the world was still poorly developed. It believed that this was due largely to the shortage of suitable data centres and a general lack of modern automatic data-processing equipment, and, in particular, that there was a need, in some cases, to up-grade national telecommunication systems. The Regional Committee recognized that data may be stored in several centres thus giving rise to a need for an accurate data-referral system. It recognized that it was also important to have a central unit that could assist users by assembling data sets more closely tailored to individual requirements. The Regional Committee requested the Secretary of IOC to arrange an IODE Advisory Mission to the region to discuss national needs and interests in data management in the framework of IODE.

101 Regarding marine information management, the Director of the Kenya-Belgium Project in Marine Sciences, Prof. Philip Polk, explained that, in the majority of the coastal States of the region, there is a shortage of documentation on marine science. The few libraries in the region that are best off in this regard do not, in many cases, have up-to-date holdings. The Assembly, at its Thirteenth Session, had taken the view that many problems of marine information management in developing countries can best be met by regional solutions, including training, document-delivery facilities, computerized information retrieval and exchange. It would appear essential, then, to establish regional or subregional mechanisms for the exchange of documents, information and bibliographies in the marine sciences.

102 It is already clear that regional co-operation requires that at least a minimum of resources and infrastructure be available at the national and institutional levels; also, trained and capable staff are a key factor. Good communication between centres in a network is essential, but, for some laboratories, this is a major difficulty - even for basic mail and telephone services. Low-cost personal computers and improving telecommunications infrastructure imply that electronic mail links will become more widely practicable.

103 A regional bibliographic database which indicates where documents are held is very valuable. Such a system can include material not included in the worldwide Aquatic Sciences and Fisheries Abstracts (ASFA) database and can also cite published regional material more quickly. Unesco's CDS/ISIS bibliographic database management system, which runs on many computers including IBM-PCs and compatibles and is available free of charge, can be used for this. Access to the ASFA database is an important tool for literature searches. This database is now available on laser compact disk, CD-ROM, which can be searched using a reader connected to an IBM-PC. Such a system, installed in one or more major marine science centres in a region

and able to serve those scientists directly, can also be used to answer queries sent in from smaller laboratories in the network.

104 Professor Polk explained that these ideas had been embodied in a project proposal entitled Regional Co-operation in Scientific Information Exchange for the Western Indian Ocean (RECOSCIX-WIO), which had been developed from experience gained in the Kenya-Belgium Project in Marine Sciences with assistance from Unesco and the IOC.

105 Mr. Peter Pissierssens, of the Kenya-Belgium Project, briefly outlined the contents of the RECOSCIX-WIO Proposal, and particularly the first phase which was expected to last from twelve to eighteen months, covering the basic equipment of participating institutions and trial exchange between a Central Dispatching Centre, presently at KMFRI, in Mombasa, holding the ASFA data base on a CD-ROM, and the other institutions in the network. He recalled that an IOC-Unesco Advisory Mission had been able to visit several IOCINCWIO countries (Kenya, Somalia, Tanzania, Madagascar and Mauritius), as well as Ethiopia, to assess their present capacities and needs for participation in the network, but a supplementary mission to Mozambique was desirable. He also pointed out that information on scientific literature within the region not yet in the ASFA database could be assembled for local use.

106 Besides the actions mentioned above, the Regional Committee recommended that its Member States progressively acquire the necessary electronic equipment (PCs or microcomputers, with associated printers and modems) to allow inter-institutional data and information flow, taking into account the advice that might be provided by the above-mentioned IOC advisory mission. It suggested that the Member States consider the advantages of participating in one or more electronic mailing schemes as a means of transferring requests, reports and ordinary messages rapidly throughout the system.

107 The Regional Committee recognized that marine scientific institutes in the region that decide to use electronic data and information transfer systems will probably require some training in the use of these systems, and that this could best be achieved in the context of a regional project (see below).

108 The Regional Committee welcomed the outline of the Project. It decided to adopt the Project in principle and the implementation of the first phase in practice. To this effect, it invited Professor Polk to prepare a detailed list of the prospective actions that should be taken in this first phase. The Regional Committee requested the Secretary of IOC, in consultation with the Unesco Division of Marine Science, to arrange an advisory mission to those countries not previously visited to discuss their specific requirements and problems of participation. It called on the IOC and Unesco to seek the extrabudgetary funding ($ 28 000) required for the implementation of Phase I. The Regional Committee invited the Kenya Marine and Fisheries Research Institute (KMFRI) to act as the Dispatch Centre for the RECOSCIX-WIO Project during the Pilot Phase, in view of the existence of the required facilities there at this time. The Regional Committee recognized that, for the system to work effectively in the region, long-term training in the field of marine information management, including the

development of a regional marine scientific data and information base covering the regional scientific literature, would be necessary, with a view to developing a regional component of ASFIS. Welcoming the success of RECOSCIX, and anticipating its successful application to the rest of the IOCINCWIO region (RECOSCIX-WIO), the Regional Committee called on the Belgian Government to continue assisting RECOSCIX and its extension to the region.

6. ENHANCING THE MARINE SCIENCE CAPABILITIES OF DEVELOPING COUNTRIES

6.1 TEMA REQUIREMENTS IN SUPPORT OF THE APPROVED PROGRAMMES AND ACTIVITIES

109 The IOC Senior Assistant Secretary in charge of TEMA, Dr. S.M. Haq, introduced this item. He pointed out that the main aim of TEMA is to assist developing countries to acquire the necessary capabilities in marine science to achieve national goals in marine affairs, including the capacity required to participate effectively in these programmes and activities. He recalled that the Technical Committee for TEMA, at its Fourth Session in 1984, placed considerable emphasis on the decisive role to be played by the IOC subsidiary bodies in the planning of their respective programmes as well as the formulation of related TEMA requirements and the implementation of TEMA components. Also, the holding of a scientific seminar prior to each session of an IOC subsidiary body, to allow the presentation of scientific papers on the agreed programmes of the Commission, and publication thereof, were steps aimed at stimulating the participation of scientists of Member States, to evaluate the results of scientific programmes and related activities, with a view to allowing adjustments, if necessary, or to formulate new programmes.

