Intergovernmental Oceanographic Commission

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3

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TABLE OF CONTENTS

A. IMPLEMENTATION OF IOC GOVERNING BODY RESOLUTION

1. RESOLUTIONS ADOPTED BY THE TWENTY-NINTH SESSION OF THE EXECUTIVE COUNCIL

Resolution EC-XXIX.1: International Oceanographic Data and Information Exchange (IODE).

Activities have been implemented as planned. IODE programme development and implementation are proceeding satisfactorily. Cooperation is extensive and extrabudgetary support is being obtained from Member States and Organizations, including the European Union. However, additional personnel would accelerate programme development, especially in regard to the interface between data and information with other IOC activities, especially those related to coastal area management.

Resolution EC-XXIX.2: International Tsunami Warning System in the Pacific (ITSU) and IDNDR-related matters.

The programme is being implemented as planned. Extrabudgetary support has been received from Member States, but more is required for a fully satisfactory implementation rate. Attempts are regularly made to obtain increased support from Member States.

Resolution EC-XXIX.3: Seventh Session of the Joint IOC-WMO Committee for Integrated Global Ocean Services System (IGOSS).

Programme activities have been implemented as planned. However, the programme will be facing serious problems when the IGOSS Co-ordinator post is no longer filled (mid-1997). It appears very untimely that this support is being withdrawn at a time when the IOC and its partners are trying to establish GOOS as a matter of priority. As a very important programme in support of global ocean observations, IGOSS should be fully utilized for the development of GOOS, and the IGOSS co-ordinator post plays a key role in this regard.

The IOC resource situation will not permit funding the IGOSS co-ordinator position. A secondment, possibly shared by several Member States, is at present the only alternative, and should be viewed, together with extrabudgetary support for programme implementation, as a contribution to GOOS development.

Resolution EC-XXIX.4: IOC Sub-Commission for the Caribbean and Adjacent Regions.

The IOCARIBE Programme is being implemented in accordance with available resources. IOC resources are not sufficient and extrabudgetary funds need to be obtained. The Secretariat has been able to raise some donor funds, but these are not sufficient. The IOC resources are fully used for maintaining the IOCARIBE Secretariat with one professional consultant hired at 75% time, one full-time secretary, and operational costs. IOC funds cannot cover more. The existing extrabudgetary funding level can only cover about 50% of what is required for a reasonably satisfactory programme implementation. The idea of using seconded experts based at their home

institutions is being explored. Preparations are underway for the IOCARIBE Symposium in 1998 and for other 1998 International Year of the Ocean activities. There has been no further progress in obtaining a UNESCO post for the IOCARIBE Secretariat. The only alternative is an extrabudgetary post the creation of which is dependent upon contributions from Member States to the IOC Trust Fund which to date have neither been received nor announced.

Resolution EC-XXIX.5: Third Session of the IOC Sub-Commission for the Western Pacific (WESTPAC)

The WESTPAC programme is being gradually implemented in accordance with availability of funds. The organization of the WESTPAC Symposium in early 1998 is proceeding. Through the IOC-WESTPAC Secretariat efforts are going on so as to achieve participation in, cooperation and coordination with, other regional programmes, including monsoon oceanography, UNEP-NOWPAP, GCRMN and GOOS modules. The NEAR-GOOS establishment is proceeding satisfactorily.

The resource situation for WESTPAC Sub-Commission is not yet satisfactory. The P-4 post at the Secretariat is being filled, but there is no other post except an extrabudgetary staff position which depends upon provisions from Member States. Associate experts are expected, but have not yet been provided. The cash-flow does not match the requirements for satisfactory programme implementation. Some Member States are providing resources, but these only cover a small part of what it is really needed.

Resolution EC-XXIX.6: Southern Ocean Forum and Regional Committee for the Southern Ocean

The activity level is very low, but an adequate interaction or dialogue is maintained with other organizations active in the region. An information network on activities in the Southern Ocean is being gradually established with emphasis on the ocean observations which are of great importance. The IOC-SOC programme is being formulated in greater detail through correspondence between the Chair of the Committee and the Secretariat.

Resolution EC-XXIX.7: Black Sea Regional Committee (IOC-BSRC)

The programme is being implemented as planned. Cooperation is being established with other organizations active in the Black Sea, and a Memorandum of Understanding has been agreed with the Black Sea Environmental Programme. Financial support for the work of the Committee is, however, not satisfactory despite efforts being made by the Secretary to raise extrabudgetary funds. Member States are urged to provide additional dedicated support to this region through the IOC Trust Fund.

2. RESOLUTIONS ADOPTED BY THE EIGHTEENTH SESSION OF THE ASSEMBLY

Implementation of these Resolutions as of the first part of 1996 is summarized in the Annual Report 1995. Further implementation is reported herein.

Resolution XVIII-1: Ad hoc Study Group on IOC Development, Operations, Structure and Statutes (DOSS-II)

The Executive Council at its Twenty-ninth Session provided advice and instructions in response to the progress report presented by the Chairman of DOSS-II. In endorsing the general thrust of the work undertaken, the Executive Council provided several specific comments which have been transmitted to the Members of the *ad hoc* Study Group.

The Second Session of the *ad hoc* Study Group is being held at the Southampton Oceanography Centre, 13-17 January 1997. In accordance with the Assembly Resolution an interim report will be presented to the Nineteenth Session of the Assembly.

The Executive Council made several recommendations with respect to the contributions to IOC activities from non-Member States of UNESCO. These views were transmitted to the Director-General prior to the 150th Session of the Executive Board of UNESCO. The Executive Board did not consider as satisfactory the suggestions made in response to its demand for a mechanism to be established to facilitate a regular contribution to the IOC Trust Fund from Member States of IOC non-Members of UNESCO. It is expected that this matter will be further analysed by the *ad hoc* Study Group.

Resolution XVIII-2: Financial Regulations applicable to the Special Account of the IOC

In accordance with the Resolution, draft financial rules were presented to the Twenty-ninth Session of the Executive Council which, after review, instructed the Executive Secretary to undertake necessary consultations with UNESCO authorities and prepare a revision for consideration by the Assembly. Consultations with UNESCO authorities have been held. According to the UNESCO Comptroller, there is no need for special financial rules for the Special Account, and that the UNESCO financial rules are to be applied. In view of this, no revised rules have been prepared, and the UNESCO financial rules are applied.

Resolution XVIII-3: UN Year of the Ocean 1998

A progress report with draft proposals for IOC activities dedicated to 1998 International Year of the Ocean was presented to the Twenty-ninth Session of the Executive Council. Most Member States of the Executive Council reiterated their commitment to this endeavour, provided information on national plans, and some indicated willingness to provide support to the IOC programme planning and management. The Executive Council instructed the Executive Secretary to solicit reports from national contacts, to be included in the report to the Nineteenth Session of the Assembly. The Executive Secretary furthermore presented a draft programme to the ACC Sub-Committee on Oceans and Coastal Areas at its meeting on 7-10 January 1997 as a basis for an inter-agency cooperative programme. Formulation of an inter-sectoral programme of UNESCO has also proceeded. A report with a specified programme proposal will be presented to the Nineteenth Session of the IOC Assembly.

Resolution XVIII-4: IOC and UNCLOS

As forecast in the Resolution, the report of the open-ended Intersessional Working Group on the IOC Role in Relation of UNCLOS (IOC-LOS) was circulated to Member States three months prior to the Twenty-ninth Session of the Executive Council. The Executive Council endorsed the progress report of the Working Group together with its tabular specification of the IOC role in relation to UNCLOS and the recommendations for submission to the Nineteenth Session of the Assembly for approval. The Executive Council recognized the IOC role within the framework of part XIV of the Convention on Development and Transfer of Technology, and considered it useful that guidelines be drafted within the IOC fields of competence. The Executive Council also considered it useful to analyse procedures mentioned in Article 247; and an updating of present ODAS draft proposals in cooperation with IMO. A progress report on these matters as well as the report of the open-ended Working Group will be presented to the Nineteenth Session of the Assembly.

Resolution XVIII-5: Intergovernmental WOCE Panel

This Resolution is being fully implemented.

Resolution XVIII-6: Climate Related Issues

This Resolution is fully implemented. The Chairman of IPCC will be invited to present one Bruun Memorial Lecture at the Nineteenth Session of the Assembly.

Resolution XVIII-7: Coastal Regions and Small Islands

This Resolution is being fully implemented. A progress report on the IOC coastal zone activities, and the contributions to coastal zone development and management with emphasis on an appropriate scientifically based approach to the overall problem of ICAM will be presented to the Nineteenth Session of the Assembly.

Resolution XVIII-8: Third Session of the Joint IOC-FAO Intergovernmental Panel on Harmful Algal Blooms

The activities of the HAB Programme are being implemented. However, the staffing situation in the IOC Secretariat is not satisfactory.

Two IOC Member States, non-Members of UNESCO have offered a senior professional to be in charge of OSLR and associated GOOS matters. A new Danish associate expert has also been identified. It is expected that these professionals will joint the Secretariat in spring of 1997.

The Fourth Session of the IP-HAB will be held in Vigo, Spain, spring 1997.

Resolution XVIII-9: Marine Biodiversity

This Resolution is gradually being implemented. A Memorandum of Understanding on cooperation between the IOC Secretariat and the Secretariat of the Convention on Biological Diversity is under preparation. The IOC has been represented at all the relevant meetings of the Convention.

Efforts are being made to establish specific joint activities with MAB.

The Executive Secretary is endeavouring to ensure that the IOC is represented at relevant meetings of the International Sea-Bed Authority.

Resolution XVIII-10: Support to the Joint IOC-IHO Ocean Mapping Programme

Discussions have been initiated on the establishment of scientific priorities for bathymetric surveys. It is noted that a SCOR Working Group on Ocean Bathymetry has been established and that scientific priorities will probably emerge from that body. Coordination with these efforts are ensured through GEBCO participation.

Meetings at a regional level for IOCEA and WESTPAC have been convened in 1996, and CGOM is expected to meet in 1997.

It is for the time being not possible to establish a UNESCO post dedicated to the Ocean Mapping programme. An extrabudgetary post or a secondment, as maintained by the Russian Federation, are the only alternatives.

Resolution XVIII-11: Second Session of the IOC-WMO-UNEP Committee for the Global ocean Observing System (I-GOOS)

Taking into account available resources, this Resolution is implemented, although it has not been possible to organize a technical workshop in cooperation with OECD. Regional workshops have been organized in 1996, and others are planned for 1997. The IOC supported participation of developing countries in the EURO-GOOS Symposium, October 1996, which included socio-economic considerations of GOOS development. A permanent UNESCO position has been provided for the Director of the GOOS Support Office. The Third Session of I-GOOS is planned for June 1997, to be preceded by a high-level consultation on GOOS development and establishment. Regular inter-secretariat consultations of the co-sponsors of GOOS have been initiated in 1996. A UN system-wide inter-agency coordinating committee involving all co-sponsors of GOOS, GCOS and GTOS was established in 1996.

Resolution XVIII-12: International Coral Reef Initiative

The Co-ordinator, financing for which has been provided through Member State contributions to the IOC Trust Fund, has established close contact with the GOOS Support Office identifying how the GCRMN effort can gradually contribute to the relevant GOOS modules. However, as yet no operational GCRMN activities have been implemented. The Co-

ordinator and GCRMN-related experts are participating in relevant meetings. A special effort was made by IOC in support of the 8th International Coral Reef Symposium, June 1996. Regional and sub-regional networks have been established which are ready to start obtaining monitoring data. Extrabudgetary funds are being sought. Support has been received from UK-ODA and from Swedish SIDA-SAREC for specific sub-areas. However, this is not sufficient, and a special appeal was made in December 1996 to the United States in view of their previous funding support. The management mechanism for GCRMN has been established, with a Scientific Advisory Committee and a "management" Committee involving the co-sponsors and host institutions of the Co-ordinator (AIMS and ICLARM).

Resolution XVIII-13: Global Sea-Level Observing System (GLOSS) Activities 1996-97

This Resolution is being fully implemented, except that a UNESCO post dedicated to deal exclusively with GLOSS cannot be obtained. However, a dedicated UNESCO staff member in the GOOS Support Office is responsible for GLOSS implementation.

Resolution XVIII-14: The Floating University

This Resolution is fully implemented. It should be noted, however, that support for this activity is now been provided solely by IOC as part of TEMA.

Resolution XVIII-15: Capacity Building in Marine Sciences, Services and Observations - TEMA

The First Meeting of the TEMA Group of Experts for Capacity Building was held in July 1996 in Paris, and the report was presented to the Twenty-ninth Session of the Executive Council. The Executive Council reviewed and endorsed the report, while providing several comments for the further work of the Group of Experts. A Second Meeting is planned for May 1997, the report of which will be presented to the Assembly, at which time an extended period for debate of the TEMA strategy is planned.

Co-ordination and co-operation is sought with other bodies in relation to capacity building efforts, through the ACC Sub-Committee on Oceans and Coastal Areas and through ICSPRO.

The IOC regional subsidiary bodies are major factors in the TEMA strategy. However, extrabudgetary funding obtained through the efforts of the Secretariat is insufficient for a satisfactory implementation, except in a few regions.

Resolution XVIII-16: IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE)

This Resolution is partially implemented, and otherwise superseded by Resolution EC-XXIX.4 (see above).

Resolution XVIII-17: IOC Black Sea Regional Programme in Marine Sciences and Services

This Resolution is fully implemented, and is also superseded by Resolution EC-XXIX.6 (see above).

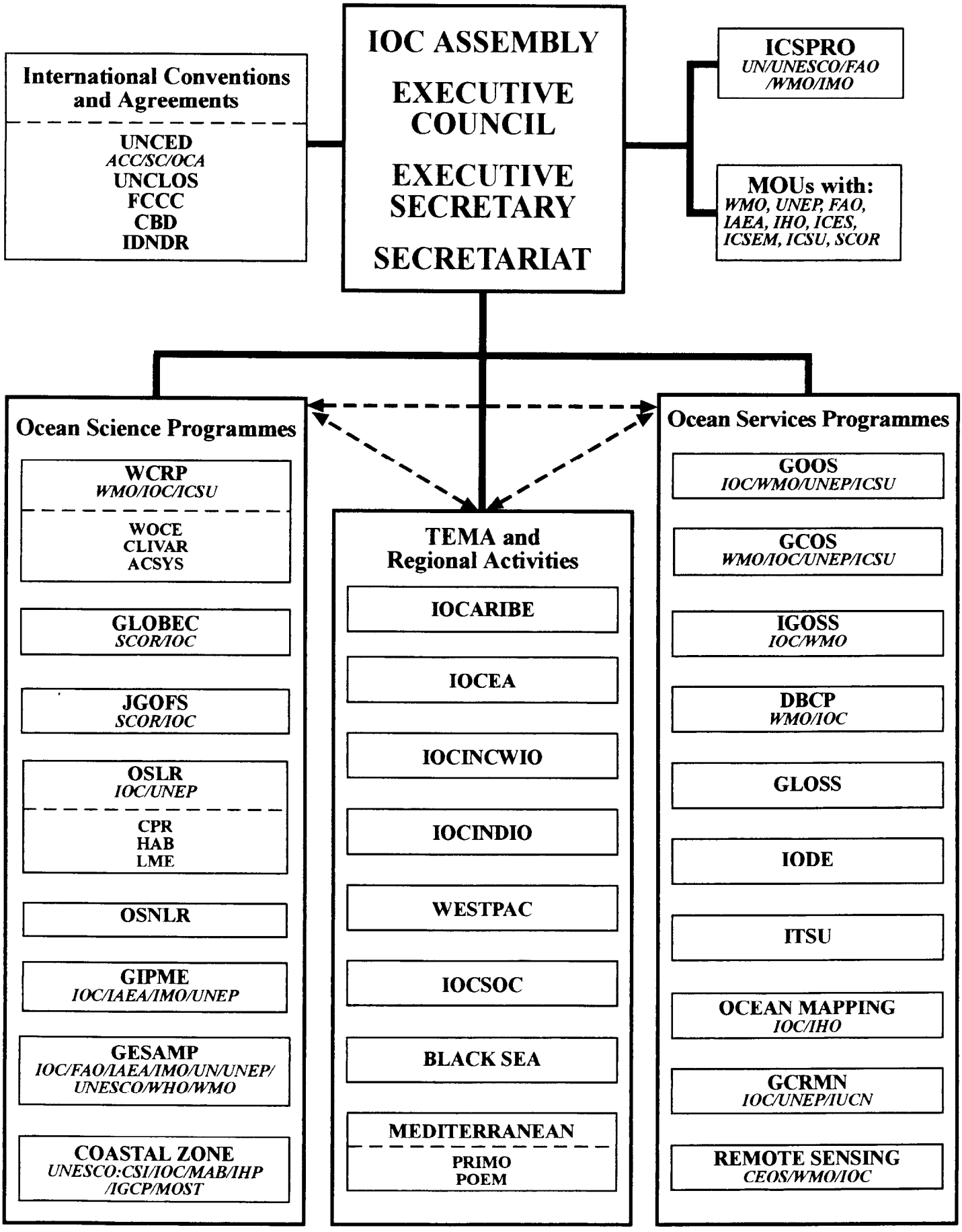
Resolution XVIII-18: Programme and Budget 1996-97

This Resolution is being gradually implemented within the limits of available resources.

The Twenty-ninth Session of the IOC Executive Council reviewed the situation in the fall of 1996 and instructed the Executive Secretary to ensure that the programme, as approved by the Assembly, is respected, as well as the forecast distribution of funds between the four objectives. This is being done to the extent possible in view of the actual resource situation.

Resolutions adopted by the Twenty-seventh Session of the Executive Council (July 1994) and the Seventeenth Session of the Assembly (March 1993) have been either fully implemented or are superseded by Resolutions the implementation of which is presented above.

1996 IOC PROGRAMMES AND ACTIVITIES



3. GENERAL OVERVIEW OF PROGRAMME STRUCTURE

The IOC programme implementation continues on the basis of the decisions of the Governing bodies, and following the programmatic structure developed over the last decade. However, considerable adjustments are taking place so as to respond to UNCED and UNCLOS. Emphasis is also given to the regional subsidiary bodies. The capacity building efforts are part of all IOC actions, but in particular, the regional programmes. An overview of the structure and activities is presented on the facing page .

B. PROGRAMME ACTIVITIES

1. OCEAN SCIENCES

1.1 OCEANS AND CLIMATE

World Climate Research Programme (WCRP): General

The Joint Scientific Committee (JSC) for the WCRP met in March 1996 in Toulouse. The IOC, WMO and ICSU are joint sponsors of the WCRP. Of particular interest to the IOC was the JSC decision to include "climate monitoring" as a specific agenda item in future JSC sessions in order to review, in conjunction with GCOS and GOOS, progress in developing operational monitoring and climate data products. It was believed this would assure a reinforcement of coordination with and development of WCRP contributions to GOOS and GCOS. This item will include reports on GOOS, GCOS, GEOS, activities of the OOPC, etc. The JSC also intends to assist with the evolution of WCRP research data projects and observing systems to operational status under GOOS and GCOS. The Committee recognized the need for more involvement of developing countries through capacity building and reaffirmed its intention to reinforce liaison between the WCRP, IGBP, and IHDP in guiding the development of appropriate START activities.

A WCRP "mid-term" scientific conference to be held in Geneva in August 1997 is being prepared by the JSC. Conference participation will be aimed at senior scientists, policy makers, senior government administrators, etc. This will be done via special invitations to selected individuals at this level. Finally, the global climate research community can look forward to the inauguration of a new bi-annual newsletter to be produced for the WCRP beginning in 1997.

The next large-scale WCRP research initiative with a major ocean observation component is CLIVAR, a research programme focused on climate variability and predictability. The CLIVAR Scientific Plan has already been completed and widely distributed. The Implementation Plan was scheduled for completion by the Scientific Steering Group by the end of 1996, to be made available to Member States early in 1997. CLIVAR's observational strategy will build on the foundation established by TOGA and WOCE. WOCE and CLIVAR planners have already begun to address the transfer of the valuable WOCE data management systems that will be subsumed under CLIVAR. WOCE and CLIVAR will continue to work together in other areas of transition as WOCE winds down and the CLIVAR observation phase commences.

World Ocean Circulation Experiment (WOCE)

The WOCE field programme that began in 1990 has been running successfully for six years and researchers are now producing a steady stream of results. Some early analyses of the interhemispheric ocean fluxes of heat and freshwater reveal large discrepancies between the WOCE measurements and previous climatological estimates. Moreover, the new *in situ* measurement technologies introduced during WOCE have dramatically improved the level of accuracy. For the first time, the major ocean basins are now populated with neutrally buoyant

ALACE subsurface floats which provide flow fields to complement the hydrographic data sets. Some of these floats are collecting temperature and salinity profiles each time they surface and efforts are being made to insert these profiles onto the GTS for real-time dissemination. The French-American TOPEX-POSEIDON altimeter satellite has provided previously unthinkable detail on surface properties of the ocean. The satellite's ability to measure surface height with a resolution of a few centimetres allows measurement of changes in surface slope (and hence currents), wave height and even the expansion of the ocean caused by internal warming. The combination of the vastly improved *in-situ* measurement capability and the repeated global altimeter coverage has proved to be a powerful tool for understanding ocean circulation and its variability.

The final phase of the observation program will culminate at the end of 1997 with the completion of a resurvey of the North Atlantic Ocean. It is estimated that approximately 85% of the planned global one-time survey will have been accomplished by that time.

With the nearing completion of the intensive observational phase, WOCE planners are finalising a strategy and implementation plan for AIMS, (analysis, interpretation, modelling and synthesis), which is the next phase of WOCE scheduled to continue through 2002. This will act as a blueprint for the integration of the modelling and observational efforts in WOCE. Some important early effort is already underway to compare WOCE results with model output and to identify model deficiencies and address them. This will be a major activity of the AIMS phase as will be the assimilation of WOCE data sets into models. Part of the preparation for AIMS includes three regional workshops whose purpose is to facilitate progress towards the AIMS phase objectives and to stimulate interaction between the groups carrying out modelling and observational programmes. The first workshop for the Pacific Ocean region was held in August 1996. Two further workshops are scheduled in 1997 for the South Atlantic and Southern Ocean. Member States can expect to be contacted directly by the JSC regarding AIMS to underscore the critical need for resources for developing and using global ocean models for both prognostic studies and assimilation, in particular for analysis of the WOCE global data sets.

Much progress is being made towards reaching the goals of WOCE, particularly in regard to estimating oceanic fluxes of heat and fresh water, documenting changes in watermass properties over several decades and understanding key processes such as mixing and subduction in the open ocean that need to be better represented in models to simulate long-term climate variability. Planning for an International WOCE Conference is underway to present this rapidly accumulating new knowledge. The Conference is scheduled for 24-29 May 1998 in Halifax, Canada and will be part of a dedicated 1998 International Year of the Ocean programme.

Ocean CO_2 and Climate

The long IOC partnership with SCOR/JGOFS in cooperation with WOCE continued to make steady progress toward quantifying the role of the ocean in mitigating increases in atmospheric CO_2 concentrations. In addition to research aimed at narrowing the uncertainties in the ocean carbon cycle, critical to the work of the IPCC, the IOC-JGOFS Ocean CO_2 Panel organized the first International Symposium on Ocean CO_2. Hosted in Puerto Rico in January

1996 by the University in Mayaguez, the abstracts of papers presented were published in a special issue of the Caribbean Journal of Science.

With the completion of the global CO_2 survey near at hand, the CO_2 Panel reflected on its future role, particularly on whether its scope should be broadened to also consider other trace greenhouse gases which are influenced by ocean processes such as methane and nitrous oxide. There is growing acknowledgement that a natural next step would be to address the ocean processes, sources and sinks of these gases as well, and that this would require expanding the Panel's terms of reference as well as modification of the membership. The IPCC is giving increasing emphasis to non-CO_2 greenhouse gases in its work plan for 1997-1999 and an ocean component would be an important contribution.

OOPC

The J-GOOS Ocean Observations Panel for Climate (OOPC), jointly sponsored by the WCRP and GCOS, held its first meeting in March 1996 at the Rosenstiel School of Marine and Atmospheric Sciences (Miami, Florida, USA). The OOPC members recognized a need to bring the scientific plan developed by the OOSDP to users and implementors via a more user-friendly approach. The favoured strategy was to select key observation-to-product lines and produce illustrative documents demonstrating their value. These end-to-end demonstrations would be faithful to the OOSDP design, but would be in a form that would enable "selling" the design by explaining to the agencies being asked to make observations exactly what they can expect to gain. The aim is to encourage participation and to provide agencies with easy-to-understand descriptions of where their contributions will lead and the benefits that will ensue. The upper ocean TOGA network in support of operational climate prediction was chosen as the first case study. The linkages between observations from the Ship of Opportunity Program, the TOGA TAO array, etc., and operational climate prediction, agricultural crop planning, water resource management, for example, are now real and of some substance. Sea level monitoring was the second case selected.

The OOPC also decided to organize a workshop on the vexing problem of establishing new and maintaining existing time-series observations. Vital as they are to understanding climate change, long-range funding for time series programs has always been problematical. The workshop, scheduled for March 1997, will examine priorities, needs and new technologies with more attractive cost/benefit ratios. The ultimate objective is to establish the basis for formulating a scientifically sound but realistically implementable time-series observation program for GOOS.

UN-FCCC and IPCC

The IOC participated in relevant parts of activities being implemented within the United Nations Framework Convention on Climate Change. This included attendance at the meetings of the subsidiary body SBSTA in spring and winter of 1996. Statements of the IOC role and contributions were made at both occasions. This included delivery of information as regards IOC work on oceans and CO_2, sea level observations and related data inventory preparations, and as regards data exchange and management of chemical and biological ocean data of relevance for the convention. The internal symposium on oceans and CO_2 organized by J-GOFS (Puerto Rico,

January 1996) and the chemical, biological data management workshop of IODE, Hamburg, May 1996, were referred to as sources of information. The IOC proposal to GESAMP to study and assess potential implications of ocean storage of CO_2 was also presented.

The IOC attended the Second Session of the Conference of the Parties, Geneva, April 1996. At that occasion, the CD-ROM on sea-level data, produced by the PSMSL and the Oceanographic Data Centre of UK for and with support from IOC as part of the GLOSS programme, was introduced through a special side-event by the Executive Secretary IOC. The CD-ROM including all existing sea level data and a hand-book on how to use the information were provided free of charge to the UN-FCCC Secretariat for distribution, in particular to Small Island States and Low Lying Countries, including AOSIS Member States. Further information on IOC activities of interest to the Convention was presented in the statement by the Executive Secretary IOC.

Liaison has been maintained through the IOC Consultant, Dr A. Metalnikov stationed in Geneva. It is through his productive action and participation in all relevant events that the relatively close linkage has been established between the IOC and the Convention Secretariat and also to some extent with the Convention itself. Liaison with the IPCC and its secretariat based in WMO has likewise been maintained through the IOC Consultant in Geneva. His actions have clearly shown the great importance of being present in order to ensure proper involvement.

The IOC participated in most relevant meetings of the IPCC during 1996, including the IPCC-XII Plenary session. Some possible cooperative actions have been identified.

The IOC has provided a list of experts on oceans and climate change and ocean and CO_2 to the IPCC Secretariat. Preliminary consideration has been given to a possible Third Meeting of Experts on Oceans and Climate Change in Malta.

1.2 OCEAN SCIENCE IN RELATION TO LIVING RESOURCES

This programme consists of several components which are being developed and implemented so as to ensure that there is an adequate dialogue between them. However, due to resources constraints and lack of staff in the Secretariat it has not been possible as yet to convene the Intergovernmental Committee on OSLR established by the Seventeenth Session of the IOC Assembly through its Resolution XVII-2.

Harmful Algal Bloom Programme

The HAB Programme Office at the IOC Secretariat was staffed with one Associate Expert seconded by Denmark, whose assignment ended in May 1996. From May onwards the Harmful Algal Bloom programme was mainly implemented through the IOC Science and Communication Centre on Harmful Algae, which was established at the University of Copenhagen in 1995. As from the second quarter 1997 the HAB Programme Office will receive an Associate Expert seconded by Denmark.

The major achievements of the Programme were:

(i) association with and support of the SCOR-IOC NATO Advanced Study Institute on the Physiological Ecology of Harmful Algal Blooms, Bermuda Biological Station, 27 May - 6 June 1996. The workshop assessed our understanding of the fundamental physiological and ecological issues underlying harmful algal events, identified inadequacies, impediments, and advanced and disseminated new approaches and technologies. The workshop had 80 participants. Proceedings will be published by NATO. The workshop resulted from activities of SCOR-IOC Working Group 97;

(ii) agreement with the Spanish Institute of Oceanography (IEO) on the establishment of a Science and Communication Centre on Harmful Algae at the IEO Oceanographic Centre in Vigo, Spain. The activities of the HAB Centre in Vigo are directed towards assisting countries in Latin America and the Caribbean in their research and training endeavours on harmful algal blooms. The Centre in Vigo started its operations in October 1996;

(iii) consolidation of services and activities at the IOC Science and Communication Centre on Harmful Algae, University of Copenhagen:

- development of cooperative research projects/proposals with institutions in Member States (Institute of Oceanography, NhaTrang, Vietnam; University of the Philippines; College of Fisheries, Univeristy of Agricultural Sciences, Mangalore, India; Institut Agronomique et Veterinaire Hassan II, Morocco). The projects include supervision of Ph.D and M.Sc. students;

- advanced training of 35 scientists in the identification and biology of harmful algae (see below);

- progress in the establishment of a HAB bibliographic database within ASFA;

- provision of 'HAB Literature Grants' to libraries of marine science institutions in developing countries through which more than 1200 books were donated. Grants consist of copies of one or more key reference books.

The Annual Report of the Centre is published in the IOC Training Course Report series.

(iv) preparation and publication of the IOC newsletter *Harmful Algae News*;

(v) publishing, jointly with Tohoku University, Japan, of the Proceedings of the 7th International Conference on Toxic Phytoplankton;

(vi) continuation of the ICES-IOC Working Group on the Dynamics of Harmful Algal Blooms including attendance at its meeting in Brest, France, 17-20 April 1996;

(vii) publication of an IOC-ICES technical report presenting examples of design and implementation of harmful algal monitoring systems (IOC Technical Report No. 44);

(viii) establishment of an ICES-IOC-WMO Working Group on Transfer of Organisms by Ballast Water, in response to one of the recommendations of the IOC Intergovernmental Panel on Harmful Algal Blooms (IPHAB) at its meeting in 1995;

(ix) cooperation with the Asia-Pacific Economic Cooperation (APEC). APEC has adopted a marine science programme and has invited the IOC and the Centre to help implement elements of training efforts on harmful algae aimed at APEC's developing nations. A joint IOC-APEC course is planned for May 1997, as part of the IOC-WESTPAC programme.

(x) obtaining extrabudgetary funding for the HAB Training and Capacity Building Programme from the Nordic Research Academy;

(xi) preparation of a series of slides for identification and demonstration of harmful algae. The slides are prepared by WESTPAC/HAB/ University of Tokyo, essentially for teaching purposes;

(xii) obtaining support from Swedish SIDA for a joint activity between the Kenya Marine Fisheries Research Institute, the Marine Science Institute, Dar-es-Salaam, Tanzania, and the IOC Science and Communication Centre in Copenhagen;

(xiii) preparation of a database on scientists and managers engaged in matters of toxic and harmful algae. The database is accessible at the IOC WWW and will also be made available in print version.

Two advanced training activities, attended by 35 scientists, have been organized within the IOC HAB Training and Capacity Building Programme, the TEMA component of the Harmful Algal Bloom Programme:

(i) The IOC/SAREC-DANIDA Regional Training Course on the Biology and Taxonomy of Harmful Marine Microplankton, University of Mauritius, 4-14 February 1996.

(ii) The Third IOC-DANIDA Training Course on the Biology and Taxonomy of Harmful Marine Microplankton, IOC Science and Communication Centre, University of Copenhagen, 15-26 July 1996.

Marine Biodiversity and Interaction with the Convention on Biological Diversity

Implementation of IOC Resolution XVIII-9 on Marine Biodiversity and the related work plan for the period 1995-97 is progressing. A number of decisions have been carried out and activities launched, as follows:

- Regular interaction with the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to the Convention on Biological Diversity on specific needs and requirements of SBSTTA for scientific input which can be provided through IOC. IOC participated in the Second Meeting of SBSTTA (Montreal, Canada, September 1996) and used that occasion to reiterate the offer of providing input through its expertise to

SBSTTA and the Conference of the Parties (COP) to the Convention. The identification of specific inputs which IOC might provide to SBSTTA and COP in the future is also being addressed within the framework of cooperation between the IOC Secretariat and the Secretariat to the Convention on Biological Diversity.

- Interaction with the International Sea Bed Authority on matters of the effects of possible future exploitation of sea bed resources and dumping on marine biodiversity, as well as discussions on the possibility for IOC to provide scientific input to the International Sea Bed Authority in this respect. The IOC Secretariat is thus developing a biodiversity component to be included into an agreement on cooperation between IOC and the International Sea Bed Authority.

- Strengthening of the links with the UNESCO Man and Biosphere Programme in order to develop joint activities in the field of sustainable use and conservation of marine biodiversity. Cooperation between IOC and MAB is on going, and is also supported by the related decisions of the last session of the MAB Council. Joint IOC-MAB activities in the field of marine biodiversity, as identified in the IOC marine biodiversity work plan for 1995-97, will be implemented.

- Assistance to Member States to undertake efforts at the national and regional levels to compile inventories of their marine flora and fauna, building on existing databases, containing *inter alia* species description and figures, ecological information and distribution and economical importance. Assistance is thus provided to IOC Member States as well as to non-member states to compile inventories, in particular through the UNESCO-IOC Register of Marine Organisms project, - now available on Internet, which is progressing very successfully.

Priority has been given to the planning, organization and implementation of those activities within the IOC marine biodiversity work plan which are directly linked to the recommendations developed by the SBSTTA to the Convention. Among these, an activity on indicators appears to be of very urgent need. Discussions are going on between the IOC Secretariat and the Secretariat of the Convention on Biological Diversity on the organization of a workshop on this important subject. In the meantime, the IOC Secretariat has contacted several experts in the field for their input to the preparation of relevant background documents.

Major on-going and forthcoming activities within the IOC marine biodiversity work plan are indicated in the following table:

MAJOR ON-GOING AND PLANNED ACTIVITIES WITHIN THE IOC MARINE BIOLOGICAL DIVERSITY (BD)WORK PLAN

ACTIVITY	FOCAL POINT	TIME FRAME	STATUS
Appraisal of the state of marine BD - "The Global Biodiversity Outlook"	IOC Secretariat in co-ordination with the Secretariat of the CBD	1996-	On-going
Workshop on identification of parameters and development of methodologies for monitoring changes in marine BD (including low-tech methodologies)	IOC Secretariat in collaboration with CBD Secretariat; GEEP	1997	To be implemented
Identification of a global network of representative ecosystems for future projects for integration of baseline inventories, research activities, methods for monitoring (including low-technology approaches), comprehensive management for sustainable use and conservation of marine biodiversity, and community level education	IOC Secretariat in collaboration with MAB Secretariat	1997	To be implemented
Further implementation of the UNESCO-IOC Register of Marine Organisms and its integration with the IUBS-ICSU-IUMS Species 2000 Programme	IOC Secretariat in co-ordination with the Editor of the Project	1993-	On-going
Upgrading of expertise through training courses, study grants and exchange of scientists	IOC Secretariat in collaboration with participating training institutions	Since the launch of TEMA	On-going
Test workshop for PA/EE material on marine and coastal BD at the school and university level for the IOCARIBE region	IOC Secretariat in collaboration with UNESCO/ED	1997	To be implemented

Since the end of 1995, several important events have taken place with respect to the Convention on Biological Diversity, namely: SBSTTA-2 and the Third Conference of the Parties (COP) to the Convention on Biological Diversity (Buenos Aires, Argentina, November 1996). IOC attended both events as an observer.

IOC has fulfilled the invitation of COP-2 (Decision II/10 - "The Jakarta Mandate") to review its programmes with a view to improving existing measures and developing new actions which promote conservation and sustainable use of marine biological diversity, taking into account the recommendations for action by the Parties to the Convention, and has provided information on its actions on a regular basis to the Conference of the Parties. This has been

achieved through the adjustment of the IOC Marine Biodiversity Strategy to be in line with the objectives of the Convention on Biological Diversity.

The attendance of IOC at COP-3 was important to ensure that the association of IOC with the activities of the Convention could further progress. A paper on the IOC response to the "the Jakarta Mandate" was circulated. That occasion also allowed linkage between the activities of the ICES-IOC-IMO Study Group on Ballast Water and Sediments with the Convention activities on alien species. One major outcome of COP-3 as to marine biodiversity was the decision that a Meeting of Experts on the Conservation and Sustainable Use of Marine and Coastal Biological Diversity will take place in Indonesia in early 1997. It is expected that IOC will receive an official invitation to attend this meeting.

Cooperation in the field of marine and coastal biodiversity is also going on between IOC and the European Union. IOC was invited to attend the EU Meeting on Inventorying Current Marine Biodiversity Programmes, Activities and Initiatives (Plymouth, UK, 4-6 March 1996). Follow-up to the meeting consists of a proposal entitled "A Species Directory to facilitate marine biodiversity research", which has been submitted to the European Union for funding. The IOC role, as identified in the proposal, is to link the efforts of European laboratories with the needs of developing countries in this field. In the future, the role of IOC will expand to providing its expertise and technical assistance to developing countries, which are partners of EU programmes, in the field of scientific and technical training related to marine and coastal biodiversity.

Critical Habitats

In the field of critical habitats, the efforts of IOC have focused on seagrass beds and coral reefs (as to coral reefs, see the report on the Global Coral Reef Monitoring network under GOOS).

The software facility which is needed for the database on which the IOC International Seagrass Bed Directory relies has been finalized, data have been updated and entered and supplementary responses collected through the questionnaire which had been sent out in 1995.

IOC co-sponsored the First International Symposium on Seagrasses (Australia, January 1996), which acknowledged the need for a global directory of seagrass bed scientists and institutions and encouraged IOC to finalize its seagrass bed directory project. The Directory project should be looked to as the first step towards the establishment of an IOC Global Seagrass Bed Network, complementary to the IOC Global Coral Reef Monitoring Network (which will contribute to GOOS). The Second Symposium will take place in the Philippines in 1998 and the IOC Secretariat is now exploring the possibility of co-sponsoring the participation of developing country specialists in this symposium. A technical committee has been established (11 people from five continents) for the Second Symposium and this committee will also advise IOC on the structure for a global network of seagrass bed institutions.

Large Marine Ecosystems and CPR

The development of Large Marine Ecosystems (LME) in the Gulf of Guinea has been closely associated with the activities of the Sir Alister Hardy Foundation of Ocean Science (SAHFOS). The Continuous Plankton Recorder (CPR) has been used in the region in the development of new routes. In January 1997 a consultation, involving UNIDO, IUCN, US-NOAA and IOC, was organized at IOC on the further development of LME, and identified several specific joint activities.

The report of the GLOBEC-IOC-SAHFOS-MBA Workshop on the Analysis of Time Series with Particular Reference to the Continuous Plankton Recorder Survey has been published (IOC Workshop Report No. 124), including submitted papers.

GLOBEC (Global Ocean Ecosystem Dynamics)

In becoming one of the Core Projects of the International-Geosphere-Biosphere Programmes (IGBP), the GLOBEC Programme has been accorded a major change in status. At the same time Dr Roger Harris of the Plymouth Marine Laboratory has been elected as Chair for the GLOBEC International. The new Scientific Steering Committee of GLOBEC held its first meeting in Baltimore, 11-13 November 1996, at which an advanced version of the GLOBEC Science Plan was presented and approved for publishing. The IOC, together with SCOR and IGBP, is co-sponsoring GLOBEC, and a MOU is being prepared.

1.3 OCEAN SCIENCE IN RELATION TO NON-LIVING RESOURCES (OSNLR)

As a follow-up to the Coastal Change Conference (Bordeaux, France, 2-5 February 1995) several actions have been developed in 1996.

The proceedings of the conference have been completed and published by IOC. This document (IOC Workshop Report No. 105 and its Supplement) consists of two volumes of more than 1,000 pages in which 107 oral presentations have been gathered - most of them in extenso - and 39 abstracts of poster sessions. The proceedings will serve as a useful information base for studies devoted to the management and sustainable development of the coastal zone. They also illustrate the application of the concept of the "past as a key for the future" and that models based on use of recent geological records of the coastal zone can provide solutions to several problems resulting from coastal changes. The main topics of the proceedings are:

(i) mechanisms and processes of coastal changes;
(ii) regional and national studies - Africa, Pacific and the Caribbean;
(iii) low tropical coasts;
(iv) Aquitaine, Mediterranean and other European coasts;
(v) short-term mechanism, processes and modelling;
(vi) coastal and inshore information systems;
(vii) training, capacity building and management;
(viii) conference reports and consultations.

A presentation of the Coastal Change Conference, its objectives, issues and perspectives, was made at the 30th International Geological Congress, Beijing, China, 4-14 August 1996. During the congress a paper prepared by Dr. P. Cook, Chairman of the Executive Committee and Dr. C. Latouche, General Secretary of the Conference was presented (Document Proceedings Session B3-9).

As decided during the Coastal Change Conference, and according to the decision adopted by the Assembly at its Eighteenth Session, selected case studies presented at the Conference are being used to produce a set of manuals aimed at facilitating the assessment of coastal change and management of specific littoral areas facing the joint effects of human impact, (construction, tourism, etc.,) and rapid coastal evolution. The preparation of two relevant manuals was launched in 1996. The first relates to Eastern Africa and concerns the following participating countries: Comores, Kenya, Madagascar, Mauritius, Mozambique, Seychelles and Tanzania, through the regional project on the "development of a regional manual on guidelines for assessment, interpretation and management of coastal changes for the Western Indian Ocean Coastal and Island States". It is planned that a preliminary version of the document will be completed during the first quarter of 1997 for presentation at IOCINCWIO-IV. A second manual entitled "Guide Methodologique d'aide à la Gestion Integrée de la zone cotière", is being prepared by France in the framework of joint action in support of UNESCO programmes relative to the coastal zone being developed through IOC, IGCP, MAB and IHP. The document relates to the French conditions, and a preliminary document was circulated for revision in April 1996 and the final document will be available during the first half of 1997. These activities are relevant to the implementation of the section A of Chapter 17 of Agenda 21.

Consultation on Article 6 of the Barcelona Resolution on Environment and Sustainable Development in the Mediterranean Basin

At the invitation of the UN Environmental Programme, Dr. Claude Latouche, an IOC Consultant, represented IOC at a Meeting of Experts which was held in Marseille, France, 2-4 October 1996. The invitation was based upon scientific expertise and knowledge of IOC regarding land/sea interaction and exchanges in the Mediterranean. The Meeting addressed the following issues: assessment of the situation regarding the evaluation and behaviour of contamination by substances which are toxic persistent and liable to bio-accumulation (TPBs); inventory of existing relevant observation/monitoring networks, organizations and laboratories; sources and ways of dissemination of pollution by TPBs, establishment of a plan of action to improve the existing network of monitoring sites and laboratories; adoption of recommendations to be forwarded by UNEP to continue investigating the phasing out of TPBs and to promote training activities on cleaner production and environmental management systems.