110 He informed the Regional Committee that there were only limited funds available to IOC and, thus, TEMA; however, there are various mechanisms established by IOC to provide support from external sources, in particular: (i) the IOC-Voluntary Co-operation Programme in which IOC plays the role of a broker between Member States requesting technical assistance, equipment and training, and the donor States; (ii) the contributions made by Member States to the IOC Trust Fund; and (iii) the IOC Research Fellowship Scheme in which a few countries have contributed fellowships in support of TEMA activities.

111 Regarding activities under TEMA for the IOCINCWIO region during the next biennium, the Senior Assistant Secretary invited the Delegates to focus attention on the needs of the countries of the region with respect to the four co-operative research projects adopted by the Regional Committee. He requested that the TEMA actions recommended in each of those project proposals be reviewed and ways and means found to implement them, taking into consideration the means available to IOC.

112 Some Delegates pointed out that short-term courses are often found to be less productive and that IOC should explore the possibility of long-term training, which would be more effective in developing the regional

marine research capability required for effective participation of scientists in the various co-operative projects.

113 The Senior Assistant Secretary explained that, while there is a need for long-term training in various disciplines of marine science, offers of support for such training from donor countries/institutions were rare; moreover, the short-term training reflected in some of the projects is aimed at providing opportunities for developing specific capabilities for such purposes as: (i) standardization of techniques to be employed in the collection of oceanographic data and the processing and analysis of samples for comparison at the regional level; (ii) orientation of scientists to basic methodology and procedures for collection of samples and analysis of data, so as to prepare them for extensive and intensive training later; and (iii) enabling senior scientists to acquire further training in the framework of their present research efforts. Short-term training is recommended for certain specific areas (e.g.,phytoplankton/ zooplankton/ichthyoplankton) so as to pave the way for more intensive training later, making use of data and samples collected locally.

114 Some Delegates suggested that the region already has some capability in marine science, and the money spent on certain group training courses could be better spent on training scientists individually for longer periods or on promoting frequent meeting of scientists in connection with the implementation of the projects. It was also pointed out that IOC's role as a broker between Member States, particularly in arranging specific assistance, is important, whereas the Regional Committee should address its needs for assistance not only to IOC in its areas of competence, but also to FAO, UNEP and other organizations for assistance in training relevant to their specific areas of competence. This could be promoted in keeping with the spirit of the ICSPRO (Inter-secretariat Committee on Scientific Programmes Relating to Oceanography) Agreement. Since Unesco provides long-term fellowships in marine science, one Delegate suggested that fellowships for the region might be channelled through the Unesco Regional Office of Science and Technology for Africa, Nairobi.

115 Commenting on the specific needs in the Project on Oceanographic Conditions in Relation to Living Resources in Western Indian Ocean Coastal Waters, some Delegates stressed the need for training of scientists in identification of plankton taxa, and eggs and larvae of commercially important species. It was suggested that the Expert Steering Group should be requested to identify the detailed needs of the Member States of the region, bearing in mind the requirements referred to in this Project.

116 Regarding the Project on Monitoring Marine Petroleum Pollution in the Western Indian Ocean, emphasis was placed on long-term training. The Delegate of Kenya informed the Regional Committee that a course on petroleum pollution monitoring had been held a year ago at the Kenya Marine and Fisheries Research Institute, in Mombasa. He proposed that the course referred to in the Project be upgraded to include other pollutants. He said that his country would be willing to host such a course in 1988, and that the Institute has adequate equipment and training facilities for this purpose.

117 In the Project on the Development of a Regional Component of GLOSS, top priority was given to the training of scientists and to the provision of spare parts for tide gauges. It was suggested that the next training course at the Proudman Oceanographic Laboratory, in Bidston, UK, be held in 1989, and that interested Member States nominate suitable scientists.

118 With respect to the Project on Regional Co-operation in Scientific Information Exchange for the Western Indian Ocean, it was proposed that the group training of marine science librarians be held, if possible, at the Kenya Marine and Fisheries Research Institute, in Mombasa, where adequate facilities for such training exist.

119 The Director of the Kenya-Belgium Project in Marine Sciences, based in Mombasa, stated that considerable assistance could be obtained by institutions in developing countries by establishing links with other institutions in developed countries or elsewhere. He informed the Regional Committee that his Government announces each year about 15 fellowships in the field of marine science. He thought the IOC could request the Belgian authorities to award 6 or 7 fellowships in support of programmes approved by the Regional Committee.

120 The Delegate of the USSR, referring to the training provided aboard the RV GEORGI USHAKOV in 1987, informed the Regional Committee that all results will be published; the data have already been made available to the Member States whose scientists participated in the cruise. He expressed the hope that the difficulties encountered this time could be overcome in the next cruise, during which a geotraverse between Madagascar and Australia would be undertaken. He invited participation from all IOCINCWIO Member States, especially Madagascar and Mauritius.

121 The Delegates of Madagascar and Tanzania welcomed the information and the invitation, especially since some difficulties in obtaining data from USSR vessels operating in the Mozambique Channel had been experienced hitherto.

122 The Regional Committee identified the immediate TEMA needs, including training of scientists and provision of equipment, as reflected in the Table given in Annex IV hereto, so as to ensure initiation of activities under the approved Projects. It recognized that lack of convertible currencies in many of the countries makes it difficult to meet those needs. The Regional Committee therefore urged Member States in a position to do so to provide required support for training of personnel and acquisition of equipment needed for implementation of the Projects. The Regional Committee welcomed the information on the fellowships being awarded each year by the Government of Belgium in the field of marine science. It requested the Secretary of IOC to explore with the Government of Belgium the possibility of awarding some of these fellowships to scientists of the IOCINCWIO region, if possible under the IOC Research Fellowship Scheme or through other appropriate arrangements.

123 The Regional Committee requested the Member States of the region to provide full support to enable their respective institutions to participate fully in the adopted IOCINCWIO Projects.