Workshop on Beach Management in the Mediterranean and Black Sea

In the framework of OSNLR activities relative to the coastal zone, IOC support was given to the European Mediterranean Centre on Insular Coastal Dynamics for the organization of the Second International Workshop/Training Programme on Beach Management in the Mediterranean and Black Sea, Gozo, Malta, 11-17 May 1996. The objective of this series of workshops is to disseminate knowledge and to provide training on coastal zone management

issues specific to beaches. The courses are aimed at professionals whose work involves aspects of integrated coastal zone management and who have a wide variety of backgrounds in natural and social sciences. The course structure included lectures on the following topics: management issues of Mediterranean beaches; beach dynamics; recreation and tourism; coastal planning; GIS/data management/remote sensing; beach and dune ecology; water quality; coastal technology; beach litter, beach management guidelines. IOC funded the participation of seven scientists from the following Black Sea and Mediterranean countries.

UNESCO Emergency Programme for the Democratic People's Republic of Korea

Following the visit of an IOC Consultant, Dr. C. Latouche, to the DPRK National Commission to UNESCO, a request for exceptional assistance through the UNESCO Emergency Programme was presented in order to replace the research vessel which sank during the storms which affected the DPRK in 1995. The vessel is *inter alia* necessary to develop the research programme discussed during the visit of Dr. C. Latouche. The studies which had been planned are relative to the monitoring of the estuary of the Daidong River after the construction of a dam at the inlet.

The final request, which received the support of IOC under its OSNLR programme, was submitted to UNESCO in March 1996. An emergency aid of US$30.000 was offered by UNESCO in May 1996.

Manual on Science and Technology associated with the definition of the Continental Shelf

IOC, in its role as a competent organization in marine scientific research under UNCLOS, assists Member States to establish general criteria and guidelines as provided for under Article 251 of the Convention. In this context, and following an invitation of a Group of Experts meeting of UN-DOALOS, the first session of the Joint IOC-IHO Editorial Board for the Preparation of a Book on Science and Technology Associated with the Definition of the Continental Shelf under UNCLOS was held at UNESCO Headquarters, 31 January 1996. The OSNLR and Ocean Mapping programmes represent major efforts of IOC in support of the implementation of UNCLOS. The Editorial Board, chaired by Dr. P. Cook, Chairman of the Group of Experts for the IOC OSNLR programme, prepared the outline of the book and decided on the chapter framework. The Board also considered potential contributors for each chapter and discussed the issues relating to manuscripts, drafting review and revision. The book will be composed of 300 to 350 pages including maps and diagrams. A timetable was prepared with the objective of completing the document by the end of 1997 or beginning 1998. The next session of the Editorial Board is planned for the first quarter of 1997 in Monaco.

Regional Workshop on Integrated Coastal Zone Management - Chabahar, Islamic Republic of Iran, 24-29 February 1996

At the invitation of the Islamic Republic of Iran and the Iranian National Commission to UNESCO, an IOC consultant, Dr. R. Arthurton participated as the IOC representative and presented a paper relating to CZM to the workshop. The overall objectives of the workshop was to present the existing situation and problems in the coastal areas of the Islamic Republic of Iran

and to give local representatives and other participants an orientation to ICZM. Also, on the basis of case studies, recommendations and/or models were developed for policy makers, environmentalists and social scientists in regard to strategies for improvement of the management of the coastal zone in Iran. Among various problems which have been addressed one of particular concern and of particular scientific interes. is the impact and long-term implications of the continuing high rate of sea level rise in the Caspian Sea. The workshop in its recommendations highlighted the interest of co-operation and collaboration between regional states and noted the importance of the assistance from international organizations in establishing ICZM regional programmes.

Training course on Marine Geology for WESTPAC region

In October 1996 an IOC-Germany-Indonesia training course in marine geology was organized through financial and expert provisions from Germany, and with the participation of several institutions in Indonesia. The course involved about 20 participants from WESTPAC countries, covering theory, applications in laboratory and field work.

1.4 OCEAN MAPPING

At present IOC Ocean Mapping activities fall within three categories: GEBCO, GAPA and regional ocean mapping projects.

GEBCO

Major achievements of GEBCO over the past years have been the digitization of the contours of the 5th Edition and the preparation of the GEBCO Digital Atlas. Now the "GEBCO Digital Atlas (GDA)" is available on compact disc (CD-ROM). This provides the results of the interpretative contouring in a computer compatible form so that they can be widely used and flexibly manipulated. To date 555 copies have been sold or distributed as complimentary copies in 55 countries. However, it has been recognized that this initial success can only be maintained if the GDA is updated regularly. A two year interval has been proposed between updates. By the end of 1995, sufficient new data have been acquired to justify the printing of the 6th Edition of GEBCO. In 1995, IOC received from the Head Department of Navigation and Oceanography of Russia a proposal to publish a new atlas "World Ocean" and transform its volume "Bathymetry" into the 6th Edition of GEBCO. This proposal of the Russian Federation will be presented for consideration to the 16th Session of GEBCO Guiding Committee.

Work has continued on the "GEBCO Guidelines". The final part (of the initially planned contents) "Digital Bathymetric Data (Multibeam Echo-Sounders)" is in draft stage and will be presented for approval at the 1997 GEBCO meetings, and subsequent publication. It has however become apparent that there is a need for an additional set of guidelines to cover the digitization of bathymetric contours, and a draft document will be prepared in the intersessional period.

The demand for an authoritative and global description of the bathymetry of the world's oceans from physical and chemical oceanographers, who are involved in modelling the ocean environment and predicting changes in global circulation, is steadily becoming more insistent, in

addition to the increasingly fine resolution requirements of marine geologists and geophysicists. Repeated routine ocean observations, as anticipated in the IOC's Global Ocean Observing System (GOOS), will be required to monitor oceanic change, and this will require a secure framework of global bathymetry. For this purpose a gridded data set is clearly needed, so a Task Team of Experts has been set up to conduct a study of the requirement and how it might be achieved.

The 16th Session of the GEBCO Guiding Committee will take place in Southampton (United Kingdom) in May 1997.

International Bathymetric Chart of the Mediterranean and its geological and geophysical series (IBCM)

An informal consultation of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological and Geophysical Series was held in Paris, France (1-2 October 1996) during the 29th Session of the IOC Executive Council.

A second edition of the IBCM is planned for publication after completion of the five Geological and Geophysical Series. Progress has been achieved in the Geological and Geophysical Series within which the Unconsolidated Sea-bed Surface Sediment Chart which will be ready for printing in April 1997. Compilation of data for magnetic anomalies chart is completed.

GAPA

The International Geological-Geophysical Atlases of the Atlantic and Pacific Oceans (GAPA) is another endeavour of IOC in Ocean Mapping. The Atlantic Ocean Atlas was published in 1991 and has now been widely distributed to contributors and to IOC Depository Centres. The companion atlas for the Pacific Ocean is now in the process of being published. Under contract from the Houston Advanced Research Centre (HARC), the Russian Mapping Production Association "Kartografia" started last October 1995 to print this atlas and it was expected to be ready for distribution mid-1996. However because of financial restrictions, the Atlas will only be printed in May 1997 and presented to the 19th Session of the IOC Assembly.

International Bathymetric Chart of the Central Eastern Atlantic

The Second Meeting of the IOC Editorial Board for IBCEA was held in Paris, France in October 1996. Progress was achieved within this project. The final version of sheet 8 is being printed and colour proofs of sheets 6 and 9 were printed in 1995 by the French Hydrographic and Oceanographic Service. The final version of sheets 6 and 9 is expected to be available at the end of 1996. Compilation of sheet n° 8 and the first compilation of sheets 9 and 6 by SHOM was undertaken using NGDC data supplied on CD-ROM. Compilation and contouring of sheet n° 2 will begin in 1997. Compilation of sheet n° 3 has started. The Institute of Hydrography of Portugal has just completed the compilation of sheets 1 and 4. The Russian Hydrographic Office was involved in the above-mentioned project and has offered to provide the data collected during Russian oceanographic expeditions in the 1970-1980 period.

International Bathymetric Chart of the Western Indian Ocean

The Third Meeting of IBCWIO was held in October 1994, Zanzibar, Tanzania. Data have been collected from various sources and strong national support was received The project has strongly advanced through this meeting. The Russian Federation, through HDNO, has joined the Editorial Board. The Republic of South Africa has shown interest in collaborating with IBCWIO but has not yet joined the Editorial Board. Besides, France just expressed its willingness to participate in this project. There has been a significant change in the ability of most Member States to handle digital source material. In 1995, the Chief Editor was working with the sheet co-ordinators to identify their capabilities as well as the hardware and software now available in their institutions with a view to furnishing them with any additional programmes needed to handle IBCWIO data. The Sheet Assembly Diagram for IBCWIO has been modified and now consists of 21 sheets. Following a successful Training Course on Bathymetric Charting held in Nosy Bé, Madagascar, on board "R/V METEOR" in June/July 1987, the German Government again has offered, as a contribution to IOC's Training, Education and Mutual Assistance in the Marine Sciences (TEMA) programme, to organize an Advanced Training Course on Bathymetric Charting in the Western Indian Ocean, on board "R/V METEOR", 16-30 December 1995. The progress during 1996 in compilation of data was achieved with the financial support from SAREC. The Fourth Meeting of IOC Editorial Board for IBCWIO is planned to take place in Maputo, Mozambique, in September 1997.

International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico

The Sixth Session of the Editorial Board for IBCCA took place in November 1996, in Cartagena, Colombia, and noted that significant progress has been achieved, compilation of all sheets nearly completed. It was decided to complete the bathymetric part of this project in 1998 and to start the geological-geophysical series.

International Bathymetric Chart for the Western Pacific

Significant progress in data compilation of sub-regions 1, 2 & 3 was made after the First Officers' Meeting in Bali, November 1994, and in accordance with resolution of 18th Session of the IOC Assembly, the Second Meeting for the IOC Editorial Board for IBCWP was organized in Bangkok, Thailand , in December 1996.

1.5. MARINE POLLUTION RESEARCH AND MONITORING (GIPME/MARPOLMON)

The GIPME Programme provided, on request, advice and assistance to the Regional Organization for the Protection of the Marine Environment (ROPME) on the evaluation of progress, new monitoring programme directions and the assessment of priorities for the Regional Sea Area in the context of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities adopted in Washington, D.C., in November 1995. GEMSI and GEEP experts undertook an evaluation of regional activities during March 1996.

A wide range of advice and assistance was also provided to the Black Sea Region through the medium of involvement in the review of the GEF Black Sea Environmental Programme and

NATO-TU Black Sea project. These two activities are being closely coordinated with the IOC Black Sea Project through GIPME mechanisms. Assistance on monitoring project design was provided by GIPME experts and the Marine Environmental Studies Laboratory in Monaco to the Institute for Sea Research, Odessa. A workshop was conducted at the Plymouth Marine Laboratory, U.K. for scientists from this region to provide training in biological effects techniques. Follow-on efforts, including the implementation of a pilot project on Mussel Watch in the context of the Health of the Ocean Module of GOOS, were undertaken both at Odessa and Sochii in the latter part of 1996.

A major issue stemming *inter alia* from the adoption of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities under UNEP auspices and the major amendment of London Convention completed in October-November 1996, for which IMO is the Secretariat, is the establishment of sediment quality guidelines for marine areas. GIPME has adopted a proactive role in attempting to devise a scientific basis for the development of such guidelines that can be used for environmental management purposes. A workshop to evaluate different approaches to formulating guidelines, originally planned for June 1996, had to be postponed due to fiscal restraints but is now planned to be held in conjunction with the meeting of the Scientific Group of the London Convention at IMO Headquarters in London in May 1997.

GIPME Expert Groups continued to assist the Marine Environmental Studies laboratory, Monaco, in the preparation of Reference Manuals on sampling and analytical methodology. During 1996, a reference determination of metals in marine biological tissues was finalized for publication in early 1997. All such manuals are evaluated prior to publication through a peer review mechanism established by GIPME in response to the needs of the co-sponsoring agencies, IOC, UNEP, IAEA and IMO.

Some responses were received to the questionnaire prepared during the VIIIth Session of the Scientific Committee for GIPME held in Costa Rica, 18-22 April, 1994, and distributed as IOC Circular Letter 1843. These responses are being analyzed to determine future directions of the GIPME Programme especially in respect to activities in developing regions.

GIPME formed the nucleus for the further development of the strategic plan for the Health of the Oceans (HOTO) Module of the Global Ocean Observing System published by IOC as Report No.IOC/INF-1044 in May 1996. Evaluation of the need for HOTO implementation in a number of regional marine areas is being made by GIPME Experts and the interests of countries in the WESTPAC and Southeast Asian area are being investigated by GIPME Officers. In addition, as a result of a meeting on In Situ Observations in Global Observing Systems in September, 1996, contacts have been established between GIPME Officers and members of the scientific communities involved in the development of both GTOS and WHYCOS in an attempt to establish a mechanism to define, on a mutual basis, the nature of the land-sea interface for the purposes of GTOS and GOOS and to develop a basis for the assignment of responsibilities for coastal zone measurements of mutual interest and benefit.

Problems being experienced with organophosphate pesticides in some South and Central American countries stimulated GIPME through its GEEP and GEMSI expert groups to design a training workshop on the analysis of sediment and fauna for organophosphate, organochlorines,

heavy metals, hydrocarbons and biological effects measurements in Costa Rica. A visit to Costa Rica to select an appropriate workshop location and investigation sites was undertaken in October-November, 1996 by the Chairmen of GEMSI and GEEP. A preliminary workshop design has been formulated in consultation with scientists in the region with the intention of holding the workshop for 20 scientists in early 1998 during the dry season.

The Open Ocean Baseline Study of the Atlantic Ocean was further advanced with the completion of the third and final cruise in the South Atlantic aboard the United States Oceanographic Research Vessel Knorr. This cruise, coordinated by Dr Gregory Cutter of Old Dominion University, USA commenced on 15 May 1996 in Montevideo, Uruguay and ended in Bridgetown, Barbados. Scientists from Canada, Germany, the Untied Kingdom and the United States participated in the sampling of major oceanic water masses for subsequent analyses of heavy metals and organic contaminants at the four designated Baseline Study Stations in the Southwest Atlantic Ocean. Two additional stations were occupied off the Amazon River to evaluate its contribution of organic and inorganic substances in the western Atlantic. Surface water was continuously sampled while the ship was underway between stations to investigate the composition of water in the various surface currents and the Intertropical Convergence Zone and to evaluate the effects of equatorial upwelling and variable atmospheric deposition of aeolian material derived primarily from North Africa. The data from this and the previous two baseline cruises will not only serve the purpose of establishing the contemporary baseline distributions of a range of contaminants in the Atlantic deep waters, including source water regions, but will also provide valuable information on biogeochemical processes that determine the transport and fate of contaminants in the open ocean environment. A web site [http://www.soest.hawaii.edu/oceanography/ioc96/ioc.html] has been established for the exchange of date and information from the latest baseline cruise. Results from the two previous baseline cruises have been published as a special issue of the journal Marine Chemistry. Additional scientific papers describing the results of the first two baseline cruises are in the acceptance or final revision stages for publication in a second special issue of Marine Chemistry under the editorship of Alan Shiller, University of Southern Mississippi, USA.

The Fifth Caribbean Marine Debris/Waste Management workshop was conducted in Curacao, 21-25 July 1996 under MARPOLMON Programme auspices. Most of the action items stipulated in the IOC-UNEP-NOAA-USCG-IMO Marine Debris Waste Management Action Plan, which was finalized in Nassau, Bahamas, January 1994, have been completed. The Caribbean Marine Debris Monitoring Project will initiate its follow-up phase in which 10 countries in the region will initiate monitoring in December 1996, coherent with the US-NOAA Manual. In addition, environmental awareness and outreach campaigns on the subject of marine debris have been carried out in cooperation with the Center for Marine Conservation in the Caribbean.

GIPME is also cooperating with UNIDO's Large Marine Ecosystem Project (LME) on Pilot Monitoring of Marine Debris in the Gulf of Guinea. The results were evaluated during the Third IOC-LME Marine Debris/Waste Management Workshop in Abidjan, 9-11 December 1996. This workshop also decided upon action to be taken based on the Marine Debris Action Plan elaborated during the First Marine Debris/Waste Management Workshop convened in Lagos, Nigeria, 15-17 December 1994.

The joint IOC-UNEP CEPPOL (Caribbean) Programme has devoted major efforts to the synthesis of the results of the eight research components of the Programme. This synthesis will serve as a basis for determining the state of marine pollution in the Wider Caribbean as well as providing guidance on further actions to be taken regarding research and management. The report of this analysis will be available in draft form in early 1997.

During 1996, the IOC also carried out a mission to assess national capabilities within IOCINCWIO for conducting baseline monitoring studies of pesticides, metals, nutrients, persistent organics, sediment load, dissolved oxygen and turbidity. The action followed the outline based on the recommendations arising from the IOC-Sida (SAREC) Field Study Exercise on Nutrients in Tropical Marine Waters.

1.5 PROGRAMME ACTIONS RELEVANT TO COASTAL AREA MANAGEMENT

Introduction

Several IOC program areas contribute directly to the development and implementation of activities in the field of coastal area management, such as: marine pollution and waste management; living and non-living resources; monitoring systems and other services (e.g. data management, dissemination of satellite data, etc.); specific training on ICAM procedures and production of guidelines. Coral reef monitoring, harmful algal bloom assessment and analysis, inshore oceanographic studies. Activities in the open oceans such as the analysis and prediction of El Nino events also contribute to the understanding of factors operating in the coastal environment and to the development of management options. A list of IOC programme areas dealing at least in part with factors relating to coastal area management is presented below together with a list of IOC subsidiary bodies which are responsible for carrying out programme actions in various parts of the world.

IOC Major Programme Areas Relevant to Coastal Area Management:

- Ocean dynamics, circulation and climate
- TOGA, WOCE (in cooperation with WMO, ICSU)
- JGOFS (in cooperation with SCOR, ICSU)
- Ocean mapping
- Bathymetric maps
- Geological/geophysical maps
- Ocean science in relation to living resources
- HAB, IREP-SARP
- Global investigation of pollution in the marine environment - GIPME (jointly with UNEP and IMO, and partly IAEA), dealing with: methods, standards and intercalibration; effects of pollutants; standards and reference materials; marine pollution monitoring;
- Ocean science in relation to non-living resources (jointly with UN)
- Coastal erosion, Coastal dynamics, the COASTS programme
- Ocean services
- Global ocean observing system (GOOS), (jointly with WMO, UNEP, ICSU)
- Global sea-level observing system (GLOSS)

- Long-term global monitoring system of coastal and near-shore phenomena related to climate change (with UNEP, WMO, IUCN)
- International oceanographic data exchange/marine information management
- International tsunami warning system in the Pacific
- International global ocean services system (IGOSS) with WMO
- Training, education and mutual assistance in the marine sciences (all programs)
- Fellowships
- Training courses
- Scientific equipment
- Research cruises

Regional subsidiary bodies of the IOC

- Sub-commission for the Caribbean and adjacent regions (IOCARIBE)
- Regional committee for the cooperative investigations in the north and central western Indian Ocean (IOCINCWIO)
- Regional committee for the central and eastern Atlantic (IOCEA)
- Regional committee for the central Indian ocean (IOCINDIO)
- Regional committee for the Black Sea
- Regional committee for the Southern Ocean
- Sub-commission for the western Pacific (WESTPAC)

Most countries are now trying to elaborate a rational policy of coastal area management in order to combine "environment and development", a goal which may be achieved only with some difficulty in view of the potential conflicting interests and the lack of an integrated vision of coastal phenomena. The elaboration of a policy in this regard implies the participation of all those directly or indirectly involved in the process of decision-making related to coastal area management.

Integrated Coastal Area Management is at the same time a tool and a process to achieve sustainability in coastal zones, an environment particularly affected by the exploitation of natural resources, demographic growth and associated industrial activities. ICAM involves parties with training in different areas (i.e. scientists, decision- and policy-makers, civic groups, local populations) and, by definition, requires an integrated approach on the behalf of all the concerned sectors. This in turn implies a need to integrate issues, problems and the concerned actors in a way so as to reduce conflicts and to find solutions to guarantee the sustainability of the environment. Integrated coastal area management attempts to take into account all these factors, allowing a precautionary assessment of the consequences related to the sum of different human activities and natural processes and events in coastal environments.

The IOC strategy in the field of ICAM adopts two different but complementary approaches: geographic and thematic. The approach used is related to specific ICAM issues, depending on the environmental situation of the geographical area concerned, local institutional and economic conditions, etc. Coastal problems are different in different regions of the World. In some regions, such as in the Western Pacific, issues are mainly related to the fast urban and economic development which is encountered along coastal zones. In other regions or countries

(such as in the case of some of the Indian Ocean countries), the problem might be related more to institutional aspects. Building local capacity seems to be a common requirement for all coastal developing countries.

Here follows a presentation of examples of recent IOC activities in different parts of the world, as regards ICAM. The presentation is not exhaustive and several other activities are presented in other sections of this report.

Indicators of sustainable development

The active participation of scientists in the debate concerning a practical definition of "sustainability" is indispensable in order to appreciate the physical, chemical and biological complexity of the coastal zone and provide information in the form of databases and analyses which will help in decision-making. Since most conflicts arise from the lack of objective information, the task of scientists is to provide decision-makers with complete and impartial evaluations. It is within this context that a multi-disciplinary working group has been set up in France as part of the IOC effort to move towards a more rational form of approach to the problem. The aim is to define a minimum number of basic criteria required for competent understanding of the way in which coastal zone phenomena interact in terms of physical, chemical, biological, geological, demographic and other factors. The group will propose a methodology which would give rise to data and indicators to help in decision-making.

This working group includes representatives from French government agencies such as BRGM, IFREMER, ORSTOM as well as universities. In addition, each scientist represents one of the UNESCO scientific programmes or bodies: MAB (Man and Biosphere), IOC (Intergovernmental Oceanographic Commission), IHP (International Hydrological Programme), IGCP (International Geological Correlation Programme).

The first phase of the programme involves a "preparatory study for the elaboration of a practical guide on coastal zone management" which aims at creating a database, which will be as complete and extensive as possible, to be used as a basis for providing responses to different environmental issues related to coastal zones. The future use of this information will be determined by demand, which in turn will determine the selection of factors to be considered and the choice of weighing coefficients to be used in arriving at suggested solutions. In the interpretation phase, the process will attempt to establish global indicators with the role of determining the extent to which predetermined objectives have been met. Furthermore, a phase for testing the method is envisaged which will be applied in various sites. The sites selected to date are: Guyana, Archipelago of Molene, La Reunion, Dakar Bay, Rhone Delta, Gabon, Baie de Seine.

Global Coral Reef Monitoring Network (IOC, UNEP, IUCN, ICRI)

The IOC maintains a strong commitment towards the management of coral reef ecosystems as part of the programme dealing with coastal area management and in support of GOOS development. In contributing towards the development of a Global Coral Reef Monitoring Network, IOC supported a workshop in association with the 8th International Coral Reef

Symposium 24-29 June, 1996, Panama City, Republic of Panama. Assistance was provided to over 12 scientists to participate in the congress from both the developing world and elsewhere (resource-persons). A workshop was held on June 27th and it was operated in two sections with the morning session looking at the information provided by long-term monitoring records in relation to desirable monitoring strategies and at the same time considering the input generated by some of the available techniques. In the afternoon the group looked at individual country presentations particularly from the Indian Ocean and the region of east Africa. Country-papers dealing with the nature and disposition of coral reefs together with an outline of how individual countries might be able to function in a global coral reef monitoring network were presented. A concerted effort was made to identify shortcomings and to find ways of working together. Over 80 participants attended the workshop.

The Chair summed-up the morning session by pointing out that the type of monitoring that might be implemented by a global network really depended on the nature of the changes that were anticipated and moreover monitoring frequency should also be tied into the kinds of management problems faced by the participating countries. The afternoon session concluded that innate capacities of participating countries would determine the kinds of monitoring programmes that could be implemented but in any case these would have to be justified by their ability to provide information that could be used to solve local problems. Training was regarded as a major requirement for many countries and the area of the Indian Ocean was identified as requiring immediate attention by IOC in order to build-up the capacity for wide-spread coral reef monitoring.

Regional Activities

IOC is involved with several activities in the area of coastal area management throughout the globe.

West Africa

IOC Regional Committee for the Central Eastern Atlantic (IOCEA)

The IOC Sub-regional Workshop on Marine Living Resources (within OSLR programme) in the Gulf of Guinea, from Guinea Conakry to Angola, took place in Cotonou, Benin (1-4 July 1996). Participants from nine Western African countries attended the meeting. They all made formal presentations relating the state of marine living resources in their respective countries. The objectives of the workshop as adopted during IOCEA-IV, Las Palmas, May 1995, were to improve the state of fishery research in countries from the Gulf of Guinea; the standardization of methodologies for data collection and processing, in order to improve the level of knowledge on marine living resources. The main outcome of the workshop was the development of a sub-regional research project on marine living resources in the Gulf of Guinea. The adopted project aims at improving scientific knowledge on existing stocks, building local scientific capacity, and establishing sustainable planning for the exploitation of living marine resources. It was proposed that the project proposal should be forwarded to major donor countries and international organizations. The workshop report is available at the IOC Secretariat.

Marine Debris Pilot Monitoring Project for the Gulf of Guinea.

The GIPME programme is co-operating with the UNIDO, LME Gulf of Guinea project. The results were analysed and synthesized during the Third IOC-LME Marine Debris/Waste Management Workshop in Abidjan, December 9-11 1996. The meeting also decided upon the order of action to be taken based on the Marine Debris Action Plan elaborated during the First Marine Debris/Waste Management Workshop, convened in Lagos, Nigeria, December 15-17, 1994.

International Seminar on the Coastal Zone of West Africa: Problems and Management

The International seminar on the Coastal Zone of West Africa took place in Accra, Ghana (25-29 March 1996). IOC provided financial support to four participants from Western Africa to attend this meeting and make formal presentations on coastal zone management experience from their respective countries.

Monograph on the Typology of the Western African Coasts

As a result of recommendations reached at IOCEA IV (Las Palmas, May 1995), the proposal for the development of a monograph of the Western African coasts is now being implemented. The monograph is made up of four thematic volumes, and each member states is being invited to contribute to it. The main themes include: physical oceanography and hydrosedimentology; marine biology and biotopes; marine geology; and coastal environment.

East Africa

Several activities of relevance to ICAM are carried out as part of the IOCINCWIO programme, see section 5.3 of this report.

In addition, in April of 1996, IOC and MAB together fielded a mission to Mozambique in order to evaluate the potential for an international Pan-African meeting on integrated coastal management. Such a meeting should give great visibility to Mozambique's efforts in this field. It has been proposed that the Pan-African Conference on Sustainable Integrated Coastal Management (PACSICOM) should also generate a major input towards the 1998 International Year of the Oceans.

Marine science and coastal management issues are of particular importance to Mozambique for several reasons. The country has more than 2,700 km of almost unspoiled coastal zone with a huge potential for fishery, tourism (both cultural and natural), and sustainable management of its natural renewable resources. More than two thirds of the population lives in this area. Unfortunately, after a period of 15 years of civil war, nearly all infrastructure has been completely destroyed and the country is now living on subsistence agriculture. After having stabilized the political system with democratic elections in 1994, foreign aid is entering the country in increasing volume. Most of this is through aid agencies of the Nordic countries (DANIDA, SIDA and NORAD), as well as The World Bank, The European Union and South Africa as well as through all UN agencies.

A possible tool for handling marine science and coastal management issues was the proposal made by the Mozambique National Commission for UNESCO to establish a joint IOC/MAB Committee under the leadership of the Ministry for Environmental Co-ordination (MICOA). Such a unit could prepare an integrated coastal management plan and be the leading scientific committee for the preparation of the proposed meeting. The advantages that would accrue to Mozambique in terms of placing sustainable coastal management in a clearly recognizable position in relation to the development process are obvious. The advantages of a successful integration of African voices in the matter of sustainable coastal zone management are significant. Because of the known influence of the oceans as part of the mechanism involved in establishing drought it is very likely that several land-locked African states may also wish to be involved in the activity.

Indian Ocean

Together with the World Bank and Sida/SAREC (Sweden), IOC organized a Workshop on Integrated Coastal Area Management in Madagascar in October 1996. The plenary session and discussions dealt with the following issues: theoretical and conceptual aspects, including the presentation of the concept of Integrated Coastal Area Management (ICAM) and related selected guidelines, procedures and methodologies; presentation of selected ICAM case studies (including from other countries in the region); existing and pending or proposed national programmes and activities relevant to ICAM and related institutional mechanisms through: (i) presentations of the state of the coastal environment of Madagascar; (ii) a presentation on the Environmental Programme of Action for Madagascar and the Marine and Coastal Component of its Environmental Programme and a presentation of the results of the assessment of the coastal zone environment situation within the Malagasy component of the FED/COI environmental programme; (iii) presentations of protection and conservation activities, including the issue of marine and coastal protected areas and presentation of NGO projects related to ICAM. After a field trip, participants elaborated on activities, interests and constraints within the different economic sectors and the relevance and role of environmental research and existing regional programmes (such as the IOC-Sida/SAREC Programme on Marine Science in East Africa and the World Bank ICAM strategy for East Africa).

The following sectors/issues were dealt with: land-use planning, fishery and aquaculture regulations, tourism regulations (including eco-tourism), harbors and marine transportation, pollution and industrial impacts, the on-going institutional decentralization process and its implications for ICAM. Gaps concerning scientific and technical expertise and knowledge will be identified and related recommendations formulated. The Workshop considered the identification of institutional mechanisms for co-ordination and implementation of ICAM-oriented activities and the formulation of recommendations specifically dealing with institutional aspects.

For the third year the IOC-sponsored course on Monitoring and Modelling of Coastal Marine Processes (MAMCOMP) was conducted at the Indian Institute of Technology Centre for Atmospheric Sciences, Delhi, India. Participants came from India, Kenya and Tanzania.

North and Central Western Indian Ocean (IOCINCWIO)

The IOC Regional Workshop on Coastal Oceanography and Coastal Zone Management (Comores, Moroni, 16-20 December) was implemented in the context of the Regional Committee for Co-operative Investigation in the North and Central Western Indian Ocean (IOCINCWIO). It specifically addressed the Small Island Developing States (SIDS) of the Indian Ocean, namely the countries of the Commission de l'Ocean Indien (Comores, Mauritius, Seychelles, Reunion (France), and Madagascar). This exercise, held in accordance with UNCED (Agenda 21, Chapter 17) and the Global Conference on the Sustainable Development of Small Islands Developing States (Barbados, April 1994), provided a good synthesis on the on-going and future programmes in the Western Indian Ocean, and needs and gaps were also identified.

Recommendations focused on the following topics: implications of climate change for the SIDS, human impacts on fragile ecosystems (in particular coral reefs, fishing techniques, marine pollution), monitoring techniques and tools for the management of coastal environment of SIDS (establishment of Environmental Information System, GIS and remote sensing techniques), presentation of the Global Ocean Observing System (GOOS) and Global Sea-Level Observing System (GLOSS), consequences of UNCLOS implementation, capacity building and regional co-operation. Several practical case studies were presented at the workshop, the report of which will be available in early 1997.

Actions undertaken by IOC contributing towards the CSI programme

In 1996 UNESCO established a new programme to facilitate co-operative and interdiciplinary work in dealing with Coasts and Small Islands (CSI) on an experimental basis. The IOC has played an active and enthusiastic role in helping to develop this UNESCO initiative.

With guidance provided by IOC, a Coral Reef Management Workshop, Jakarta Bay, Indonesia was subsequently organized by UNESCO-Jakarta in April 1996. Participating agencies included ANTARA (The Indonesian News Agency) and P3O-LIPI (The Centre for Oceanological Research & Development - Indonesian Institute of Sciences). The objective of the workshop was to strengthen management of the Seribu Islands and was aimed at management officials, resort-owners, dive-shop owners and managers including government agency staff. Managers, teachers, fishermen and journalists also attended and a field trip was included in the programme.

The workshop concluded that if the UNESCO-IOC programme was able to save the Pulau Seribu region then the problems facing Indonesia with regard to the sustainable management of coral reefs throughout the archipelago would be solved. This would also necessarily cover coral reef health, biodiversity maintenance, education, welfare of fishers and so forth. It was further pointed out that in some islands, fishers have a most destructive attitude in their practice of catching aquarium fish since the demand offered by the market is very high and this has occasioned the use of potassium cyanide. It was suggested that training programmes be offered to fishers to teach them how to catch aquarium fish without recourse to the use of cyanide, using the experience already obtained in the Philippines.

A workplan was subsequently elaborated at a meeting coordinated by UNESCO-Jakarta in July of 1996. Pre-conditions suggested for execution of the work plan were that all activities should first involve participation of local authorities and the inhabitants of the islands concerned and that government officials should be involved as partners. The main line of the work should be built around an inventory of real and well-understood problems working from past experience rather than to attempt to initiate actions on the basis of high ideals. Fishers and islanders in general should be introduced to the idea of sustainability through simple language. It was agreed that a news-letter would be issued and that the first publication (promoted by UNESCO) would focus on identifying the problems and on fund-raising. The subsequent issue would be targeted on fishers, islanders in general and on donors involving news about the islands, practical advice progress reports and so forth. Islanders would be encouraged to contribute to subsequent issues. A home-page on the Internet, with the support of UNESCO-Jakarta and IOC was also suggested as a mechanism to co-ordinate Pulau Seribu initiatives.

The work constituted a follow-up of a UNESCO assessment programme to evaluate the state of reefs adjacent to population centres in May 1985 which involved the implementation of an international workshop in Pulau Seribu, Indonesia The UNESCO-IOC International Coral Reef Evaluation Workshop, Seribu Islands, Jakarta, Indonesia, 11-20 September 1995, re-surveyed 28 island reefs using replicated methods (with some additions) similar to those employed in 1985. Reefs ranged from within Jakarta Bay in close proximity to Jakarta to the outer end of the Pulau Seribu chain. The surveys detected a significant decline in the status of coral reefs in the outer island group, caused by a variety of human and biotic disturbances, among which crown-of-thorns starfish were apparently playing a prominent role in an area wherein they had previously been considered "rare".

Conflict Management in the Coastal Environment

A multi-disciplinary mission by the Science and Social Science Sectors in UNESCO was undertaken to Guayaquil, Ecuador, in 1996. IOC participated in the activity, along with the UNESCO Regional Office in Montevideo, to advise both the Government of Ecuador and the private sector concerning the Taura Syndrome (wide-spread mortality in shrimp ponds in the Gulf of Guayaquil).

Since the majority of coastal area problems are cross-sectoral and can only be solved through an interdisciplinary approach the forces involved must be approached through the medium of the human communities that are largely responsible for effecting often unwanted changes. One such area is the Gulf of Guayaquil in Ecuador. The Gulf of Guayaquil is of interest as it presents a situation whereby a major portion of the export earnings for a nation are critically poised on environmental health involving two primary producers (bananas and shrimps) in a comparatively limited area. In recent years, the aquaculture industry has been plagued by catastrophic shrimp mortalities within ponds surrounding the Gulf.

Attempts to approach the issue holistically from the point of view of the cause of shrimp mortalities have not been successful. This, in part, is because there may be more than one cause for the mortalities which are now known collectively as the "Taura Syndrome" and the details of particular processes have not been clearly defined. Efforts to resolve the issue have suffered from

an approach which is at the same time excessively broad and also un-coordinated. Continuing work dealing with the issue must take into account the immediate problem faced by the local community which is caused by an apparent conflict in management of the productivity of bananas and shrimps in that each sector is responsible for an array of impacts. To date, the management-effort has not effectively dealt with the sociological problems involved or the potential instabilities that are resulting and will worsen if the environment is allowed to further deteriorate in any significant way. A gap has arisen between the available scientific knowledge and the willingness of the stake-holders to consider the evidence. This has been exacerbated by fears that the potential cure that might be suggested could be worse than the disease itself.

Situations such as this constitute an opportunity for the application of principles involved with "sustainable development". In the Gulf of Guayaquil, it is clear that the communities concerned are largely motivated to deal with the issue in a fundamental manner. As such, this could provide the first clear model, on the global scale, where "sustainability" could become the driving-force for development. IOC, together with CSI and the UNESCO Social Sciences Sector, is helping to bring such issues to the fore-front of consciousness so that some form of resolution to the crisis can be found before the conflict expands and threatens regional stability. The work to date has thus been a very real contribution to the culture of peace and has already involved sacrifice and adjustments by the communities concerned.

The wide-ranging nature of the work in the coastal zone carried out by IOC is related to the problem-oriented approach taken by the Commission in recent years, where attention has shifted from mid-ocean studies to coastal areas, with a particular reference to regions of high population density where impacts are the greatest. The formulation of scientifically-based plans for the management of the coastal environment, taking into account social, cultural and economic interests, appears a mandatory step towards the resolution of conflicts and the development of peaceful utilization of coastal areas. Among critical elements identified in recent IOC studies as being of prime importance in relation to coastal zone management are the following: sea level change and coastal flooding; coastal circulation; assessment of organic carbon accumulation in coastal sediments; changes in plankton community structure; changes in coastal and benthic ecological communities.

Publications on Coastal Area Management

Several books on coastal area management have been prepared. One is the result of collaboration between IOC and the Centre for the Study of Marine Policy , Graduate College of Marine Studies, University of Delaware (Dr Robert Knecht and Dr Biliana Cicin-Sain) in the production of a book entitled "Integrated Coastal Management: Concepts and Cross-National Practices". The book has been produced especially for those concerned with the design and implementation of integrated coastal management programmes in both developing and developed countries. The book is now undergoing review and will be published by UNESCO-IOC in 1997. Main chapters include:

1) Evolution of international prescriptions for integrated coastal management from the Law Of the Sea Convention and the decisions emanating from UNCED (Rio 1992);

2) Fundamental concepts, approaches and methodologies for Integrated Coastal Zone Management (ICM);
3) A practical guide for the development and operation of an ICM programme;
4) An examination and analysis of the variation of cross-national practices in ICM (based on the results of a 30 nation survey);
5) Prescriptions for what seems to work best in ICM programmes.

The second book, being prepared in cooperation with CSI, covers tropical ecosystems and is entitled "Coral Reefs, Mangroves, Seagrasses: A Sourcebook for Managers", by Frank Talbot and Clive Wilkinson. The book aims at the middle-manager or local-area-planner and involves a core of 28 case histories indicating documented changes together with the reasons for the changes. Case histories are drawn from developing countries in the main (Kenya, Madagascar, Maldives, Moorea, Nigeria, Panama, Philippines etc). Examples are also taken from Okinawa, Florida Bay and Hawaii.

Methods of assessing the need for a management plan are outlined, proceedings for development and implementation of such plans are presented along with the rational for involvement of stake-holders and users, in a section by Richard Kenchington. Twenty-four authors have been involved in the creation of the book.

A third book is resulting from the IOC-ICAM Workshop in Karachi, Pakistan, October 1994. It is aimed specifically at the needs with respect to ICAM of developing countries in tropical and sub-tropical regions. Concepts are presented and analysed together with a series of case-studies. A socio-economic presentation of recently emerging economic and social dimensions of ICAM is also given.

2. OCEAN SERVICES

2.1 OCEANOGRAPHIC DATA MANAGEMENT (IODE)

IODE-XV

For the IODE programme the year 1996 started with a landmark event - the Fifteenth Session of the Committee on IODE which took place in Athens, Greece, 23-31 January. This Session has marked, not only the 35th anniversary of the IODE system establishment but also was a turning point in understanding the evolution of IODE data centres from "data libraries" to "services and products producers". Increasing interest in oceanographic data and information was raised due to public awareness of the "greenhouse effect", global warming and sea-level rise, and was reflected through the attendance of almost 100 participants from 38 countries and 17 partner organizations at IODE-XV. The meeting was particularly well supported by developing countries with almost half the participants coming from Africa, Asia and South America.

The session summed up the progress achieved by the Committee in the last three years and identified new objectives. It was decided that the main emphasis should be on the upgrading of the skills of its data and information centres. This included skills in managing new data types and in implementing and using new data management and electronic document capabilities including the World Wide Web (WWW), Internet and CD-ROMs.

IODE Network

The Session identified clearly the benefits which developing countries might have through joining the IODE system and participation in its activities. It resulted in increased interest in IODE. New data centres have been established or designated in Croatia, Kenya, Mozambique, Ukraine. IODE National Co-odinators have been nominated in Bulgaria and Georgia. On the basis of an Indian NODC, an RNODC for the Indian Ocean was organized in Goa, bringing the total number of RNODCs to 13. In spite of this, there are still big gaps in the network of data centres in the Caribbean basin, the Persian Gulf, Africa and South East Asia. The fundamental question in strengthening the IODE system is facilitating regional co-operation and capacity building. It is expected that a number of activities being implemented or planned in Africa (RECOSCIX-WIO and CEA, GODAR-VI), in the Persian Gulf (IOC/ROPME mission, Regional Training in Oceanographic Data Management, both in 1997), activities in South East Asia and others will improve the participation of the countries of the region in IODE.

GTSPP

The IGOSS-IODE Global Temperature and Salinity Profile Programme has moved from the pilot to an operational phase. GTSPP demonstrated a successful programme of a fully integrated "end-to-end" data management of the type needed to support GOOS. It evolved to an effective mechanism of close co-operation between data collection and management programmes such as IGOSS and IODE in meeting demands of the WOCE scientific community. The GTSPP steering group met in 15-19 April 1996, Washington, D.C., USA jointly with the WOCE Data Management Meeting, identified new objectives and decided to revise its plan of actions. A CD-ROM of GTSPP data and information has been produced by the MEDS of Canada and widely distributed among IOC, WMO and ICSU Member States. It was suggested to consider ways of developing a "follow on" from GTSPP such as a Global Ocean Velocity Pilot Project.

GODAR

This project, dedicated to locate and rescue existing ocean data, has achieved much in the last few years primarily due to the support provided by the USA and EU/MAST. The global dataset of temperature and salinity profiles has increased to over 2.0 million, with additional 500,000 profiles acquired only in 1996. It is expected that in 1997 an updated version of the World Ocean Atlas will be published on CD-ROMs which will include new data types such as biological and chemical data. GODAR has assisted in raising the profile of marine data management and increased technology and capability transfer to developing countries. An additional result of GODAR is the increased quantity of naval data being released by a number of countries.

In September/October 1996, the Fifth Regional GODAR Workshop for the Member States of the Caribbean Basin and South America took place in Cartagena, Colombia. The Workshop brought together experts from 13 countries which described the state of their data holdings, identified needs and formulated recommendations targeted to rescuing available data and making them freely accessible for the international community. GODAR-V Workshop report has been published in the IOC series and is widely available. With modest investment from the Member States GODAR can contribute to the needs of wide user groups even more in years to come.

The sixth and last regional GODAR workshop is planned for April 1997 in one of the countries of Western Africa. The first phase of the GODAR project will culminate by the GODAR Global Conference at the end of 1997 in Washington, D.C., USA.

New Data Types

While IODE is well placed to address many of the requirements resulting from different IOC programme activities, it recognizes the need to improve its capabilities to manage and exchange a much wider range of marine parameters. IODE and IGOSS developed a joint data and information management strategy in support of GOOS which was approved by the Second Planning meeting of I-GOOS in Washington, May 1996. In this document necessary attention was given to the need for data from coastal areas, for biological and remote-sensing data. To meet the requirements of GIPME, OSLR and the IOC Marine Biodiversity Strategy, the Workshop on Marine Chemical and Biological Data Management took place in Hamburg, Germany from 20-24 May 1996. The deliberations of the Workshop have been included in the Workshop Report N°. 122 published in the IOC Workshop Report Series. A volume of the proceedings has been finalized and is now in press.

Training and Capacity Building

The IODE presentation would not be complete without mentioning the training and capacity building activities. The training and education needs of Member States have been identified and are being met. Two training courses have been implemented; for the WESTPAC region in Japan, October 1996 for WESTPAC countries and in Copenhagen, November 1996 for Eastern and Central Europe. Due to staff and financial constraints, training courses for the ROPME countries and Eastern Africa have been postponed until 1997.