6.1.1 Requirements for, and Improved Uses of, Research Vessels

124 The IOC Senior Assistant Secretary in charge of TEMA provided background information on the activities undertaken by IOC since the Regional Committee's First Session. He recalled that the IOC, jointly with FAO and with the support of NORAD, had organized a Workshop on Improved Uses of Research Vessels (Lisbon, 1984), to examine the problems facing a number of developing countries in the operation and management of research vessels. The Workshop recommended, inter alia, that IOC, jointly with FAO, prepare a Manual on the Use of Research Vessels. A proposal on this submitted to ICOD jointly by IOC and FAO was accepted for funding; teaching materials on the subject will also be prepared. A Training Course on the Use of Research Vessels will be held in 1989. The Course will provide an opportunity to test the Manual with a view to improving it if necessary.

125 The Senior Assistant Secretary drew the attention of the Regional Committee to the several alternatives that are open to consideration for strengthening the capacity of the countries to use research vessels in support of marine research, particularly in the context of the adopted IOC programmes and co-operative projects. First, a number of countries may jointly fund, operate and manage one research vessel. Although this may be economically a better proposition, there are inherent difficulties in such joint ownership, operation and management. Second, the countries may use the facilities offered by foreign oceanographic vessels visiting the region through arrangements for shiptime for scientists, as well as for training. This source could be extremely useful, but, it may not provide a permanent solution to the needs of the countries. Third, a number of countries have research vessels that are in need of repair before they can be used. International assistance may be explored, but this may not be easily obtained. Fourth, the countries may use local boats including commercial trawlers on hire to respond to their needs, until a permanent solution is found. One other source of research vessels is the FAO/UNDP Pool of Research Vessels, which has been operating for 20 years. The countries may submit a request, in consultation with FAO and IOC, for such assistance on a short-term basis.

126 The Delegate of Madagascar informed the Regional Committee that the Centre National de Recherches Océanographiques (CNRO), Nosy Bé, has, for the last five years, been using a fishery research vessel acquired and run from donations by the Government of Japan. However, the CNRO is faced with problems of management of the vessel on its own, since the assistance provided did not foresee spare parts for the vessel.

127 The Delegate of Mauritius informed the Regional Committee that his country had acquired a research vessel in 1981, but was unable to use it for want of repair and maintenance facilities, and consequently had decided to sell it.

128 The Delegate of Kenya said that his country is planning to acquire a new research vessel by 1989. He said that the idea of one research vessel

to be jointly owned, operated and managed, is impracticable and suggested that the best approach would be to hire a research vessel through IOC/FAO sources.

129 The Delegate of Tanzania stressed the fact that shortage of foreign currency makes it difficult to repair the RV KASKAZI, which has been out of action for several years.

130 The Delegate of France informed the Regional Committee that a French supply ship has been engaged in oceanographic studies. There is a possibility that this vessel could be made available, for co-operative research, to the Member States of the IOCINCWIO region. She suggested that the Secretary of IOC approach the French authorities to formalize arrangements.

131 The Regional Committee concluded that the problem of research vessels in the region, although extremely complex, constitutes one of the most important issues that need to be resolved in the long-term interest of the Member States of the region to develop marine resources and manage the marine environment.

132 The Regional Committee recognized that this problem deserves to be considered from scientific, technical and managerial standpoints, and therefore instructed the Expert Steering Group for the Project on Oceanographic Conditions in Relation to Living Resources in Western Indian Ocean Coastal Waters to consider the requirements for research vessels in the IOCINCWIO Region, within the Terms of Reference given in the Annex III, hereto. It also requested the Secretary IOC to organize an advisory mission which should report its findings to the Member States concerned and to the Regional Committee.

133 The Regional Committee encouraged its Member States to acquire, or make operational, medium-sized boats available in the region as an interim measure.

134 The Regional Committee acknowledged with thanks the offer of France to involve scientists of Member States of the IOCINCWIO region in the future French research programmes in the region. It requested the Secretary IOC to explore with the relevant French authorities the implementation of this offer.

135 The Regional Committee, being informed that a number of foreign institutions are willing to offer opportunities for the participation of scientists from the IOCINCWIO region in their oceanographic activities in the region, which would allow scientists of the region to collect oceanographic data and samples from coastal and offshore areas under national jurisdiction, strongly recommended that Member States of the region provide all necessary facilities to research vessels of foreign institutions involved in co-operative research programmes in the region to have access to ports of call and areas of scientific interest in zones under national jurisdiction.

136 The Regional Committee requested the Secretary of IOC to convey this request to Member States and to take other appropriate action to that effect.

137 It also urged the Member States offering such co-operative research cruises in the region to ensure prior consultation with the relevant scientists and institutions in the region in the planning, conduct and follow-up of scientific programmes that are of interest to them.

6.2 IMPLEMENTATION OF THE UNESCO-IOC COMPREHENSIVE PLAN FOR A MAJOR ASSISTANCE PROGRAMME TO ENHANCE MARINE SCIENTIFIC CAPABILITIES OF DEVELOPING COUNTRIES

138 The IOC Senior Assistant Secretary in charge of TEMA provided background information on the Unesco-IOC Comprehensive Plan. He recalled that the Plan had been drawn up and adopted by the Commission and then Unesco in response to a special Resolution of the Third UN Conference on the Law of the Sea, on "Development of National Marine Science, Technology and Ocean Service Infrastructre" (April, 1982). He drew the attention of the Regional Committee to the points raised in the Preparatory Expert Consultations; it had been recognized as timely that the countries of the IOCINCWIO region strengthen their national institutions so as to develop the capacity to deal effectively with marine development problems of the region. In this context, he recalled the recommendations of the First Congress of African Scientists, convened by the Organization of African Unity with the support of Unesco and UNDP (Brazzaville, 25-30 June 1987), and those of the Second Conference of Ministers Responsible for the Application of Science and Technology to Development in Africa (CASTAFRICA-II) held in Arusha, Tanzania, 5-16 July 1987, which recommended, inter alia, development of marine sciences.

139 Several Delegates emphasized the great importance they attached to the idea of developing technical assistance projects in marine science and related aspects exclusively for the IOCINCWIO region and emphasized the need for concrete action in this matter by IOC.

140 The Chairman reminded Delegates that, a few years ago, Unesco, jointly with ECA and with the support of UNDP, had organized a mission to various African countries with a view to developing a project for Africa to be funded by UNDP itself. The project, which was designed to support and strengthen national centres of marine science, was published as Unesco Technical Report Series N° 14 (Marine Science and Technology in Africa: Present State and Future Development). He informed the Committee that, unfortunately, the Project had not been followed up.

141 The Regional Committee agreed that a regional technical assistance project, or, if more appropriate, two projects each covering a sub-region of IOCINCWIO with common requirements, are timely and would enable Member States and their marine scientific and similar institutions to strengthen their infrastructure as well as the manpower needed to respond to their rapidly growing needs for a better knowledge of the ocean and its resources as a basis for attaining development and management objectives.

142 The Regional Committee therefore requested Unesco to reconsider, at least for the IOCINCWIO region, ways and means of achieving the objectives of the former Unesco-ECA Project on the Development of Marine Science and Technology in Africa, with a view to developing, jointly with IOC and with the assistance of the Regional Committee itself, appropriate sub-regional projects under the Comprehensive Plan.

143 The Regional Committee welcomed the recommendation of the Congress of African Scientists to develop African science, including marine science, endogenously, and called on its Member States to take all possible steps to give effect to the recommendations of the Congress. It also welcomed the decision of CASTAFRICA-II to approve funding for a Unesco project to develop the marine sciences in Africa.

7. FUTURE PROGRAMME OF WORK

7.1 PROGRAMME OF WORK 1988-89

144 The Technical Secretary informed the Regional Committee that the IOC proposals for the 24 C/5 (1988-89) take into account the fact that this period corresponds to the last biennium of the present Medium-term Plan and should serve as a bridge to the next six-year exercise.

145 It should be noted that a step forward has been taken to concentrate the activities of the Commission within Unesco Major Programme X.4, covering all aspects of the marine area, from the coast out to the open ocean, whereas the activities of the Unesco Division of Marine Sciences have been concentrated in Major Programme X.5. This is in line with the views expressed in Commission III during the Twenty-third General Conference of Unesco.

146 In the 24 C/5 approved by the General Conference of Unesco, US $ 25 000 were allocated specifically to IOCINCWIO under the Regular Budget. However, some US $ 75 000 were expected to be made available from extrabudgetary resources (e.g., contributions to the IOC Trust Fund), and an undetermined but significant amount of funding would be used to implement activities of, or relevant to, the Regional Committee in the context of IOC global programmes such as GIPME, IGOSS, IODE etc.

147 The Regional Committee stressed that the level of funding allocated by the Commission for IOCINCWIO is completely inadequate and that it simply cannot conduct a viable programme of work with such limited funding.

148 The Regional Committee considered it especially important to ensure that the limited regular programme funds available be allocated to the IOCICNWIO projects to which the Regional Committee assigns the highest priorities. Therefore, the Regional Committee requested the Secretary of IOC to: (i) provide funds under this budget specifically to support one meeting, in each of the next two years, of the Expert Steering Group for the IOCINCWIO Project on Oceanographic Conditions in Relation to Living

Resources in Western Indian Ocean Coastal Waters; (ii) provide funds for workshops, seminars, expert consultations and advisory services directly related to other IOCINCWIO-approved projects; and (iii) provide funding for short-term travel and study grants from other funding sources, especially IOC Member States, and not out of the IOC Regular Programme Budget.

149 The Regional Committee concluded that, if a viable IOCINCWIO scientific programme is to be developed and maintained in the region, the Committee must be able to meet every two years. It recognized that the IOC budget for the biennium 1988-1989 would not permit this objective to be reached immediately. However, the Regional Committee strongly recommended that the IOC provide funding in its next budget biennium (1990-91) to permit the Regional Committee to meet as early as possible in 1990.

7.2 EXPECTED TRENDS DURING THE UNESCO MEDIUM-TERM PLAN 1990-1995

150 The Technical Secretary recalled that, at its Fourteenth Session, the Assembly had requested Member States to submit their suggestions on elements for the marine component of the Unesco Medium-Term Plan to the Secretary no later than 30 June 1987, and had emphasized the opportunity being provided to IOC Member States to ensure that the importance of the oceans is appropriately reflected in the Unesco programme for 1990-1995.

151 The present draft of the IOC contribution to the next Unesco Medium-term Plan takes into account the trends in international co-operative marine science and ocean services, based upon guidance received from the Chairmen of the major scientific, technical and regional subsidiary bodies. The draft proposal takes into account the need to consolidate and strengthen implementation of the IOC programme at the regional level, while reinforcing and expanding ocean-observing technology and systems. However, Member States' comments on the proposal could still be taken into consideration up till the end of January 1988.

152 The Delegate of the United States noted that a questionnaire attached to Document IOCINCWIO-II/10 had been sent to all Unesco Member States but probably not to the three IOC Member States that are not Member States of Unesco. He requested that this be done.

153 The Regional Committee welcomed the general views given in Document IOCINCWIO-II/10, but wished to know whether the Director General's questionnaire had been sent to those IOC Member States that are not Member States of Unesco.

154 The Technical Secretary pointed out that the questionnaire was attached to Document IOCINCWIO-II/10, as well as having been made available at the Fourteenth Session of the Assembly; the Member States concerned had therefore been in a position to provide the Secretary of IOC with their views in the light of the questionnaire.

155 The Regional Committee noted, however, that Member States' views on the Medium-term Plan are receivable up to January 1988 and that these views, as far as the IOC is concerned, will be taken into account by the

Secretary IOC in presenting a proposal to the IOC Executive Council at its Twenty-first Session. It therefore urged its Member States to submit their views on the IOC proposal for the Unesco Medium-term Plan to the Secretary of IOC as soon as possible.