A number of countries have offered to provide facilities for short term training which are now being announced on the IOC WWW server as well as other training opportunities. The IOC is planning to start the production of an IODE video-based training and information dissemination programme as one of the contributions to the 1998 International Year of the Ocean. Member States are invited to co-operate and support this important undertaking.

IOC-TEMA activities are based on a regional approach in capacity building and closer links have thus been established with regional UNESCO offices. The IODE Regional Co-ordinators have been nominated to promote the IODE programme, its practices and procedures in the regions. Missions have been organized to Colombia and Ecuador to assist these Member States in improving data and information management infrastructure.

Resources

To implement the diverse responsibilities needed to support the increasing demand in ocean data and information management arising from the rapidly expanding user community, there is a strong requirement for increasing resources. The Committee succeeded in establishing important linkages with other organizations and external funding agencies, such as EU/MAST, ICES, ICSU, SIDA-SAREC, LUC, JAICA and others. However, Member States should consider expanding contributions to the IODE programme directly or "in kind" and through providing short-term secondments.

2.2 MARINE INFORMATION MANAGEMENT

GEMIM

The Fifth Session of the IODE Group of Experts on Marine Information Management (GE-MIM) was held in Athens, Greece between 17 and 19 January 1996. This Session was a special one as, for the first time, it was organized back-to-back with an IODE Session (IODE-XV, Athens, Greece, 23-31 January 1996). This presented a unique occasion to bring data and information managers closer together and discuss issues which cross the traditional data/information boundaries. This resulted in lively discussions which covered many aspects of MIM activities and products detailed below. The GEMIM Session recommendations for the period 1996-1998 focus on (i) the development of regional information networks; (ii) the development of the IOC WWW server; and (iii) an action plan which includes the development of a full-text CD-ROM of IOC publications, the Global Directory of Marine Science Institutions and Scientists, the MIM Publication Series, further development of the ASFISIS software and assist developing countries in joining the ASFA system, and the integration of information and data. During 1996 several of these Recommendations have been implemented:

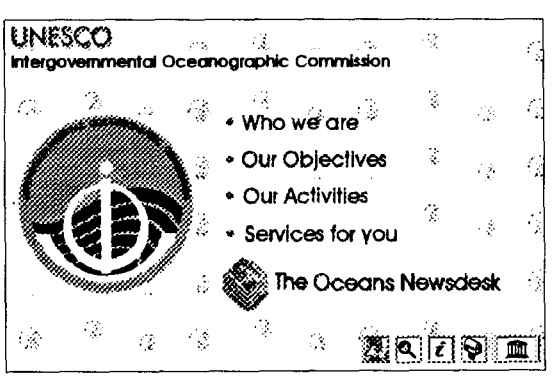
REGIONAL NETWORK

The Government of Belgium approved the second phase of the RECOSCIX-WIO project for a period of three years. The support includes a financial contribution of approximately US$ 300,000 over a period of three years, as well as staff support by posting a full-time project manager (Dr. E. Vanden Berghe) at the project's Regional Dispatch Centre in Mombasa. Phase II has started in April 1996. The new manager is bringing substantial experience in database management to RECOSCIX-WIO which will also be beneficial for the ODINEA project, supported under the IOC-Sida East Africa Marine Science programme.

In May 1995 a mission was organized jointly between IOC and Belgium to (i) investigate the project development status in the RECOSCIX-WIO collaborating institutions.; and (ii) to investigate the current data management capacity and requirements in marine science institutions in the IOCINCWIO region with a view to develop a regional marine data management network (ODINEA). The mission visited, between May and August 1996, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Mozambique, La Reunion, Seychelles and Tanzania. Two mission reports were produced with recommendations for follow-up.
Although it was planned, we were not able to proceed with the development of the **RECOSCIX-CEA** project, due to lack of funding. Nevertheless, it is expected that the pilot project of RECOSCIX-CEA will be initiated in 1997.

WWW

Started in September 1995, the development of the WWW has accelerated considerably in 1996. The server was completely revised in February 1996 to provide better navigation. Most IOC programmes are now providing input for the server on a regular basis.



In 1996 development concentrated heavily on user-oriented products. These include the '***The Oceans Newsdesk***' and the '*Services for you*'.

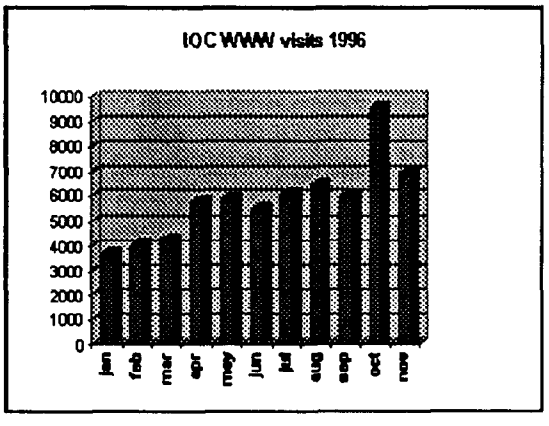
Statistics

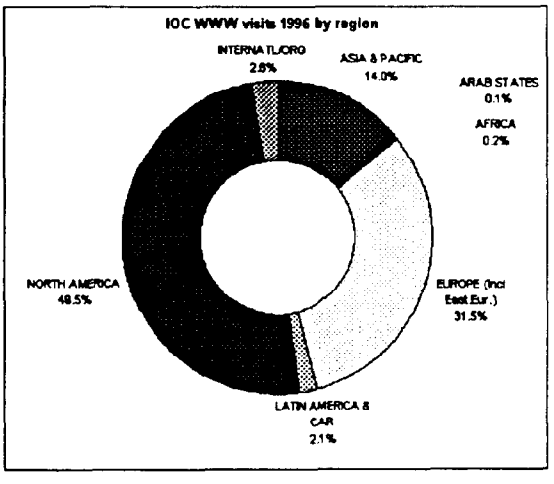
Overview of 1996

Between 1 January 1996 and 30 November 1996 the IOC WWW server received **64245** visits. This makes the IOC server the second most visited server of UNESCO. The below figures shows the evolution during the year.

Geographic distribution

In November 1996 49.5% of visits came from the United States and Canada, 31.5% from Europe (including Eastern Europe and Russia), 14% from Asia and the Pacific, 2.6% from international organizations (.int and .org), and 2.1% from Latin America and the Caribbean. The Arab States and Africa represented only 0.1 and 0.2% respectively.





The Oceans Newsdesk

- Subscribers to the **ioc-news** listserv are now automatically notified when new items are added in the newsroom.
- **WWW by E-mail** : established in November 1996 this service allows users to retrieve WWW items (html files) through E-mail. This is especially important to many users who have access to E-mail but not to complete Internet services which is required for WWW browsing. The IOC WWW by E-mail service aims mainly at users in developing countries.

Services for you

- **Ocean Pilot**: the 'Ocean Pilot' is a database which specializes in marine oriented servers: we have searched the Internet using many search engines, looked through many indexes and visited all the servers which are in the database. In many cases we have extracted information which describes what you will find in the server or we have identified subject keywords.The Ocean Pilot should be considered as a 'quick reference' to find WWW servers. It does not aim at being complete as this would be an endless task.
- **Ocean Experts Directory** is to become a Global Directory of Marine Science Institutions and Scientists. In 1996 we implemented a first database: the Western Indian Ocean Directory (WIODIR) maintained by the RECOSCIX-WIO project was loaded on the server. The database can be searched by name, country, institution or research subject. With the cooperation of several regional bodies additional directories for other regions are planned to be added in 1997. A standard questionnaire for information gathering has been prepared and is being distributed.
- **IOC's on-line Publication service:** in order to ensure better access for the user community to IOC publications we started with the loading of the main IOC publication series (Report of Governing and major Subsidiary Bodies, Reports of Meetings of Experts and Equivalent Bodies, Workshop Reports, Manuals and Guides, and Training Course Reports) on the server. We identified the Acrobat PDF (Portable Document Format) as a suitable format for multi-platform electronic document distribution. In 1996, **40** documents have been loaded on the server. Some selected reports are also being provided as html files. It is planned in 1997 to undertake a major document conversion exercise in order to scan and convert historical documents and load these on the server. The service will also be provided on CD-ROM which is now planned for 1997.
- **IOC's List of Acronyms**: The present list is the result of continuous systematic and thorough scanning of all working documents, reports and publications produced by IOC (in one or more languages) and other bodies co-operating with IOC, as well as of relevant scientific periodicals and publications. It has been compiled mainly for the use of translators, interpreters and terminology sections, not only of UNESCO, but also of other organizations of the UN system. The Languages and Documents Service is now making it available to the IOC Member States, UN agencies and the scientific community at large. The database contains over **2500** acronyms in English, French and Spanish.
- **International Marine Meetings List**: this database, maintained in collaboration with the ASFB Newsletter Editor (Australia), the Institute for Marine Scientific Research IZWO (Belgium), and PICES contains information on hundreds of marine related meetings covering 3 years (current + 2). A separate list contains details on IOC meetings.
- **Oceans Electronic Mailing Lists**: this service provides a compilation of electronic mailing lists (listserv) which have a Marine, Oceans or Coastal focus. The list has been compiled by Kylie Hall (Victorian Fisheries Research Institute, Australia) and Eric Baran (University of Lyon-1, France).
- **Ocean Software**: currently provides information on the Ocean-PC project but will shortly provide download service for various ocean data management software as well as the Micro CDS/ISIS based ASFISIS bibliographic information management and Directory management software.

ASFA

The IOC has continued its active involvement in ASFA (Aquatic Sciences and Fisheries Abstracts) by participating in the 1996 ASFA Board, and by providing support to the Kenya Marine and Fisheries Research Institute (KMFRI) as a new ASFA input centre.

EURASLIC

IOC assisted by CEC-MAST participated in the organization of the Biannual Conference of the European Association of Aquatic Sciences Libraries and Information Centres (EURASLIC) which took place in Malta, 25-26 April 1996. The workshop was attended by participants from Latvia Portugal, United Kingdom, Germany, France, Finland, Denmark, Lithuania, Belgium, Greece, Norway, Poland, Estonia, Morocco, Italy, Russia, Croatia, Bulgaria, and Malta. This allowed very useful exchange of information between the participants. Especially the linkages between the Eastern and Western European libraries created very interesting possibilities for future cooperation. Discussions were also held on the development of a European Directory of Marine Science Institutions and Scientists, a project which is currently being developed by IOC, the European Science Foundation and the Plymouth Marine Science Laboratory . During the meeting commitments were made by several participants to cooperate in this project by ensuring input to the database.

IAMSLIC

IOC provided support for several participants from developing countries in the 1996 Conference of the International Association of Aquatic and Marine Science Libraries and Information Centers (IAMSLIC), Monterey, USA, 12-17 October 1996. During the Conference IAMSLIC decided to strengthen collaboration with IOC through the publication of a joint IAMSLIC-IOC International Directory of Aquatic and Marine Science Libraries and Information centers, early 1997. Furthermore IAMSLIC will actively participate in the development of the Global Directory of Marine Science Institutions and Scientists. It was also agreed that the theme for the 1997 Conference will be 'Global change: crossing the boundaries' which will include discussions on the role of the information manager in multi-disciplinary research and in the management of meta-data.

2.3 ITSU AND OTHER IDNDR-RELATED ACTIVITIES

In compliance with the view of the Twenty-fifth Session of the IOC Council which named the tsunami programme as one of the IOC priority activities, increased support was provided for the implementation of the recommendations of the ITSU-XV (Papeete, Tahiti, 24-28 July 1995).

The first phase of the TIME project has been finalized with the publication of the TIME Manual and providing training opportunities for the application of the TIME methodology and numerical models in national tsunami mitigation activities. Training in TIME was arranged in Japan and Chile. The training course in Chile is worth a special mention as it attracted attention of many countries of central and south America and was an application of the "train a trainer" approach. Key trainers at the course have been those who received training earlier in Japan. The formulation of the project proposal for the second phase is now being finalized and will be brought to the attention of the next session of the ICG/ITSU - ITSU-XVI (Lima, Peru, 23-26 September 1997). Arrangements for the ITSU-XVI are progressing well with the completion of the agreement between UNESCO and Peru and drafting a first set of working documents. It is envisaged that invitation letters and the first set of documents will be despatched in February 1997.

Under the contract with the Novosibirisk Computing Centre of the Russian Academy of Sciences, the work is proceeding for the development of the Expert Tsunami Data Base (ETDB) to cover the entire Pacific. The results of the work will be reported at ITSU-XVI and may constitute an important contribution of the programme to the 1998 International Year of the Ocean.

The highest priority activity was given to support to ITIC. With the contributions of the USA and IOC the Centre implemented the annual visiting experts programme (2 experts from Colombia received training), published the Tsunami Newsletter, developed a WWW site and carried out Tsunami Bulletin Board operations. In April 1996, Mr. S. Farreras from Mexico after one year on duty left the post of the ITIC Associate Director. His contribution to the programme was acknowledged by a special letter. By IOC Circular Letter N°. 1507, IOC Member States were invited to contribute to ITIC and ICG/ITSU activities and give new proposals for the post of the ITIC Associate Director.

Co-operation with other international agencies in increasing the effectiveness of the tsunami system in the Pacific took much of the ICG/ITSU efforts. The joint IOC/ITSU and IUGG/Tsunami Commission Workshop on Operational Aspects of Tsunami Mitigation took place in Petropavlovsk-Kamchatskii, Russian Federation from 19-23 August 1996. The Workshop formulated scientifically proven recommendations which will be brought to the attention of ITSU-XVI for approval. The ICG/ITSU experts represented IOC at the meetings related to natural hazards mitigation such as ICAROS '96 Seminar, arranged for countries of the Caribbean basin (25-29 November 1996, in Venezuela) and the International Workshop on Disaster Reduction in the Mediterranean Region, arranged by IDNDR Secretariat (26-28 September 1996, in Italy). Support was provided to implement Hazards '96 Conference, the Workshop on Storm Surges and the International Conference on Natural and Technological Coastal Hazards both from 2-6 December 1996, in Tirupati, India.

In 1994, at the Yokohama World Conference on Natural Disasters, Member States were urged to refocus their efforts from relief operations to preparedness and increase of awareness. The ICG/ITSU took a few initiatives towards fulfilling this recommendation. New TREMOR systems were installed, the revision of the tsunami communication plan has been completed, the first 3 volumes of textbooks and teacher's guides on earthquakes and tsunamis have been published in English. The publication of the fourth volume is planned for the first quarter of 1997.

Thanks to the contribution of Russia and USA preparations have been finalized for the rebuilding of the tsunami warning system in the Kuril-Kamchatka region and the installation of new equipment will be carried out in the first half of the next year.

For many years IOC has been recognized as a leading agency in tsunami mitigation. In 1996, in response to the decisions of IOC and WMO governing bodies, the Commission started the development of a project proposal on storm surges in the northern part of the Indian Ocean. Interagency consultations between WMO, IOC, UNESCO(IHP) arranged by IOC in conjunction with the Workshop on Storm Surges in Tirupati, India helped to specify the timetable of the project development to identify a project leader and formulate the project objectives. It is endeavoured to make this project really intersectorial by including MAB, Sectors of Culture and Education in its development and implementation. Other international organizations as UNEP, ECOSOC will be invited to participate.

2.4 REMOTE SENSING AND RELATION TO CEOS

The last year has been a salient one for marine remote sensing. It started on March 21 1996 with the launch of MOS on the Indian Satellite IRS-P3. It was followed on April 26th with the launch of MOS on the Pirorda space station and the launch of OCTS and POLDER on ADEOS on August 17th. IOC in close cooperation with CEOS was prepared for the launch of

these sensors. On March 22-23 the first session of the IOC International Ocean Colour Coordination Group (IOCCG) was held followed by the Workshop on Ocean Colour Calibration and Validation. Both events were hosted by CNES. The IOCCG laid out its terms of reference and laid out its work plan in pursuit of the following goals:

- Foster Expertise in Using Data (Training)

Broaden the user community for ocean color, particularly in developing and emerging countries, through training courses and workshops. Facilitate development of data systems in these areas to support and sustain the user communities. Promote international cooperation in research and application development through international symposia, provision of data and software for scientific research and scientific exchange programs. Develop training materials that provide the user with the tools and the capability to utilize real data, both in the course of instruction and after the completion of the course material.

- Provide the Voice of User Community

Develop consensus among users on key issues related to satellite-ocean-color science and technology and communicate the collective view to those who design and operate satellite ocean color sensors and who develop, distribute and archive ocean-color-data products. Evaluate, on request, proposals from CEOS members for new sensors, new data products and new applications related to satellite-ocean-color measurement.

- Advocate the Importance of Ocean Color Data to Global Community

Develop appropriate information systems such as a newsletter, home page, and data access networks to show the importance of ocean color data to the global community. Organize workshops and conferences targeted at potential users of the data (e.g. fisheries, coastal resource agencies). Promote demonstration projects that involve both providers and users of ocean-color data.

- Optimize the Quality of Data for Calibration and Validation

Encourage the formation of an international calibration and validation network for ocean color. Recommend that sea truth measurements conform to accepted international protocols such as the SeaWiFS optics protocols and the JGOFS biogeochemical protocols, and that sensor calibrations be traceable to national calibration standards. Encourage the development of an international protocol for satellite sensor characterization, quality assurance of data, exchange of validation data. Facilitate the formation of a distributed calibration and validation archive and database network.

- Advocate the collection of essential ocean & atmosphere data

Identify processes and phenomenon relevant to the application of ocean-color data and publicize these through CEOS as well as other international fora, such as COSPAR, examining requirements for satellite data. Recommend data-collection strategies to fill existing gaps in time and space, of key variables.

- *Facilitate merging of Data*

Encourage agencies to agree on common formats for data exchange, common data products and algorithms. Facilitate provision of common tools to access data in different formats. Provide assessments of data quality and work to identify and eliminate errors and uncertainties of measurements. Recommend workshops to address issues relevant to data merging and integrated use.

- *Facilitate Access to Data*

Facilitate access to ocean-color data and ancillary data (wind, ozone, etc). Encourage the provision by relevant agencies of *in situ* data where such data are required for the derivation of secondary products. Recommend that both satellite and *in situ* data transit the data system together and are accessible in common data-exchange formats from the same source.

The Group elected Dr. Trevor Platt as its first Chairman. Within the context of CEOS Ocean Colour was established as a task of the Working Group on Information Systems and Services Sub-Group on Data. It is also represented by IOC on the User Panel of that Group. Ocean Colour was also represented on CEOS Working Group on Calibration and Validation where its sub-group on infra-red and optical sensors launched a program addressing the atmospheric correction for ocean colour sensors as well as other infra-red and optical sensors. Space agency support for this effort has been particularly beneficial in getting this activity up to speed.

IOC continued to participate in the other activities of CEOS regarding user requirements for ocean remotely sensed data. Of particular interest was the development by CEOS of the concept of an Integrated Global Observing Strategy (IGOS). This strategy will initially address how the space agencies will work together to address the many diverse interests of the Affiliate organizations. A meeting to address the remote sensing issues of this concept was held in Seattle in March followed by a meeting to address the *in-situ* interests which was held in Geneva in September. Subsequent to these meetings the CEOS plenary (Canberra, 13-15 November 1996) decided to form two groups to address the ongoing development of this strategy. The first is the Analysis Group which is designed to follow-on with work conducted by the CEOS Requirements Task Force and the Affiliates Requirements Group. The second is the Strategic Implementation Team that is composed of high level agency and affiliate people and designed to continue the development of the IGOS. IOC as an affiliate agency along with GOOS will participate representing the ocean community in both the Analysis Group and the Strategic Implementation Team. Interest continues to be expressed in regional coastal remote sensing products and an initiative in this regard is under development in the WESTPAC region

3. GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

3.1 AND PLANNING

3.1.1 The Joint Scientific and Technical Committee: J-GOOS

J-GOOS, though still hampered by limited resources, continued to make progress in establishing panels to address the design issues for the GOOS modules.

Health of the Ocean Module (HOTO)

The Strategic Plan prepared by the HOTO Panel was accepted and given wide distribution. With completion of that initial planning phase, HOTO membership and terms of reference were modified. The Committee agreed that the follow-on HOTO should move ahead with a regional implementation effort and directed that increased emphasis be given to human health issues and prognostic modelling aspects.

Living Marine Resources Module (LMR)

J-GOOS recognized that defining a course of action for an LMR Panel was not as straightforward as for the other modules. LMR is still in the "hypothesis" stage; the demonstrability of the end-to-end linkages from observations to operational products for managers has not been proven. Traditional stock assessment will not, in the next decade, provide the knowledge that can lead to an understanding of environmental controls of the stocks. Moreover, the actual spectrum of the user community has not been well identified. For this reason J-GOOS sponsored an LMR workshop to examine the issues and propose a plan of action and terms of reference for an LMR module. The workshop responded with an approach that combined models with observations that J-GOOS found persuasive. The Committee planned to move toward formal establishment of a Panel for the LMR Module along the lines developed by the workshop as soon as resources permitted.

Coastal Module (CM)

The Committee continued to emphasize the critical necessity of developing a sound strategy for a Coastal Module. An initial plan to hold a Coastal workshop as early as July 1996 for this purpose had to be aborted due to a series of meetings in that time frame that resulted in unresolvable schedule conflicts of key people being counted on to organize it. The workshop was rescheduled for February 1997.

Services Module (SVS)

As a result of recommendations from its *ad hoc* working group with oversight for the SVS Module, J-GOOS distinguished two distinct activities that had previously been incorporated in the SVS Module: (A) Marine Prediction and (B) Services for GOOS Modules. The former includes wave forecasts, safety at sea, tsunamis, ship routing/efficiency, storm surges, etc. J-GOOS decided it should provide scientific guidance on the development of observing and modelling involved in marine prediction and took steps to identify the scientific and technical issues that need to be addressed for this activity.

J-GOOS set up a planning group to put together an overall science-based plan for GOOS. They entrusted a consultant to achieve this plan. The final version of this plan should be ready in 1998 for the "Year of the Ocean" after submission to the different GOOS bodies and endorsement by I-GOOS. As some concerns were expressed by the GOOS sponsors about possible duplication or inconsistencies with the GOOS Strategic Plan prepared by the GOOS Strategy Sub-Committee, they agreed that there is a need to achieve a coordinated effort. The final title of this plan should be "The realization of GOOS: Priorities for Action". A draft version should be submitted at the next I-GOOS Session (Paris, 25-27 June 1997).

3.1.2 The IOC-WMO-UNEP Committee for GOOS and related matters

Progress in GOOS design and planning was reviewed by the IOC-WMO-UNEP Committee for GOOS at its second Planning Session, Washington, 16-17 May 1996. This Session was preceded by a NOAA-IOC Workshop on socio-economic aspects of the Global Ocean Observing System. 20 national representatives attended both events. The report of the Session was considered by the IOC Executive Council at its 29th Session where the following points were emphasized:

(i) **The Executive Council strongly endorsed** the concept of regional development of GOOS and related regional co-operation;

(ii) **The Executive Council encouraged** the integration of GOOS activities with GCOS and GTOS in relation to data management and space observations;

(iii) **The Executive Council stressed** the need to accelerate progress on the coastal module. Some concerns were expressed about the slow progress in its development;

(iv) **The Executive Council requested** I-GOOS and J-GOOS to work together on the Scientific plan for GOOS as recommended by the recent meeting of GOOS sponsors and incorporate a "phased approach" into the I-GOOS Strategy Sub-Committee (SSC) Strategic Plan to allow the implementation of GOOS elements as they become feasible;

(v) **The Executive Council supported** the holding of a "two-tier Priority Agreement" meeting in 1997, the second tier being to accelerate the immediate implementation of GOOS elements that are ready. **The Executive Council felt** that the "Priority Agreement" meeting should assist in defining the principles of GOOS and in integrating the needs for implementation.

Following the recommendations of I-GOOS PS-II, as well as recommendations of the Second Session of the I-GOOS SSC, Paris, 25-27 March 1996 and relevant recommendations of the Executive Council, the following actions have been taken:

(i) The final version of the document "Towards Operational Oceanography : the Global Observing System" was published and distributed by IOC;

(ii) A first version of the "GOOS Strategic Plan" was prepared by selected members of the I-GOOS SSC. The final version should be endorsed at I-GOOS III;

(iii) Establishment of a joint GCOS/GOOS/GTOS data and information Panel. The terms of reference of this Panel were prepared and should be endorsed at I-GOOS III;

(iv) Support was given to the TAO Implementation Panel as a Joint GCOS/GOOS/CLIVAR implementation Panel;

(v) Socio-economic studies and studies on "value of information" on GOOS potential outputs in selected regional areas have been undertaken;

(vi) Participate to the reflection on objectives and benefits arising from an Integrated Global Ocean Strategy. A first meeting on "*in situ*" Observations for the Global Observing System was held in Geneva and GOOS provided substantial background papers;

(vii) The outline of a "GOOS Handbook" was prepared. It was decided that this Handbook should be finalized in 1998 and a first version electronically accessible available in 1997;

(viii) New terms of reference were assigned to the Strategy Sub-Committee, while a reflection on a new GOOS organizational Structure began at the highest level, in order to increase co-ordination and cost/efficiency within GOOS governing bodies, reflection that should concretize in 1997;

(ix) A series of GOOS regional workshops, organized under the auspices of the GOOS Capacity Building Panel, combined with regional cost/benefits studies was planned in selected developing countries areas. The first workshop was organized in Goa, 18-19 November 1996. Nine developed and developing countries of the Eastern Indian Ocean participated in this workshop and expressed their national priorities among the GOOS modules.

GOOS Regional Development

The first stage of NEAR-GOOS plans is achieved with the implementation of the NEAR-GOOS Coordination Committee that met in Bangkok, 4-6 September and the implementation of two data base maintained by JMA and JODC in Japan that can be accessed and updated by participating Countries. Description of the system and electronic conditions of access was implemented at the GOOS Support Office on the IOC web server.

EuroGOOS

EuroGOOS published and distributed "The Strategy for EuroGOOS". The first EuroGOOS Conference was held in The Hague, 7-11 October, and attended by all European countries as well as by some developing countries owing to support provided by the IOC.

3.2. EXISTING ELEMENTS OF GOOS

3.2.1 Global Sea-Level Observing System (GLOSS)

Activities on the development of GLOSS were carried out in accordance with the Plan of Action for 1995-1997 period, adopted by the Eighteenth session of the IOC Assembly.

Following the resignation of Dr. David Pugh as Chairman of the IOC Group of Experts on GLOSS, Dr. Philip Woodworth was appointed as an Interim Chairman of the Group from 1 January 1996. The Executive Secretary of IOC expressed his appreciation and thanks to Dr. Pugh for his efficient leadership of the Group in developing GLOSS since the establishment of GLOSS as an IOC programme in 1985.

Dr. Woodworth initiated the preparation of a new GLOSS Implementation Plan in order to update the one adopted by the IOC Assembly in 1989.

Close contacts were maintained with WOCE sea-level activities, the International GPS Service for Geodynamics and regional sea-level programmes (South Pacific, Indian Ocean, Southern Ocean, IOCARIBE, IOCEA, MedGLOSS, etc..), and close contacts were established with CLIVAR and GOOS/OOPC in designing sea-level observational elements of those programmes.

The PSMSL continued producing GLOSS Bulletins widely circulated via WWW to provide information on GLOSS development and related scientific and operational sea-level activities, including, in particular, the IPCC Second Scientific Assessment on Changes in Sea-Level.

The PSMSL has continued playing an active role as the Global GLOSS Centre and its activities were supported by IOC.

Summary of the status of GLOSS from the viewpoint of data submission to PSMSL is given in the following table:

Cat.	Jun. 89	Oct. 90	Aug. 91	Oct. 92	Oct. 93	Oct. 94	Oct. 95	Oct.96
1	105	133	136	158	177	183	168	186
2	51	50	57	46	33	35	59	46
3	47	42	36	29	26	26	22	21
4	103	81	77	73	72	64	59	55
Total	306	306	306	306	308	308	308	308

Category 1: "Operational" stations for which the latest data is 1992 or later;

Category 2: "Probably operational" stations for which the latest data is within the period 1982- 1991;

Category 3: "Historical" stations for which the latest data is earlier than 1982;

Category 4: For which no PSMSL data exist.

There has been significant progress in 1996 during which the number of Category 1 stations increased over previous years.

The GLOSS CD-ROM was produced by the British Oceanographic Data Centre in co-operation with the Permanent Service for Mean Sea Level and with the support of the National Oceanographic Data Centre of the USA. It contains: an overview of the GLOSS system; the GLOSS Stations handbook; PSMSL Data Sets; PSMSL Public Access Files and two volumes of the IOC Manual on Sea-Level Measurement and Interpretation. The GLOSS CD-ROM was presented by the Executive Secretary IOC at a special event and made available to the participants of the Second Conference of Parties of the UN Framework Convention on Climate

Change (July 1996, Geneva) and also was widely distributed to GLOSS and IODE national contacts, participants of training courses and international meetings.

The IOC/GLOSS Seminar/Workshop on Sea-Level Observations and Analysis for Spanish and Portuguese-speaking countries of South America was held in Argentina, 19-27 November 1996. It was hosted by the Hydrographic Service of Argentina and attended by trainees from Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Mexico, Panama, Peru, Venezuela, Mexico and invited lecturers from UK, USA and Brazil.

Following the CIESM Workshop on a monitoring system for sea-level measurements in the Mediterranean Sea (15 February 1996), IOC and CIESM agreed to co-operate in organizing a monitoring system for systematic sea-level measurements in the Mediterranean and the Black seas (MedGLOSS) as a regional component of GLOSS, the organizations signed in June 1996 a Memorandum of Understanding on this matter. A joint IOC/CIESM Group of Experts on MedGLOSS was established to provide scientific and technical guidance to IOC and CIESM and countries of the region on the development of the system. Its first meeting was convened at IOC-UNESCO in Paris, early 1997.

Four tide-gauges, donated by Sweden and adjusted for tropical conditions by Germany, were sent by Germany to Cote d'Ivoire, Gambia, Nigeria and Guinea, in 1996. All these Member States had expressed their readiness to receive and install the tide-gauges.

The United Kingdom and the United States of America provided contributions to the IOC Trust Fund specifically in support of GLOSS activities.

3.2.2 Global Coral Reef Monitoring Network (GCRMN)

Coral reefs around the world have suffered a dramatic decline in recent years, with about 10% already degraded beyond recovery. Another 30% are likely to decline seriously within the next 20 years. It has been predicted that more than two-thirds of the world's coral reefs may collapse ecologically within the lifetime of our grandchildren, unless we implement effective management of these resources as an urgent priority. Coral reefs are an essential supplier of protein to subsistence communities; a valuable currency earner for low-income countries through exploitation of their resources, particularly through tourism; a protector of land; and a paradise of biodiversity. Reefs are home to a myriad of organisms, with many of them sensitive to prevailing climate and environmental conditions. Changes in the atmosphere, on land or in the sea all influence reef systems. Millions of people in developing countries depend on reefs for food and part of their livelihood. Reefs provide an important source of food for the inhabitants of countries as populous as Indonesia, Jamaica, Kenya and the Philippines. It has been estimated that coral reefs may account for 20-25% of the fish catch of developing countries. The economies of atoll nations and states such as the Maldives, French Polynesia and Marshall Islands are based on marine resources, mainly those of coral reefs. The Pacific is home to some 2.5 million people living on islands that are exclusively built by coral or surrounded by significant coral reefs. Another 300,000 people live on coral islands in the Indian Ocean, and many more in the Caribbean.

The dangers facing coral reefs today have more than one cause, but they all result from universal problems. The major factors causing coral reef decline are population growth and technological development e.g. pollution, sedimentation, overfishing, coral and sand mining,

unplanned tourism and curio collection). Lately another factor has entered the scene: global climate change may directly impose new stresses on reefs through accelerated sea-level rise, changes in the frequency and severity of storms and floods, changes in circulation patterns and the chemistry of sea-water. More worrying is that global climate variability and change may interact synergistically with more direct human pressures to cause added and accelerated environmental damage.

Our knowledge of the status and health of the world's coral reefs remains patchy. In order to make reliable assessments and prediction of the state of the coral reefs, there is an urgent need to develop an internationally co-ordinated coral reef monitoring system. Such a system should be established on a sound scientific basis, using reproducible basic methods, complemented with the use of new technology, including satellites, to provide information required for more efficient management and long-term conservation or protection of coral reefs. To be fully effective over a global scale, the monitoring network should extend to all coral reef user communities, thereby creating a partnership between scientists, resources managers and communities.

The first attempt to develop a global coral reef monitoring system was made through a partnership between the United Nations Environment Programme, the Intergovernmental Oceanographic Commission, the World Meteorological Organization and the World Conservation Union in 1990 in developing the UNEP, IOC, WMO and IUCN Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change. During the 7th International Coral Reef Symposium in 1992, many national institutions expressed their wish to participate in a pilot coral reef monitoring activity. In December 1994, several countries launched the International Coral Reef Initiative (ICRI) introduced by the United States of America at the SIDS Conference (Barbados, May 1994). In 1995, the 18th Session of the IOC Assembly on its part endorsed the ICRI Call to Action. The Assembly re-launched the Global Coral Reef Monitoring Network (GCRMN) and agreed on the appointment of an international co-ordinator for GCRMN using support provided by the US Government. IUCN and UNEP are co-sponsors. Hosting of the office for the GCRMN International Co-ordinator is currently shared between the Australian Institute of Marine Science (AIMS) and the International Centre for Living Aquatic Resources Management (ICLARM, Philippines). The five agencies together with ICRI form the GCRMN management group. A widely representative IOC-UNEP-IUCN GCRMN Scientific and Technical Advisory Committee has been established to provide scientific and technical advice to sponsoring agencies and governments on the development of GCRMN. The Chair of that committee is also on the management group. The strategies for developing the GCRMN were reviewed at the 8th International Coral Reef Symposium in 1996. This has resulted in this GCRMN Strategic Plan, which contains advice provided by the GCRMN Management Group and the Scientific and Technical Advisory Committee It is being published by the IOC.

The objective of the GCRMN is to provide an international network for long-term monitoring of biophysical and socio-economic aspects of coral reefs throughout the world. The aim is to assess the trends in biophysical status and social, cultural and economic values of the coral reefs, and to provide scientifically-based information required for improved protection, conservation, management and sustainable uses of coral reefs and related systems for people of the tropics and the world. The GCRMN is a response to the call of Chapter 17 of Agenda 21 and other international conventions and agreements, particularly the Convention on Biological Diversity. It will also contribute to the Global Ocean Observing System (GOOS) initiated by IOC jointly with UNEP, WMO an IUCS as a global framework for the gathering,

co-ordination, quality control, distribution and the generation of derived products of all kinds of marine and oceanographic data of common utility, as defined by the requirements of a full spectrum of user groups. It will also contribute data to the Global Terrestrial Observing System (GTOS).

Two advisory groups were established: the IOC/UNEP/IUCN Scientific and Technical Advisory Committee (STAC, Chairman: Dr. Bernard Salvat) is providing scientific and technical advice to the sponsoring agencies, regional organizations and governments on development; and the GCRMN Management Group provides high level policy, political and strategy advice. The Group consists of representatives of IOC, UNEP, IUCN, AIMS, ICLARM, ICRI and *ex officio* the Chair of STAC. The GCRMN Co-ordinator acts *ex officio* as the Group Secretary.

The development of GCRMN was reviewed by the first STAC meeting, and also by the IOC GCRMN Workshop, organized during the 8th International Coral Reef Symposium (Panama, June 1996). IOC provided financial support for participation of 13 reef specialists from developing countries in the Symposium. These experts provided valuable insight on how to implement coral reef monitoring in a range of developing countries.

The GCRMN Strategic Plan was prepared by the Management Group with the advice of the STAC. The Methods Manual for the GCRMN is currently being reprinted by AIMS and GCRMN Monitoring Protocols are being prepared to implement these methods in different countries with markedly different reef structures and cultures. A set of methods for gathering socio-economic data is being developed through collaboration between IUCN, UNEP and IOC.

Close contact has been established with ICRI (International Coral Reef Initiative) activities, particularly through co-ordination of regional activities and participation of the GCRMN Co-ordinator in ICRI Regional Workshops for the East Asian Seas and Western Indian Ocean/East African States regions. Two Regions (South Asia and Western Indian Ocean/East African States) have nominated GCRMN Regional Sub-Nodes and commenced planning for training.

Dr. C. Wilkinson visited the IOC Secretariat in November 1996 and discussed further development of the GCRMN, with the participation of Dr. P. Holthus, the coral reef expert at IUCN.

The Overseas Development Administration (ODA) of the UK has agreed to co-operate with IOC and other sponsoring agencies in establishing and supporting the position of the GCRMN Regional Co-ordinator in the South Asia region for the 1997-1998 period. This is due to commence in early 1997, with an operating budget for coordination and implementation of training and reef monitoring.

The goal is to extend GCRMN coral reef monitoring to all tropical countries with coral reefs. Further development and implementation of the GCRMN will require substantial financial support from and cooperation among Member States and sponsoring agencies and close collaboration with the ICRI activities.

3.2.3 Integrated Global Ocean Services System (IGOSS)

Apart from the routine tasks needed by an operational system such as IGOSS, 1996 was devoted towards the implementation of the specific decisions taken at the seventh session of the Joint IOC-WMO Committee for IGOSS (IGOSS-VII, Paris, November 1995). A first step was to practically establish the subsidiary bodies IGOSS needs to operate properly, viz this time the IGOSS Ship-of-Opportunity Programme Implementation Panel (SOOPIP) and the IGOSS Group of Experts on Communications and Products (GE/CP). This was done in accordance with rules and procedures by requesting the National Representatives for IGOSS whose countries wish to participate actively in the work of these groups to nominate representatives, through Joint IOC-WMO Circular Letters IGOSS Sp. No. 96-104 and 105, respectively.

One of the most urgent items considered by IGOSS-VII was the question of the international co-ordination and management of an operational ship-of-opportunity programme (SOOP), for which IGOSS-VII had elaborated a plan. A paper on the topic was presented by the IGOSS Operations Co-ordinator at Oceanology '96 in Brighton, United Kingdom, in March 1996. Most importantly, a meeting of the newly created SOOP Management Committee (SMC) was convened in May 1996, in Toulouse, France. This Committee has as primary terms of reference to: (i) co-ordinate and consolidate contributions of resources (expendables, ships, etc.) to the programme by national agencies; and (ii) make decisions about which measurement requirements can/will be met within the constraints of available resources. Its initial membership (which may evolve with time and needs) comprises: the Chairman of IGOSS (who chairs the SMC), representatives of scientific advisory bodies (such as the Ocean Observations Panel for Climate - OOPC), representatives of each agency contributing resources, a representative of the IOC-WMO Secretariats and the Chairman of the SOOPIP.

Following scientific advice from the OOPC, the SMC agreed that the initial IGOSS SOOP objective would be the maintenance on an operational basis of the low-density SOOP XBT network established under TOGA and WOCE. It further decided to develop and maintain a detailed tabular summation of the present status of and future plans for national contributions to maintain the agreed base network. This document will be updated annually and will serve as a basic and essential management document for the programme, both nationally and internationally. As a follow-up of this decision, a "XBT resources survey" was prepared by the IGOSS Operations Co-ordinator and distributed to Member States for comments and eventual amendments in July 1996, under Joint IOC-WMO Circular Letter IGOSS Sp. No. 96-107. The survey was completed in December.

A new code form for transmission over the Global Telecommunication System (GTS) of the World Weather Watch (WWW) of WMO had been implemented as from 8 November 1995, in particular to allow for the instrument type for XBT, with fall rate equation coefficients, to be documented in the messages. This new code, known as JJYY (as opposed to JJXX for the previous one) was increasingly used during the year, as reflected in the reports received from the IGOSS-IODE Global Temperature and Salinity Profile Programme (GTSPP).

With regard to information distribution, it is worth noting that the IGOSS home page on the World Wide Web has been enhanced and that a related page on XBTs was created for the IOC/GOOS home page.

Finally, it should be noted that the USA decided not to continue supporting the IGOSS Operations Co-ordinator position after the present Co-ordinator's departure, in July 1997.

Alternative secondments are being sought in this regard and any volunteering would be much welcome.

3.2.4 Data Buoy Co-operation Panel (DBCP)

The Twelfth Session of the DBCP (Henley-on-Thames, United Kingdom, 22-25 October 1996) was preceded by a Technical Workshop which was considered as having been a significant success in encouraging the exchange of information relating to data buoy activities, and in stimulating new developments in buoy and communications technology. A total of 23 speakers, several from new communications service providers, gave papers, which will in due course be published in the DBCP Technical Document series.

The DBCP session itself was attended by around 40 participants from 10 countries and nine organizations and covered a wide range of topics. The increasing numbers of Action Groups (which, in addition to the European Group on Ocean Stations, the International Arctic Buoy Programme, the International Programme for Antarctic Buoys and the International South Atlantic Buoy Programme, includes a new International Buoy Programme for the Indian Ocean and, within the very near future, the Global Drifter Programme, successor of the Surface Velocity Programme of TOGA and WOCE) and the large variety of other activities in which the Panel is involved, testifies to the growth in importance of the Panel and its work.

Serious concern was nevertheless expressed regarding the potential effects of continuing budgetary constraints on contribution levels by existing contributors in future years, and the consequent impact of this on the future of the technical co-ordinator position. The Panel therefore firstly urged both the Secretariats and Panel members to make every effort to recruit new contributors to the trust fund, stressing that even small contributions from several countries would have a significant positive impact on the future of the Panel. At the same time, it requested the Secretariats and the chairman to prepare for the next session a tabulated assessment of the likely impacts of future budget reductions and of possible scenarios to deal with these, while maintaining the required technical support.

Among the numerous technical and organizational issues tackled at the session, it is worth noting the proposal which had been developed during the intersessional period to establish a *Global Implementation Programme*. The Panel agreed with the underlying concepts of the proposal, in particular with regard to the future development of global deployment strategies to implement requirements from programmes such as GOOS and GCOS as they emerge; the maintenance of a database of programme information; the identification of possible areas of collaboration among programmes; and the provision of assistance to deployment programmes as required. At the same time, however, reservations were expressed concerning the formation of another "programme", with its implications of yet more committees and groups and additional bureaucracy. Recognizing that this certainly was not intended with the proposal, and also that the activities proposed would take some time to develop properly, the Panel therefore agreed to proceed slowly with the concept, with a first step being a reorganization of the agenda for its next session, to clearly separate technical from administrative issues and highlight the central functions agreed under the proposal.

Following usual practice, the Sixteenth Meeting on Argos Joint Tariff Agreement (JTA) was held after the DBCP session, from 28 to 30 October, in Henley-on-Thames. One of the key issues was the negotiating of a preferential tariff for authorized users (who are represented by a government signing a Memorandum of Understanding with Collecte - Localisation - Satellites (CLS) / Service Argos and are government funded or considered as non-profit) in 1997. It proved

not possible to implement the computation mechanism agreed at previous meetings, because the volume of activity under the Global Agreement was most likely to be too low. CLS/Service Argos agreed to take the risk of fixing a price which would be significantly below the one that would have resulted from the computation, because the company was keen to maintain a good spirit of co-operation with the JTA user community during a difficult period.