8. NATIONAL LIAISON ARRANGEMENTS WITH IOC AND FOR IOCINCWIO

156 The Technical Secretary emphasized the view that the relationship between a Member State and the Secretariat of the Commission determines to a substantial degree the level of national participation in IOC programmes and activities. The mechanism of liaison should basically act as a conduit between interested national authorities and institutions (laboratories, government agencies, etc.), on the one hand, and the IOC, on the other; at the same time, it may promote internal co-ordination amongst those national institutions within the Member State.

157 He recalled that the IOC Assembly had urged the Member States of the Commission to establish and maintain appropriate mechanisms for the formulation of national marine science policies, and to improve or establish, as required, National Oceanographic Commissions or equivalent bodies, composed, as appropriate, of representatives of interested government departments, universities and research institutions actively involved in marine science and technology and other related aspects of ocean affairs, to maintain liaison with national users of the results of marine scientific research, to work closely with other national institutions and international organizations concerned with this multidisciplinary field, and to develop and support marine science activities,

158 The IOC Assembly, at its Thirteenth Session, decided that there was a major need for improving liaison between Member States and the Commission Secretariat, and called on Member States to consider creating, if not existing, National Oceanographic Commissions or similar national co-ordinating bodies, and nominating National Representatives to IOC.

159 The concerns expressed by the Assembly (and sometimes by subsidiary bodies) are manifested in practice by such situations as a failure of important IOC documents, Circular Letters, etc., to reach those persons and institutions in a Member State that are most directly concerned by the subject of the communication, and therefore resulting in no response or a late one, and in a loss of the opportunities offered by participation in IOC programmes, to meet national interests and needs and develop capabilities in the field of marine scientific affairs at the national and at the regional or global levels. So far, there are no National Oceanographic Commissions in the regional Member States of IOCINCWIO.

160 The Delegate of Kenya informed the Regional Committee that there does not appear to be an immediate need for the nomination of a specific individual to provide a liaison mechanism. Rather, in Kenya, this function will continue to be undertaken by the relevant operational institution (KMFRI) working through the National Commission for Unesco. In addition, because of the financial implications, it will be some time before Kenya can even consider the establishment of a National Oceanographic Commission, and

the National Commission to Unesco will continue to be responsible for all Unesco activities, including those of IOC.

161 The Delegate of Tanzania informed the Regional Committee that a National Oceanographic Committee had been recently formed.

162 The Delegate of Madagascar said that a similar body is being formed in his country and that the Centre National de Recherche Océanographique was initiating activities at an international level.

163 The Delegate of Mauritius informed the Regional Committee that the National Environment Committee had established Sub-Committees on Coastal and Marine Pollution and on Marine Sciences which would assume most of the functions required for liaison.

164 The Regional Committee briefly reviewed the situation in the region with respect to liaison with the IOC Secretariat and with other relevant organizations, as well as between the Member States of the region themselves. It welcomed the information provided by Tanzania, Madagascar and Mauritius on present national liaison arrangements. Nevertheless, it urged all its Member States to keep under continuing review national co-ordination arrangements with a view to identifying any bottlenecks in communications with the IOC Secretariat and other outside entities. The Regional Committee, having been informed of the advantages of electronic mail systems, urged its Member States, and particularly IOC Action Addresses and/or IOC Officers (whether of governing or subsidiary bodies) to consider participating in one or more appropriate networks, for purposes of external communications and, if appropriate, for internal communications as well.

165 In the context of national liaison arrangements, the Regional Committee also considered the question of defining its membership. It believed that, in accordance with existing rules, all IOC Member States of the region should be assumed to be members of the Regional Committee unless they formally advise the Secretary of IOC of their decision to cease to be a member. Regarding other Member States from outside the region but active in marine scientific research or co-operation there, the Regional Committee recognized the desirability of their notifying the Secretary of IOC formally of their decisions to be considered members of the Regional Committee so as to improve liaison and allow economies in documentation. The Regional Committee expressed its regret that neither Somalia nor the Seychelles had sent Delegations to its Second Session, especially in view of the fact that, from the oceanographic climatic standpoint, their interests could be well served by active participation in the Regional Committee and its marine scientific programmes. Nevertheless, it requested the Secretary IOC to make a particular effort to contact the appropriate authorities in Somalia with a view to assessing that Member State's interests in the field of marine science, and to study ways and means of enhancing the Seychelles' participation in IOCINCWIO. It also believed that the Comoros would be interested to participate in IOCINCWIO activities, and requested the Secretary to make appropriate enquiries in that respect.

9. CO-OPERATION WITH RELEVANT REGIONAL ORGANIZATIONS AND PROGRAMMES

166 The Technical Secretary recalled that several other international and regional organizations are active in various aspects of marine affairs. To avoid duplication of effort, it is desirable that IOC programmes and activities, particularly those under IOCINCWIO, be harmonized as far as possible with relevant activities of these other organizations. The IOC co-operates closely with the five organizations (UN, Unesco, FAO, WMO, IMO) members of the Inter-secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO), notably in: Ocean Science in Relation to Non-living Resources (OSNLR), with the UN; Ocean Science in Relation to Living Resources (OSLR), with FAO; the Integrated Global Ocean Services System (IGOSS), with WMO, as well as the oceanographic components of the ICSU-WMO World Climate Research Programme, and the WMO-IOC Drifting Buoy Co-operation Panel; in the Global Investigation of Pollution in the Marine Environment (GIPME) and the Marine Pollution Monitoring (MARPOLMON) System, with IMO (Marine Environment Division); and Training, Education and Mutual Assistance in the Marine Sciences (TEMA), with Unesco (Division of Marine Sciences)

167 Under GIPME/MARPOLMON, the IOC also collaborates closely with the UN Environment Programme (Ocean and Coastal Areas Programme Activity Centre), particularly through the various regional Action Plans, notably that for the East African region in the present context. It also collaborates with the International Atomic Energy Agency (International Laboratory for Marine Radio-activity).

168 In the IOCINCWIO region, the IOC has collaborated, whenever opportunities have arisen, with the FAO's Indian Ocean Fishery Commission, the UN's Economic Commission for Africa (ECA) and with the Organization of African Unity (OAU).

169 The Regional Committee welcomed the information on co-operation between IOC and the main UN organizations concerned with marine scientific affairs.

170 The Regional Committee stressed the importance it attaches to close co-operation between IOC and the Unesco Division of Marine Sciences. It welcomed the information that France (La Réunion), Madagascar, Mauritius, Seychelles and Comoros had formed an Association Thonière Régionale, which has a Scientific Committee charged with developing the relevant marine scientific research. It decided to co-operate with the Association as appropriate. It also decided to strengthen its co-operation, directly, on scientific or technical aspects, or through the Secretary IOC, on planning and policy aspects, with the FAO's Indian Ocean Fisheries Commission in activities of common concern.

10. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN

171 The Delegate of Madagascar reminded the Regional Committee of the slow but not negligeable progress that had been made in regional co-operation under the Regional Committee's aegis. There was now a feeling that this modest start was gathering pace, with the realization that, if the

Member States of the region were to develop adequate marine scientific capabilities, they could no longer continue to rely almost entirely on outside help, but would have to make a greater effort of self-development. This realization was, he believed, in large measure due to Prof. Msangi. He therefore proposed the incumbent Chairman, Prof. A.S. Msangi, for a second term of office. The Delegate of Mozambique seconded this proposal.

172 There being no other candidate, the Regional Committee re-elected Prof. Msangi by acclaim.

173 The Delegate of Mozambique then reminded the Regional Committee that there were two major groups of interests in marine science in the region: those of the continental countries and those of the island countries, with their proportionally much larger Exclusive Economic Zones and the possibilities and responsibilities attached to them. He therefore felt it apt that, with a Chairman from a continental country, the Regional Committee would benefit from having a Vice-Chairman from an island country. He had seen the active role being played by Mr. Ragoonaden, of Mauritius, in various spheres of IOC activity and therefore proposed Dr. S. Ragoonaden of Mauritius as Vice-Chairman. The Delegate of Tanzania seconded the proposal.

174 There being no other candidate, the Regional Committee elected Dr. Ragoonaden by acclaim.

175 The Chairman thanked the former Vice-Chairman, Dr. A. Ralison of Madagascar for his support and, on behalf of the Regional Committee, wished him success in his new undertakings.

11. DATES AND PLACE OF THE NEXT SESSION

176 The Delegate of Mauritius informed the Regional Committee that he would study with the relevant national authorities the possibility of holding the Third Session in Mauritius.

177 The Regional Committee welcomed this suggestion and invited the Delegate of Mauritius to inform the Secretary of developments. It recalled that, in considering its Programme of Work and Budget, it had preferred its Third Session to be as early as possible in 1990.

12. ADOPTION OF THE SUMMARY REPORT

178 The Regional Committee adopted the Draft Summary Report of the Session on the understanding that the information sections of each Agenda Item would be added by the Secretariat, and the Chairman given an opportunity to clear the final text.

13. CLOSURE

179 The Chairman, having been forced to absent himself because of a personal bereavement, the Vice-Chairman closed the Session at 14.00 hr on 11 December 1987.

ANNEX I

AGENDA

1. OPENING

2. ADMINISTRATIVE ARRANGEMENTS

   2.1 ADOPTION OF THE AGENDA

   2.2 DESIGNATION OF THE RAPPORTEUR

   2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

3. REPORT OF THE SECRETARY ON INTERSESSIONAL ACTIVITIES

4. OCEAN SCIENCES IN THE WESTERN INDIAN OCEAN

   4.1 DEVELOPMENT OF A REGIONAL COMPONENT OF OCEAN SCIENCE IN RELATION TO LIVING RESOURCES (OSLR)

   4.2 DEVELOPMENT OF A REGIONAL COMPONENT OF OCEAN SCIENCE IN RELATION TO NON-LIVING RESOURCES (OSNLR)

   4.3 DEVELOPMENT OF A REGIONAL COMPONENT OF OCEAN DYNAMICS AND CLIMATE (ODC) AND PARTICIPATION IN RELEVANT ASPECTS OF WCRP/TOGA

   4.4 DEVELOPMENT OF A REGIONAL COMPONENT OF MARINE POLLUTION RESEARCH AND MONITORING (GIPME/MARPOLMON)

5. OCEAN SERVICES IN THE WESTERN INDIAN OCEAN

   5.1 OCEAN OBSERVING SYSTEMS

      5.1.1 Regional Component of the IOC Global Sea-level Observing System (GLOSS)

      5.1.2 Development of Future Ocean-Observing Systems in the Region

   5.2 DEVELOPMENT OF OCEANOGRAPHIC DATA AND INFORMATION MANAGEMENT SYSTEMS IN THE REGION

6. ENHANCING THE MARINE SCIENCE CAPABILITIES OF DEVELOPING COUNTRIES

   6.1 TEMA REQUIREMENTS IN SUPPORT OF THE APPROVED PROGRAMMES AND ACTIVITIES

      6.1.1 Requirements for, and Improved Uses of, Research Vessels.

   6.2 IMPLEMENTATION OF THE UNESCO-IOC COMPREHENSIVE PLAN FOR A MAJOR ASSISTANCE PROGRAMME TO ENHANCE THE MARINE SCIENCE CAPABILITIES OF DEVELOPING COUNTRIES

7. FUTURE PROGRAMME OF WORK

7.1 PROGRAMME OF WORK 1988/89

7.2 EXPECTED TRENDS DURING THE MEDIUM-TERM PLAN 1990-1995

8. NATIONAL LIAISON ARRANGEMENTS WITH IOC AND FOR IOCINCWIO

9. CO-OPERATION WITH RELEVANT REGIONAL ORGANIZATIONS AND PROGRAMMES

10. ELECTION OF OFFICERS

11. DATES AND PLACE OF THIRD SESSION

12. ADOPTION OF SUMMARY REPORT

13. CLOSURE

ANNEX II

RECOMMENDATION IOCINCWIO-II.1

OCEAN DYNAMICS AND CLIMATE (ODC)
ESPECIALLY TOGA AND WOCE AND RELATED TEMA REQUIREMENTS

The Regional Committee,

Recalling that, at its First Session, it had stressed the need to study ocean dynamics in the IOCINCWIO region,