Another important issue was the recommendations made by the DBCP that: (i) a new tariff structure should be arranged that will encourage full-time data collection, with a minimal impact on data collection costs, in support of requirements of operational meteorology and oceanography; and (ii) the JTA should consider the provision of favourable tariffs for programmes that have both large numbers of platforms as well as common objectives for well-defined ocean-atmosphere missions and which operate over a long period to provide real-time data for GTS distribution. This led to the adoption, on an interim basis, of what was called the *Argos Large International Programme (ALIP)*, with the following basic principle: large programmes, using essentially standardized platforms which can be quite routinely processed by CLS/Service Argos, will benefit from an important discount (70%) on platform processing cost when such platforms come in addition to the initially committed number of such platforms. It is expected this might encourage the managers of those programmes to deploy more platforms than they had initially foreseen, since one important limitation in the number of platforms deployed rests with the processing costs. The meeting recognized that there remained many potential problems with the interim ALIP, and that these as well as others not yet identified would emerge during the course of the 1997 trials. It agreed that these problems would need to be satisfactorily addressed, together with a full ALIP proposal from the DBCP, at the next meeting, before any final decision could be made on a future long-term ALIP.

4. CAPACITY BUILDING IN MARINE SCIENCES, SERVICES AND OBSERVATIONS: TEMA

In addition to a number of study grants related to the IOC research programmes and services (provided through the regular programme of UNESCO, and following frequent and several individual requests for assistance), activities in capacity building carried out during 1996, include:

(i) Development of regional and sub-regional co-ordination and thematic networking emphasizing capacity building

In the framework of the standing UNESCO (IOC) and EC (FER) agreement for the Marine Science and Technologies axis, a Workshop on Management of Oceanographic Systems of the Eastern Pacific was held in the European-Latin American Centre (EULA), University of Concepcion, Chile, 9-16 April 1996, with participation of 80 experts from the Eastern Pacific as well as specialists from France, Italy, Germany, The Netherlands, Denmark and Spain.

The thematic areas developed are: a) Integrated Coastal Zone Management, b) Sustainable Management of Living Resources, c) Global Change, Air-Sea Interaction and "El Nino' Phenomena, d) Post-graduate Education and Research, and e) Marine Environmental Risks and Emergencies.

Feasibility studies to establish thematic and project networking for these five areas are in progress. The one on Integrated Coastal Zone Management has been completed and the other four are expected to be finished end March 1997.

As an output of the thematic area on Global Change, Air-Sea Interaction and "El Nino" Phenomena, a consortium between two major Chilean Universities, with participation of main research institutes and universities of Colombia, Ecuador and Peru has been consolidated through a "Programme for Regional Studies in Physical Oceanography and Climate in the Eastern South Pacific Ocean". The project is supported through national efforts, IOC and SIDA/SAREC.

Associated to the latter thematic area, the 8th Session of the Joint IOC/WMO/CPPS Working Group on the "El Nino' Phenomena, was held in University of Concepcion, Concepcion, Chile, 17-18 April 1996, with attendance of representatives from 11 member states. In addition to endorsing the consortium Project mentioned above, main outputs relate to: the revision of the Terms of Reference for the Joint Working Group; and, a preliminary discussion of a potential GEF initiative to improve oceanographic operational capabilities in the South East Pacific. The latter initiative (led by WMO with support of IOC and CPPS), will be reviewed during a workshop in Bogota, Colombia, August 1997.

The pilot capacity building networking exercise for Latin America, will be completed during 1997, with: (i) Pluridisciplinary Workshop on the Wider Caribbean Network on Integrated Coastal Area Management, to be held in Cartagena, Colombia, 2-7 June 1997, which is mainly co-sponsored by the IOC of UNESCO, the European Union (through FER) and the Colombian government, as well as bi-lateral agencies of European countries and some UN organizations; (ii) Workshop on Management of Oceanographic Systems in the South-Western Atlantic Ocean, to be held in Porto Alegre (Gramado) Brazil, 16-23 September 1997, following a format and with financial assistance similar to the Workshop for the Eastern Pacific. Co-sponsorship of ASOS and MERCOSUR is also under consideration.

Results from the three events above will be presented to an overall EC-FER-UNESCO-IOC evaluation conference in Madrid, December 1997. This will be regarded as an IOC contribution to the 1998 International Year of the Oceans.

Additional activities related to the networking effort, include preliminary co-ordination with the MEDISLE networking for the Mediterranean islands, based upon the Euro-Mediterranean Centre on Insular and Coastal Dynamics, Foundation for International Studies Institute, University of Malta. IOC participated at the meeting for the establishment of a Mediterranean Network for Islands Sustainability (Valetta, Malta, 24-25 July 1996) and has been requested to be part of the scientific committee for a Workshop on Insular Coastal Area Risk Management in the Mediterranean, to be held in the same place in October 1997.

(ii) Partnership with other Capacity Building Programmes in marine sciences and technology and services

Co-ordination has been maintained with the UN/DOALOS-UNDP Train-Sea-Coast Programme which will be invited to participate in the Second Meeting of the TEMA Group of Experts for Capacity Building (Bremen, Germany, 12-14 May 1997), as well as to the Cartagena and Porto Alegre TEMA Workshop.

(iii) Clearing House Reference system on Marine Science and Technology training opportunities

A second and more elaborated version of the TEMA Directory for Latin America and the Caribbean is under elaboration and will be provided to the TEMA Group of Experts for

comments. Additional information on other regions will be progressively incorporated, including electronic mail facilities at experts/institutions level.

The First Meeting of the TEMA Group of Experts for Capacity Building, was held in Paris, 8-10 July 1996. The Group, comprised of 12 experts selected among candidatures submitted by Member States, reviewed among others, the main topics described above. The second meeting will be held in Bremen, Germany, 12-14 May 1997.

Training, education and assistance activities within the subject area and regional programmes of IOC are reported in the respective sections of this report. Examples of other specific training actions are the Germany/IOC training course on marine geology, Indonesia, October 1996, the preparation and presentation of the CD-ROM on existing sea-level data, and the considerable support to the Floating University Programme.

5. REGIONAL ACTIVITIES

5.1 IOC SUB-COMMISSION FOR THE CARIBBEAN AND ADJACENT REGIONS (IOCARIBE)

Following the evaluation of IOCARIBE activities since its initiation as a Sub-commission in 1995, IOCARIBE is starting a new phase, especially in the process of strengthening and developing knowledge throughout the region and reinforcing national capacities of all its Member States. During 1996 the Sub-Commission has focused its activities on the implementation of Recommendations and the Action Plan discussed and formulated during its Fifth Session held in Barbados, December 1995.

As a follow-up to the Evaluation Report an IOCARIBE Medium Term Strategy and Action Plan was prepared by the Acting Secretary of IOCARIBE in consultation with Member States and IOCARIBE Officers. After circulating the document among Member States, the IOCARIBE Medium Term Strategy 1996-2000 (Revised Version) and Action Plan was approved and endorsed by the IOC Executive Council at its Twenty-ninth Session (24 September - 2 October 1996).

New Officers were elected for the next Intersessional Period of the Sub-Commission: Dr Bradford Brown from the USA was elected as Chairman, and Dr Leonard Nurse from Barbados, Dr Marco Polo Bernal-Yarahuan from Mexico and Captain Sigifredo Velandia-Rocha from Colombia were elected as Vice-Chairmen.

Several efforts are being made to increase awareness and presence of IOCARIBE in the region. To cope with this objective, the Caribbean Directory Database IOCARIBE "Yellow Pages" has been established and is intended to comprise the Directory of Marine Institutions and Scientists of the Caribbean Region. These IOCARIBE "Yellow Pages" are expected to be published on WWW through Internet, IOC Home Page.

The IOCARIBE Newsletter "IOCARIBE NEWS" is being printed on a regular quarterly basis in two languages, English and Spanish, and is produced with the support of the South-East Fisheries Science Centre and the advice of Mr Fred Berry who is working part-time for IOCARIBE and the SEFSC in Miami. The IOCARIBE NEWS has a large distribution among Member States, scientists within the Caribbean region, as well as outside the region.

An IOCARIBE magazine/publication is planned to highlight main IOCARIBE activities and including some pictures. It is expected to be published in colour and is intended to re-inforce marketing of IOCARIBE among Member States and also within the scientific community.

The Government of Colombia provided IOCARIBE with an additional contribution for the provision of new air conditioning equipment for the office.

A new staff member paid from the Annual Colombian Contribution has been hired. Ms Luz Milena Chan is working in IOCARIBE since March this year. Ms Chan is the Assistant of the IOCARIBE Secretary and is involved directly with the development of databases in IOCARIBE. She is a computer specialist.

The IOCARIBE Marine Information Centre has been properly organized and documentation is now classified by programme (e.g. MPRM, OPC, CZM) and subject. A list of 'IOCARIBE Documents in Stock' has been prepared including reports of all meetings and workshops held mainly in the Caribbean region, where IOCARIBE has played an organizational role. This list has been circulated among Member States for their information and consultation.

In the field of telecommunications, Internet connections have been established in the Regional Secretariat with an additional telephone line dedicated for that purpose. IOCARIBE has established communications via E-mail, and the IOCARIBE Home Page will be established in the near future in the IOC Home Page.

The IOCARIBE Office is reinforcing its role as an UNESCO Regional Office. The Secretariat has also established necessary technical requirements (dedicated telephone line and modem) in order to establish direct communications with UNESCO through the SITA (Societe Internationale des Telecommunications Aeronautiques) Network, which is the system used by UNESCO to establish communications with the field Officers. Adequate software and necessary training for the IOCARIBE staff will be received from a UNESCO staff member in the IOCARIBE Office by December 1996.

Within the framework of the IOCARIBE Programme on Ocean Processes and Climate OPC the Project on Global Climate Change - Establishment of a Regional Monitoring Network is underway and is planned to be finalized by the end of this year. Geomorphological maps are being done and a Manual on Beach Dynamics and Coastal Mapping is being prepared. A workshop to evaluate the manual will be convened in 1997.

The regional network of tide gauges was enhanced with two new tidegauges - one in Guyana and another one in Jamaica. A book on Small Island Oceanography has been prepared and edited by Dr George Maul, former IOCARIBE Vice-Chairman and Project Coordinator for OPC and GLOSS in the Caribbean.

As a follow-up of IOCARIBE Recommendation-V.5 Part B on Ocean Processes and Climate, an IOCARIBE Tsunami Warning System Workshop was convened in the University of the Virgin Islands, St. John, May 23-24, where an IOCARIBE Tsunami Warning System was proposed with the purpose of programme development to include education, monitoring, forecasting, communications and mitigation of the Tsunami hazard in the Caribbean and Adjacent Regions.

IOCARIBE has been supporting the Oil and Marine Debris component of the Marine Pollution Research Control and Abatement Programme and in conjunction with the Centre for

Marine Conservation assisted in the organization of the 1996 Beach Cleanup Campaign for Colombia with the FIR Rosario Islands Foundation. To reinforce these components IOCARIBE co-sponsored two meetings in Cartagena: (i) a training workshop convened in March 1996 "Train the Trainers" where several teachers, students and environmental authorities of the City of Cartagena received training on treatment and effects of Marine Debris; and (ii) first Technical Meeting on the Wider Caribbean Initiative for Ship Generated Waste (WCISW) convened also in Cartagena on March 4-8, 1996. IOCARIBE is a partner in the GEF Project on WCISW.

The Sub-Commission is in the process of obtaining funding from donor agencies such as SIDA-SAREC, US-NOAA, US-EPA and the World Bank to develop and implement scientific projects in the Caribbean region.

During 1996 IOCARIBE has played an organizational role and/or has participated in the following meetings:

- First Technical WCISW Workshop (Cartagena, 4-8 March 1996)
- Workshop "Train the Trainers" (Cartagena, Colombia, 9 March 1996)
- First Meeting of the Board of Officers of IOCARIBE (Cartagena, Colombia, 15 March 1996)
- Interamerican Conference of Ministers of Science and Technology (Cartagena, Colombia, 28-30 March 1996)
- IOCARIBE Tsunami Warning System Workshop (University of the Virgin Islands, St. John, 23-24 May 1996)
- Fifth Caribbean Marine Debris Workshop (Curacao, NA, 22-25 July 1996)
- CPPS Meeting of Experts on Land-based Sources of Marine Pollution in the SE Pacific (Bogota, Colombia, 31 July - 2 August 1996)
- EUROGOOS-95 Conference (The Hague, 7-11 October 1996)
- II International Conference on Hazards in the Caribbean (Kingston, Jamaica, 9-12 October 1996)
- Fifth Session of the Workshop on Global Oceanographic Data and Archeology Rescue Project GODAR-V (Cartagena, Colombia, 8-11 November 1996)
- Workshop on Integrated Framework for the Management of Beach Resources within the Small Island States (Puerto Rico, October 1996)
- Sixth meeting of the Editorial Board of the Caribbean Sea and the Gulf of Mexico (IBCCA) (CIOH, Cartagena, 18-20 November 1996)
- Association of Caribbean States: Technical Committee for the Protection and Conservation of the Environment in the Caribbean (Caracas, 21-22 November 1996).

5.2 IOC SUB-COMMISSION FOR THE WESTERN PACIFIC (WESTPAC)

The Third Session of the IOC Sub-Commission for WESTPAC

The Third Session of the IOC Sub-Commission for WESTPAC was held in Tokyo, Japan, 26 February - 1 March 1996, with participation of thirteen Member States and 6 organizations. The meeting first reviewed the development over the last intersessional period, notably the establishment and coming into operation of the IOC regional secretariat for WESTPAC; the convening of the 3rd Scientific Symposium focusing on marine science contribution to the Integrated Coastal Area Management; and the completion of the implementation of the programme of work for 1993-1995. Much progress had been made over the past years on many WESTPAC projects, e.g. Harmful Algal Bloom, especially in terms of training and publication and distribution of reference material. Paleogeographic Map, with the first maps of Last Glacial

Maximum (LGM, 20,000-15,000 years ago) being published, the completion of two intercalibration exercises on nutrient analysis (1994 and 1995), the launching of the Asia-Pacific Mussel Watch Programme in cooperation with UNU and UNEP, and the initiation of the North East Asia Regional GOOS (NEAR-GOOS).

In formulating the Programme of Work for 1996-19998, much emphasis was given to the follow-up to UNCED, particularly Chapter 17. The WESTPAC programme activities were reformulated so as to ensure that its activities contribute towards solving global and regional problems, e.g. Integrated Coastal Area Management (ICAM), and provide services to various types of users. In this connection, a new interdisciplinary project entitled "Cooperative Study on the Gulf of Thailand" was initiated. The NEAR-GOOS project which aims at providing oceanographic services (physical oceanographic parameters, to be followed by chemical and biological measurements) to various users on a real or near-real time basis was also adopted. Other projects approved along these lines include the Pacific-Indian Ocean Through-flow in conjunction with participation in CLIVAR Asian-Australian Monsoon System Study, the Global Coral Reef Monitoring Network, the Asia-Pacific phase of International Mussel Watch, Harmful Algal Bloom, River/Atmospheric Inputs to the Marine Environment, and the Health of the Ocean Module of GOOS. A seminar on the contribution of marine science to ICAM was held back-to-back with the meeting to allow more academic inputs to decision-making in this respect.

The on-going cooperation with UNEP, WMO, IMO, ESCAP, CCOP, SOPAC, PICES, APEC, JECSS, ASEAN in the implementation of WESTPAC projects received much emphasis, in order to increase efficiency and avoid duplication of efforts. Cooperation with international and national donors was also given a lot of attention with a view to mobilizing enough resources for the effective implementation of the WESTPAC projects.

Implementation of Regional Programmes

Development and Operations of NEAR-GOOS

To prepare the NEAR-GOOS Implementation Plan, an Expanded Experts Meeting was organized in the IOC Regional Secretariat for WESTPAC, Bangkok, Thailand, 8-10 January 1996. Experts from China, Japan, Republic of Korea and Russia participated in the meeting. It was suggested that an Operations Manual should be prepared for the NEAR-GOOS implementation.

Following the decision of the WESTPAC-III, a Co-ordinating Committee for NEAR-GOOS has been established, with 2 members, nominated by the respective governments, from each participating country. The first meeting of the Co-ordinating Committee was held in the IOC-WESTPAC Secretariat, Bangkok, Thailand, 4-6 September 1996. The Implementation Plan and the Operation Manual were discussed and finalized.

The meeting re-confirmed that the system should be developed as an open system for all who are interested in contributing to and access data from the system, free of charge. The meeting also discussed the procedure for the registration, technical aspects of the operation of the system, training activities in this project and the relevant homepage. To encourage wider participation and data exchange, the meeting agreed to establish real-time and delayed mode databases, as well as the associate databases for the operation of the system.

The meeting report was submitted to the Twenty-ninth Session of the IOC Executive Council. The Executive Council agreed to start the NEAR-GOOS cooperation as soon as possible. The oceanographic data in the NEAR-GOOS region has been provided via Internet.

The Operation Manual is being translated to Japanese and Chinese for easy reference to the participants.

The operation of NEAR-GOOS has been started.

Preparation of the Project on the Co-operative Study of the Gulf of Thailand

As adopted by the WESTPAC-III, a new project on the Co-operative Study of the Gulf of Thailand is starting its implementation in the region, as well as outside the region.

A questionnaire has been circulated to the coastal countries concerned and other potential institutions outside the region. About 30 positive responses have been received with identification of the available historical data and existing monitoring programme. Based on the information, a draft scientific plan is being prepared by the Project Leader.

A national workshop on the implementation of the project is being organized in the National Research Council of Thailand, early 1997. Scientific input and suggestions on the implementation were obtained from institutions. An on-board training exercise was organized in cooperation with SEAFDEC.

Paleogeographic Map

The IOC/WESTPAC Paleogeographic Map for the last glacial maximum of the region has been compiled and published covering the entire WESTPAC region. The map (1:20,000,000) is accompanied by two data maps (1:10,000,000) for the northern and southern hemispheres, and by a volume of explanatory notes. The map shows the paleo-coastlines, sea surface temperature, sediment types, sea-ice limits, some geomorphological features, etc., with paleogeographic information from a total of 779 offshore and onshore sites.

As seen from the map, the emergence and submergence of extensive continental shelves are the most outstanding geographic features of the late Quaternary glacial cycles in the WESTPAC region. The sea-level induced environmental signal has been amplified in the marginal seas, giving rise to drastic changes in the sea areas and configurations, and to reorganization of sea water circulation. It is found out that the glacial geographic changes have had profound impact on regional and global climate change, since most of marginal seas are influenced by monsoon circulation, and some of those are located within the warm pool of the Western Pacific.

The next WESTPAC Paleogeographic mapping for Holocene was proposed and adopted by WESTPAC-III, to compile Paleogeographic maps for 6000-7000 ABP showing coastlines, sediment type, vegetation and hydrological conditions. A workshop is planned to be held in early 1997.

Harmful Algal Bloom in the WESTPAC Region

As one of the most active projects in the WESTPAC region, the Harmful Algal Bloom programme plans to have annual training courses for the WESTPAC member states for the next 10 years. The IOC/WESTPAC Training Course on Species Identification of Harmful Microalgae is planned to be held in the Asian Natural Environmental Science Centre, Japan, Tokyo, 28 February - March 1997.

International Bathymetric Chart for WESTPAC

The Second Editorial Board for the IBCWP was held in Bangkok, Thailand, 9-12 December 1996. A separate report is available.

Public awareness - WESTPAC Newsletter

The fourth issue of WESTPAC Information, the newsletter for the Sub-Commission, has been prepared and published by the IOC Regional Secretariat and distributed widely to the member states within and outside the WESTPAC region.

The fifth issue is planned for publication in December 1996.

The WESTPAC Brochure was prepared and distributed.

Co-operation with other organizations

CCOP

A Memorandum of Understanding on the cooperation with CCOP was signed on 1 February 1996, by the Director of the CCOP Technical Secretariat and Deputy Director of the IOC/WESTPAC Secretariat. Regular meetings are being held between two secretariats.

The Director of CCOP Technical Secretariat attended the Third Session of the IOC Sub-Commission for WESTPAC in Tokyo, Japan, 26 February - 1 March 1996.

The Deputy Director of the IOC/WESTPAC Secretariat attended the 33rd CCOP Annual Meeting, Shanghai, China, 30 October - 3 November 1996.

A proposal to form a working group among the secretariats of CCOP, ESCAP and IOC/WESTPAC has been agreed on and the first meeting was organized in December 1996.

UNEP

To develop the project document on the Northwest Pacific Action Plan (NOWPAP), two meetings were organized during 1996, with IOC-WESTPAC represented at both meetings, i.e. Technical Experts Meeting, Bangkok, 9-11 September 1996, and the Second Intergovernmental Meeting, Tokyo, Japan, 18-20 November 1996.

The project document was adopted by the 2nd Intergovernmental Meeting with approved budget for the implementation of 5 priority projects identified by the member countries. IOC was invited to be the implementing agency for:

NOWPAP/1	Establishment of comprehensive database and information management system;
NOWPAP/3	Establishment of a collaborative, regional monitoring programme.

IOC has accepted the invitation and a Memorandum of Understanding on this matter will be signed by IOC and UNEP. The total budget for the first phase of the two projects is about US$ 201,000. The projects are expected to be implemented starting from February 1997.

IOC was represented at the 12th Session of COBSEA, Manila, the Philippines, 3-4 December 1996.

WMO

The WMO/IOC project proposal on South-East Asian Centre for Atmospheric and Marine Prediction (SEACAMP) was finalized in the Second Meeting for the project, Singapore, 6-8 May 1996. The proposal will be submitted to the ASEAN Sub-Committee on Meteorology and Geosciences by Singapore, and to the ASEAN Committee on Science and Technology for approval.

Other organizations

As invited by APEC Marine Resources Conservation Working Group, a project proposal on Inventory of the Ocean Observation and Monitoring Programmes in the Asia and the Pacific was prepared and passed to the APEC Scretariat, January 1996. The proposal was discussed by the Working Group meeting, and it will be further developed.

SEA START Regional Centre. Co-operation with South East Asian START Regional Centre is undertaken, to facilitate co-operation in the fields of training and research, in particular, the training on the data and information network.