Having received reports on recent progress and plans being developed for TOGA and WOCE, especially those aspects of these programmes that are relevant to the IOCINCWIO region,

Recognizing the social, economic and scientific importance of these programmes globally and to the region,

Emphasizing the need to ensure that scientists in the region are fully informed about WOCE, especially as it relates to the IOCINCWIO region,

Noting that WMO is considering the organization of Training Courses in Marine Meteorology and Physical Oceanography, at the Regional Meteorological Training Centre in Nairobi,

Urges Member States of the region to participate more fully in TOGA, particularly in the observational component of the programme;

Requests the IOC to provide funding for scientists from the region to participate in the International WOCE Scientific Conference in October 1988;

Accepts the offer of the JSC-CCCO Scientific Steering Group for WOCE to convene a WOCE Regional Workshop for the Western Indian Ocean in 1989;

Decides to support this Workshop;

Requests the IOC and IOC Member States involved in WOCE planning to provide funding for scientists from the region to participate in this Workshop;

Urges IOC Member States with major TOGA and WOCE interests to provide fellowships, post-doctoral programmes, and other education and training, technical assistance, equipment and other support, directed at enabling the countries of the region to participate more fully in TOGA and WOCE, especially with respect to development of modelling capabilities in the region;

Encourages the WMO to proceed with the organization of the above-mentioned Training Courses in Nairobi;

Requests the IOC to arrange for marine scientists from the region to participate in these Courses.

ANNEX III

TERMS OF REFERENCE OF THE EXPERT STEERING GROUP
FOR A REGIONAL PROJECT ON OCEANOGRAPHIC CONDITIONS
IN RELATION TO LIVING RESOURCES IN WESTERN INDIAN OCEAN COASTAL WATERS

The Expert Steering Group shall:

1. BASIC FUNCTIONS

Operating under the current IOC Guidelines for the structure and functioning of Groups of Experts, generally oversee the implementation of the Project, with a view to developing a regional component of OSLR, and assist institutions and scientists participating in the implementing network to co-ordinate their activities under the Project; in doing so, work out the requirements for research vessels suited to undertaking the relevant regional studies, the modalities by which such research vessels could be acquired, run and maintained, and explore the possibilities of acquiring or retaining a research vessel or vessels on a permanent basis for this and other future regional studies.

2. PROGRAMME DEVELOPMENT

2.1 PLANNING

Based on Document IOCINCWIO-II/8 Annex 1 (Project on Oceanographic Conditions in Relation to Living Resources in Western Indian Ocean Coastal Waters), and in consultation with the participating institutions/scientists, prepare a detailed plan of action for carrying out the Project through the network of participating institutions/scientists.

2.2 PROMOTION

Assist in the promotion of the Project in the Member States of the Regional Committee for IOCINCWIO and in their marine scientific communities.

2.3 CO-ORDINATION

Identify the institutions/scientists interested in participating in the network to be established to implement the Project, determine the actions each could undertake, and generally inform each participating institution/scientist of the actions being taken by the others, so as to avoid unnecessary duplication of effort.

2.4 SCIENTIFIC AND TECHNICAL ADVICE

Advise institutions/scientists participating in the implementing network on the methods, procedures and operations to be preferred in carrying out the Project.

Advise the Regional Committee for IOCINCWIO on: the requirements for research vessels to be used on a regional basis to implement offshore components of the Project; the availability of suitable vessels in the region; the possibilities of acquiring or retaining a research vessel or vessels for the region on a permanent basis; the work and resources that are required to make this (or these) vessel(s) operational for the purposes of the Project, bearing in mind that the specialized advice of a naval engineer and/or naval architect may be needed on this matter, and to maintain such a vessel or vessels.

2.5 COLLABORATION

Collaborate closely with the IOC-FAO Guiding Group of Experts on OSLR, with a view to taking advantage of experience gained elsewhere in similar types of study, and to developing the basis for an IOCINCWIO regional component of OSLR.

3. OTHER FUNCTIONS

3.1 REPORTING

Report to the Regional Committee for IOCINCWIO at each of the Committee's Sessions or, if developments so justify, to the Chairman of the Committee and the Secretary of IOC in the intersessional period.

ANNEX IV

IMMEDIATE TEMA NEEDS AS IDENTIFIED IN FOUR CO-OPERATIVE PROJECTS ADOPTED BY THE REGIONAL COMMITTEE FOR IOCINCWIO AT ITS SECOND SESSION

TITLE OF PROJECT	TRAINING			EQUIPMENT AND MATERIAL	EXPERT SERVICES
	Group	Short-term	Long-term		
1. OCEANOGRAPHIC CONDITIONS IN RELATION TO LIVING RESOURCES IN WESTERN INDIAN OCEAN COASTAL WATERS	1. Training Course on Collection, Processing and Analysis of Oceanographic Data and Phytoplankton Samples (1 month) 2. Training course on Collection, Processing and Analysis of Zooplankton/Ichthyoplankton Samples (1 month)	No.: 4 Duration: 3 months	To be decided	Equipment and material and expert services required for effective implementation of the Project to be determined by the Expert Steering Group	
2. MONITORING MARINE PETROLEUM POLLUTION IN THE WESTERN INDIAN OCEAN	3. Training Course on Methods of Monitoring, Processing and Interpretation of Petroleum Pollution	Fellowships No.: 7 Duration: 3 months	-	To be determined by correspondence or other means between IOC Secretariat (IOC/MPU), GEMSI, GEEP, GESREM and interested institutions in the region	
3. IOCINCWIO REGIONAL COMPONENT OF THE GLOBAL SEA-LEVEL OBSERVING SYSTEM (GLOSS) SYSTEM (GLOSS)	4. Training Course on Sea-Level Observations (Bidston, UK)	No.: 5 Duration: 2 weeks	-	- Sea-Level gauges (2) - Spare parts (7 countries) - Improved levelling (6 countries) - Documentation (7 countries)	- Assistance for installation of gauges (5 countries) - Mission(s) to 6 countries
4. PROVISION OF MARINE SCIENTIFIC INFORMATION IN THE REGION (Pilot Phase)	5. Training Course for Marine Science Librarians Duration: 2-3 weeks	-	-	- 1 computer system and related hardware and software	- Expert (3 years) - Aid in installation of computer equipment - Advice on communications and document retrieval

ANNEX V

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ANNEX VI

LIST OF WORKING DOCUMENTS

IOCINCWIO-II/1 prov.	Provisional Agenda
IOCINCWIO-II/2	Annotated Provisional Agenda
IOCINCWIO-II/3 prov.	Draft Summary Report of the Second Session of the Regional Committee for the Co-operative Investigations in the North and Central Western Indian Ocean
IOCINCWIO-II/4	List of Documents
IOCINCWIO-II/5	Provisional List of Participants
IOCINCWIO-II/6 rev.	Report of the Secretary on Intersessional Activities
IOCINCWIO-II/7	IOCINCWIO Component of Draft IOC Programme of Work and Budget for 1988-89
IOCINCWIO-II/8	Action Paper
IOCINCWIO-II/8 Annex 1	Proposal for a Project on Co-operative Investigations of the Oceanography and Pelagic Living Resources of the Western Indian Ocean
IOCINCWIO-II/8 Annex 2 rev.	Proposal on the Establishment of a Regional Component of the IOC Global Sea-level Observing System in the Western Indian Ocean
IOCINCWIO-II/9 rev.	A Proposed Project for Regional Co-operation in Scientific Information Exchange - Western Indian Ocean
IOCINCWIO-II/10	Summary of the IOC Contribution to the Unesco Draft Medium-term Plan 1990-1995 with Particular Reference to the Western Indian Ocean
IOCINCWIO-II/Inf.1	Information for Participants
IOCINCWIO-II/Inf.2	Proposal for a Regional Pilot Project on Monitoring Marine Petroleum Pollutionin the Western Indian Ocean

N.B. THIS LIST IS FOR REFERENCE ONLY. NO STOCKS OF THESE DOCUMENTS ARE MAINTAINED.

IOCINCWIO-II/Inf.2 Add.	Main comments on the Proposal during the ad hoc Preparatory Expert Consultation
IOCINCWIO-II/Inf.3	Marine Sciences Activities and Perspectives in Mozambique
IOCINCWIO-II/Inf.4	Résumé des activités du département d'océanographie physique et chimique (DOPC) sur la pollution marine et marégraphes
IOCINCWIO-II/Inf.5	Report of the Working Group on Oceanographic Conditions in Relation to Living Resources
IOCINCWIO-II/Inf.6	Marine Fisheries Resources of Tanzania
IOCINCWIO-II/Inf.7	Studies in Physical Oceanography in the Western Indian Ocean
IOCINCWIO-II/Inf.8	Studies on Marine Chemistry Done in the Indian Ocean, and Future Prospects
IOCINCWIO-II/Inf.9	Beach Mineral Deposits Potentialities in Tanzania - OSNLR
IOCINCWIO-II/Inf.10	Project on Oceanographic Conditions in Relation to Living Resources in Western Indian Ocean Coastal Waters

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ANNEX VII

LIST OF ACRONYMS AND ABBREVIATIONS

ASFA	Aquatic Sciences and Fisheries Abstracts
ASFIS	Aquatic Sciences and Fisheries Information System
CASTAFRICA	Conference of Ministers Responsible for the Application of Science and Technology to Development in Africa
CCCO	Joint SCOR-IOC Committee on Climatic Changes and the Ocean
CNRO	Centre National de Recherche Océanographique (Nosy-Bé, Madagascar)
CTD	Chlorinity, Temperature, Depth
ECA	Economic Commission for Africa
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization of the United Nations
GEEP	Group of Experts on Effects of Pollutants
GESREM	Group of Experts on Standard and Reference Materials
GGE	Guiding Group of Experts
GIPME	Global Investigation of Pollution in the Marine Environment
GLOSS	Global Sea-Level Observing System
IBCWIO	International Bathymetric Chart of the Western Indian Ocean
ICOD	International Centre for Ocean Development
ICSPRO	Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography
ICSU	International Council of Scientific Unions
IGOSS	Integrated Global Ocean Services System
IOC	Intergovernmental Oceanographic Commission
IOCINCWIO	IOC Regional Committee for the Co-operative Investigations in the North and Central Western Indian Ocean
IODE	International Oceanographic Data Exchange

IREP	International Recruitment Programme
JSC	ICSU-WMO Joint Scientific Committee
KMFRI	Kenya Marine and Fisheries Research Institute
MARPOLMON	Marine Pollution Monitoring System
NODC	National Oceanographic Data Centre
NORAD	Norwegian Agency for International Development
OAU	Organization of African Unity
OCE (Unesco)	Division of Marine Sciences
ODC	Ocean Dynamics and Climate
OSLR	Ocean Science in Relation to Living Resources
OSNLR	Ocean Science in Relation to Non-living Resources
PC	Personal Computer
RECOSCIX-WIO	Regional Co-operation in Scientific Information Exchange for the Western Indian Ocean
RNODC	Responsible National Oceanographic Data Centre
ROSTA	Regional Office of Science and Technology for Africa
RV	Research Vessel
SCOR	Scientific Committee on Oceanic Research
SETMY	Sea Level, Environments and Tectonics in the Past Million Years
SETR	Sediments, Eustatic sea-level changes, Tectonics and Resources
TEMA	Training, Education and Mutual Assistance in the Marine Sciences
TOGA	Tropical Oceans and Global Atmosphere
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VCP	Voluntary Co-operation Programme

WCRP	World Climate Research Programme
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
XBT	Expendable bathythermograph