Secretariat

During 1996, the IOC Regional Secretariat continued its operation with one professional staff and staff supported by the National Research Council of Thailand (NRCT). During WESTPAC-III, it was announced that a new UNESCO post at P-4 level would be recruited. At the 29th Session of the IOC-EC, the government of Sweden informed the meeting that an associate expert will be seconded by the government to the IOC/WESTPAC Secretariat.

Thanks to the generous and continued support from NRCT, and administrative assistance from UNESCO Office in Bangkok, PROAP, the secretariat office operated effectively in the year of 1996.

Co-operation with South Pacific

The focus of WESTPAC is the South East Asian coastal area and the ocean area bordering the Asian continent. Collaborative activities with the regional organizations of the South Pacific such as the South Pacific Geosciences Commission (SOPAC) and the South Pacific Regional Environmental Programme (SPREP) suggest that IOC utilize WESTPAC to undertake the various coordination activities required. Most WESTPAC member countries have bilateral programmes with countries and regional organizations in the South Pacific which indicates that the expanded use of WESTPAC for coordination purposes could be beneficial. Initial talks with both SOPAC and SPREP indicate a willingness to operate in this manner. A process is underway to formalize this approach which is subject to further approval.

Discussions have continued with the relevant South Pacific regional organizations to develop cooperation in GOOS-related activities. The IOC participated in the annual session of the South Pacific Applied Geosciences Commission (SOPAC) to brief the meeting on IOC activities, particularly the GOOS programme. The meeting decided that cooperation with IOC should be pursued and several specific activities were identified, including: Science conference on

Habitats to be co-sponsored by IOC and SOPAC and others, to be held in NOUMEA during November 1997. This will link biology, geology and chemistry in study of various habitats with the objective of setting in place long term monitoring and observing systems; workshops on harmful algal blooms, GOOS capacity building and health of the ocean; several sponsors will be sought and linkage will be made to the 1998 International Year of the Ocean if possible.

An exchange of letters has been initiated to describe the terms of reference for cooperation. To effect cooperation it will be necessary to attend respective meetings of the organizations. It has been suggested that SOPAC represent the South Pacific region at meetings of GOOS. This could lead to the formation of Pacific GOOS. Also, the South Pacific region could be viewed as a region wherein pilot studies of GOOS could be carried out, perhaps in conjunction with the North East Asia Regional GOOS.

Advantage was taken of the participation of the South Pacific Regional Environmental Programme (SPREP) Director at the SOPAC meeting and similar discussions were held with him concerning cooperation with IOC. These were very positive and an exchange of letters is in progress to clarify the understanding. SPREP is particularly interested in GOOS and might be willing to co-sponsor several of the identified workshops.

In order to utilize supplementarity in raising awareness of marine environmental issues, SPEARHEAD EXHIBITIONS and IOC have forged a cooperation agreement involving Spearhead's organization of the Oceanology International Pacific Rim Conference in Singapore, 1997, and for future conferences in this series. After being contacted by Spearhead, the Executive Secretary IOC agreed to provide information on contacts in the marine science community in exchange for publicity of IOC, support for IOC participation and meeting facilities at the conference sites. IOC will also assist in publicizing the conferences through its newsletter and its membership. The IOC logo will appear prominently on flyers and brochures advertising the meeting.

The Singapore conference in 1997 will have a session on GOOS at which Dr Aprilani Soegiarto will give the keynote address at the invitation of Spearhead Exhibitions. Dr Nic Fleming will also give a paper on GOOS and IOC member states might consider other activities that might be scheduled in conjunction with the conference.

5.3 IOC REGIONAL COMMITTEE FOR CO-OPERATIVE INVESTIGATION IN THE NORTH AND CENTRAL WESTERN INDIAN OCEAN (IOCINCWIO)

IOC-Sida

IOC was requested by Sida to prepare an overview of IOC-SAREC cooperation between 1990 and 1995. This review was submitted to, and evaluated by Sida. At the same time IOC submitted a three-year draft workplan to Sida which was subsequently approved. IOC-Sida cooperation was considered successful and will continue for another three years.

OSNLR

Two experts from Kenya and Tanzania respectively were contracted to compile a set of methodological guidelines for the assessment, interpretation and management of coastal changes in the region. Ten regional experts have been identified who will contribute material for the guidelines. These guidelines are planned to be submitted to IOCINCWIO-IV (May 1997) and subsequently ground-truthed in already identified pilot study sites.

OSLR

A Harmful Algae Workshop was organized at the University of Mauritius from 5-14 February 1996 with participation of 7 persons from different countries in the region and local participants from Mauritius. The main task of the training course was to improve the scientific knowledge of the participants with respect to identification of harmful marine microplankton. The activity was supported by IOC, Sida/SAREC and Danida.

Marine Pollution

During 1996 IOC launched a mission to assess national capabilities in regard to carrying out base-line monitoring studies of Pesticides, Metals, Nutrients, Persistent Organics, Water Sediment Load, Dissolved Oxygen, and Turbidity. This action follows the outline based on the recommendations arisen from the IOC-Sida (SAREC) Field Study Exercise on Nutrients in Tropical Marine Waters (IOC Workshop Report No 99) where the expert group recommended to follow the IOCINCWIO action plan with regard to establishment of Base-Line Stations under the GIPME/MARPOLMON programme. Based on the results and the institutional capabilities, contracts are being issued with five countries in the region to initiate the monitoring programme. The aim is to continue to upgrade the capabilities and human resources in order to produce and obtain data and information needed for planning and management purposes. A clear linkage to the ICAM programme will be ensured. The aspiration is to have the base-line monitoring stations coherently running and thus gathering data on the above elements by mid-1998.

ICAM

Two major ICAM-related activities were supported by IOC in 1996: (i) IOC-World Bank-Sida/SAREC Workshop on Integrated Coastal Area Management (Nosy Be, Madagascar, 14-19 October 1996); and (ii) IOC Regional Worskhop on Coastal Oceanography and Coastal Zone Management (Moroni, Comores, 16-20 December 1996).

WIOMSA

Support to WIOMSA and its activities was further increased in 1996: the Marine Research Grants (MARG) are a clear success and are boosting research activities in the region. This year 12 long-term research grants (one year), totalling US$ 70,000 were disbursed to individual scientists from Kenya, Mozambique and Tanzania. A wide awareness campaign is expected to attract applications from additional countries in the region.

Support to the WIOMSA Secretariat was continued through provision of office equipment (PC and photocopier), funds for operational expenses, and participants support for the 1996 WIOMSA Board of Trustees.

Travel Grants

Eight individual travel grants for a total of US$ 20,000 were provided in 1996.

Communication

In 1996 access to the Internet for scientists in the IOCINCWIO region has improved in most countries. IOC has renewed its e-mail support for a few requesting institutions. WWW

access is now available in Mauritius (University of Mauritius) and is expected soon in a number of institutions in Kenya. We expect that other countries will follow suit in 1997/1998.

In order to ensure human capacity for the development of WWW servers travel grants was provided for the participation in the INET 1996 Workshop on Technology for countries in the early stages of internetworking.

Data Exchange: ODINEA

At the Third Session of IOCINCWIO (Mauritius, December 1994), the need to enhance capacity to manage the data collected within the framework of the scientific programmes was clearly recognized and it was agreed that the RECOSCIX-WIO RDC could function as a regional centre for the distribution of the data. A project proposal for the establishment of an Ocean Data and Information Network in Eastern Africa (ODINEA) was developed in 1995. In January 1996, during the 15th Session of IODE (Athens, Greece), the ODINEA Project Proposal was endorsed and the IODE Committee called on Member States to support the project to: (i) strengthen national data management capacity; (ii) to develop a regional data and information network, noting that RECOSCIX-WIO could be adapted to serve these needs. In May 1996, as part of a joint IOC-Belgium expert mission, RECOSCIX-WIO cooperating institutions were consulted about the ODINEA project and possible IODE DNAs were identified. Kenya nominated the Kenya Marine and Fisheries Research Institute (KMFRI) as a National Oceanographic Data Centre (NODC). IOC provided two PCs to KMFRI in order to start pilot activities of the NODC.

Information Exchange: RECOSCIX-WIO

The Government of Belgium approved further support to RECOSCIX-WIO for another three years. Although the services and products developed during Phase 1 will be continued, emphasis during Phase 2 will be on the development of data products in general, and on the production of a CD-ROM in particular.

In 1996 IOC has provided support for the printing and distribution of the regional newsletter WINDOW.

In 1996 IOC has provided support for a **study** on the feasibility of establishing an East African Journal of Marine Sciences. A questionnaire was sent to over 300 scientists in the region. The study has concluded that there is an established need for a scientific journal but the majority of scientists feels that the journal should include freshwater as well as marine topics. .

In 1996 IOC has provided support, through the WIOMSA Secretariat, Zanzibar, Tanzania, for the preparation of Marine Science Country Profiles (MSCP) for Comores, Kenya, Madagascar, Mauritius, Mozambique, Seychelles and Tanzania. The profiles are expected to be finalized by March 1997.

5.4 REGIONAL COMMITTEE FOR THE CENTRAL EASTERN ATLANTIC (IOCEA)

Following the Fourth Session of the Regional Committee, Las Palmas, May 1995, and the endorsement of the programme proposal by the IOC Assembly in July 1995, several activities have been implemented, despite limited financial resources and staff at the IOC Secretariat. Following instructions of the Assembly, actions have also been extended to include Angola, Namibia and South Africa. Specific programme elements being pursued in priority are presented below.

Marine Pollution

At the end of the UNESCO-IOC/FAO/WHO/IAEA/UNEP programme for monitoring of pollution in the Marine Environment of West and Central Africa (WACAF/2), in 1994, monitoring of marine pollution in the IOCEA region was continued by IOC. The Marine Debris/Waste Management Pilot Monitoring Project for the Gulf of Guinea was initiated by IOC, in Lagos, Nigeria, in December 1994. This project is now being implemented with the cooperation of UNIDO's LME Gulf of Guinea project. The LME Gulf of Guinea project gave full financial support for the last two Workshops held in Abidjan.

There have been three Workshops so far since 1994, the first in Lagos, Nigeria and the last two in Abidjan, Cote d'Ivoire in 1995 and 1996. After the first workshop, the five participating countries were given financial aid to monitor beach debris for a period of one year. At the last Workshop the results were analyzed and synthesized and it was decided that the fourth workshop should be planned for December 1997 in Limbe, Cameroon.

At the last meeting participants discussed future action to be taken based on the Marine Debris Action Plan elaborated and adopted during the first Workshop in Lagos, 1994. It was also decided that another year of the beach monitoring exercise would permit better analysis of the results which would be put together as a manual and used for public awareness in the Marine Debris/Waste Management Outreach Campaign.

The participating countries are Benin, Cote d'Ivoire, Cameroon, Ghana, Nigeria and now Togo. We envisage going beyond the Gulf of Guinea and include as many countries of IOCEA as possible.

Integrated Coastal Area Management (ICAM)

Regional Workshop on Integrated Coastal Area Management (Conakry, Guinea 18-22 December 1995)

An IOC Regional Workshop on Integrated Coastal Area Management took place in Conakry, Guinea (18-22 December 1995). IOC provided support for participants of the region to attend. Beside its regional dimension, the objective of this workshop was to initiate the formulation of a national ICAM plan for Guinea, taking into account the objectives of the IOCEA programmes. Sessions took place on the characteristics of the Guinean coast, setting up the different biological, climatical and hydro-sedimentary parameters to take into account in the establishment of an ICAM strategy, as well as the identification of conflictual activities (mainly socio-economical activities) affecting the coastal and marine resources. Participants elaborated recommendations on a management strategy based upon a systematical planification of coastal and marine resource use, on monitoring measures for the coastal environment of Guinea, and finally on the need for capacity building, nationally and regionally. Participants from the region made several presentations on national ICAM experience. The report of the workshop is now available.

International Seminar on the Coastal Zone of West Africa: Problems and Management, Accra, Ghana 25-29 March 1996

The International Seminar on the Coastal Zone of West Africa took place in Accra, Ghana (25-29 March 1996). IOC provided financial support to four participants from Western Africa to

attend this meeting and make formal presentation on coastal area management experience from their respective countries.

In March 1997, a series of National Level Strategy and Policy Workshops on Integrated Coastal Area Management will take place to encourage the development of draft coastal area management plans by 1998. These will be organized by the GEF-funded Large Marine Ecosystem Project for the Gulf of Guinea (UNIDO), and IOC will be invited to contribute.

Ocean Science in relation to Living Resources

IOC Sub-regional Workshop on Marine Living Resources in the Gulf of Guinea Cotonou, Benin, 1-4 July 1996

The IOC Sub-regional Workshop on Marine Living Resources in the Gulf of Guinea, from Guinea Conakry to Angola, took place in Cotonou, Benin (1-4 July 1996). Participants from nine Western African countries attended the meeting. They all made formal presentations relating the state of marine living resources in their respective countries. The objectives of the workshop, as adopted during IOCEA IV, were to improve the status of fishery research in countries of the Gulf of Guinea, the standardization of methodologies for data collection and processing, to improve the level of knowledge on marine resources. The main outcome of the workshop was the development of a sub-regional research project on marine living resources in the Gulf of Guinea. The adopted project aims at improving scientific knowledge of existing stocks, building local scientific capacity, and establishing sustainable planning for the exploitation of living marine resources. It was proposed that the project proposal should be forwarded to major donor countries and international organizations. The workshop report is available at the IOC Secretariat.

Monograph on the Typology of the Western African coasts

As a result of recommendations reached at IOCEA IV (Las Palmas, May 1995), the proposal for the development of a monograph of the Western African coasts is now being implemented. The monograph is made up of four thematic volumes, and each member state is being invited to contribute to it. The main themes include: physical oceanography and hydro-sedimentology; marine biology and biotopes; marine geology; and coastal environment. The first volume is expected to be published in early 1997.

International Oceanographic Data Exchange

Sixth Regional Workshop on the IODE Global Oceanographic Data Archeology and Rescue project (GODAR-VI) for the countries of Western Africa, Accra, Ghana, April 1997.

The IOC Committee on International Oceanographic Data and Information Exchange at its Fifteenth Session, in Athens, Greece, 23-31 January 1996, decided to have the Sixth Regional Workshop on the IODE Global Oceanographic Data Archeology and Rescue project (GODAR VI) for the countries of Western Africa in the first half of 1997. The Chairman of the Ghana National Commission for IOC is organizing the event.

RECOSCIX-CEA

Also, IOC together with UNEP-Water is looking into the possibility of creating the RECOSCIX-CEA network similar to the operational system in Eastern Africa. The center is being planned to be based in Abidjan, Cote d'Ivoire.

Southern part of the region

IOC is participating in the BENEFIT (the Benguela Environment, Fisheries, Interaction and Training Programme) training activities in the region covering Namibia, Angola, and Republic of South Africa. The "Advanced Training Course in Marine Science", which is the first training course arranged by BENEFIT, will take place in Swakopmund, Namibia, 2-18 April 1997. This Training Course has been arranged jointly with support from IOC, GTZ (Agency for Technical Co-operation, Germany), IOW (Institut fur Ostseeforschung Warnemunde) and ZMT (Zentrum fur Marine Tropenokologie).

15 students from Angola, Namibia, South Africa and other African countries will attend the training course. Several scientists from Germany, Namibia and South Africa will participate and give lectures at the course. One person from the IOC Secretariat will attend the opening ceremony and will give lectures on Harmful Algal Blooms and general plankton ecology. This activity will be followed by a 25-days scientific cruise on board German vessel R/V Peter Kottsov and a Norwegian vessel R/V Dr. Fridtjof Nansen.

The IOC is providing support to several participants from the region. Discussions have been pursued with Angola with a view to strengthening its participation in sub-regional activities. As a result a mission is being planned to identify specific actions that IOC could support.

5.5 IOC REGIONAL COMMITTEE FOR THE CENTRAL INDIAN OCEAN (IOCINDIO)

The Second Session of IOCINDIO was held in Goa, India, 20-22 November 1996, hosted by the National Institute of Oceanography at the invitation of the Government of India. The Session was preceded by a regional workshop on GOOS development and capacity building towards GOOS, at NIO, Goa, 18-19 November 1996.

The Committee reviewed programme implementation since the First Session of the Committee in 1988. It noted that many activities have been carried out at national or sub-regional levels, but that cooperative activities at the regional level have been relatively limited. The Committee stressed that the coastal area constitutes a common problem as a zone of multiple uses and that a common approach, methodology and sharing of data and information were required.

Several activities have been carried out in the region addressing coastal area management and protection. The international course on marine pollution monitoring and modelling in the coastal area given in 1995 and 1996 hosted by IIT, Delhi, India, is one example. Following the IOC-NIO (Pakistan) international workshop on ICAM held in Karachi, Pakistan, October 1994, a publication on experiences of ICAM actions and needs for ICAM has been prepared and will be published in 1997. In December 1996 the international symposium and workshop on coastal zone protection from natural hazards and storm surge forecasting was held in Tirupati, India, co-convened with support of IOC. The Global Coral Reef Monitoring Network is developing a sub-regional mode in the IOCINDIO region with the support of the UK Overseas Development

Administration (ODA). Training courses on sea level observations have been held and sea level stations established or up-graded over the 1995-1996 period.

The national programmes presented at IOCINDIO-II show that very considerable ocean research and observations are going on in the region. Further details are given in the report of IOCINDIO-II.

5.6 IOC SOUTHERN OCEAN COMMITTEE (IOCSOC)

The First Southern Ocean Forum was held at the Alfred-Wegener Institute for Polar and Marine Research (AWI), Bremerhaven, Germany, from 9 to 11 September 1996. The Forum reviewed the present knowledge, gaps and needs for future ocean research and related ocean services in the Southern Ocean, as well as the international framework for cooperation. It was attended by experts of Argentina, Australia, Brazil, Chile, France, Germany, Russia, South Africa, UK and USA and representatives of WMO, IWC, CCAMLR , COMNAP, ICSU/SCOR, WCRP, GOOS. The forum was chaired by Dr Max Tilzer (Director of the AWI).

The Sixth session of the IOC Regional Committee, attended by representatives of Argentina, Australia, Brazil, Chile, France, Germany, Russian Federation, South Africa, United Kingdom, United States of America and WMO, IWC, COMNAP, SCOR/ICSU and WCRP, was also held at the AWI immediately after the forum, 12-13 September 1996. The Committee reviewed the conclusions and proposals made by the Forum and formulated recommendations on the future IOC activities, covering the following broad themes: international cooperation in the Southern Ocean; climate change; Southern Ocean ecosystems and their living resources; pollution and monitoring, GOOS and data management. The committee also proposed to revise its terms of reference and decided to set up an intersessional advisory group to advise and assist the Chairman and the Secretariat in implementing recommendations of the session. Dr Max Tilzer (Germany) was elected as the Chairman of the Committee.

The report and recommendations of the IOCSOC-VI were considered by the Twenty-ninth Session of the Executive Council (October 1996). The Executive Council adopted Resolution EC-XXIX.6 "Southern Ocean Forum and Regional Committee for the Southern Ocean" by which it approved recommendations of the IOCSOC-VI, including *inter alia* the revised terms of reference of the Committee.

The IOC representatives took part in the following meetings: XXIXth Meeting of SCOR (12-16 August 1996, Cambridge, UK) by Dr G. Giermann (Germany); XXth Antarctic Treaty Consultative Meeting (29 April - 10 May 1996, Utrecht, the Netherlands) by Dr J. Stel (Netherlands); and the 1996 meetings of the CCAMLR and the Scientific Committee (21 October - 1 November 1996, Hobart, Australia) by Prof. P. Quilty (Australia). In May 1996 IOC provided a report on its activities in the Southern Ocean to UNEP for inclusion in the report of the UN Secretary General to the 51st General Assembly on the state of the environment in Antarctica.

5.7 SOUTH EAST PACIFIC

The 8th Session of the Joint IOC-WMO-CPPS Working Group on "El Nino" was held in Concepcion, Chile, 17-18 April 1996. It considered and adopted the proposed new terms of reference widening the scope of work of the Group. Following a request from the 11th Meeting of the ERFEN programme of the CPPS the IOC and WMO assist ERFEN through the Working

Group to prepare a GEF proposal to strengthen operational oceanography and meteorology capacities in the region. This will eventually become a part of the South-East Pacific component of GOOS.

An EU-sponsored workshop on institutional networking was convened by IOC in Concepcion, Chile, April 1996, which is reported in IOC/INF-1042.

The UNDP-sponsored project on El Nino studies was completed through the actions of CPPS.

5.8 SOUTH WEST ATLANTIC

The IOC cooperates with and supports the Sub-Regional Programme for the Upper South-West Atlantic Ocean (ASOS) established by Argentina, Brazil and Uruguay. The Fourth Session of ASOS was hosted in Brazil, October 1996. Several activities of TEMA, OSNLR, OSLR-HAB, GLOSS and GOOS are going on in the region. These include workshops, training courses, observations and data analysis. Details are reported under the relevant sections.

The IOC participated in the UNEP-ASOS meeting of experts from Argentina, Brazil and Uruguay in Brazil, 4-5 November 1996. This considered a proposal to develop a regional cooperative programme for the protection and management of the marine and coastal environment of the three countries, as part of the UNEP Regional Seas Programme. A preliminary Action Plan is under consideration within the framework of ASOS.

5.9 MEDITERRANEAN SEA

Cooperation with CIESM is expanding. It includes :PRIMO (the International Research Programme in the Western Mediterranean); POEM (Programme on Physical Oceanography of the Eastern Mediterranean); the development of MED-GLOSS. The First Session of the Joint IOC/CIESM Group of Experts on MED-GLOSS was held at IOC, Paris, 20-21 January 1997. Consultations have been held regularly with CIESM Executive Director. A major scientific seminar of POEM was convened in 1996 and a conference on scientific understanding of the Mediterranean Sea is being organized through POEM, to be held in UNESCO, July 1997.

The IOC also cooperates with the Barcelona Convention and the Mediterranean Action Plan-UNEP Office in Athens, Greece. The IOC is involved in MEDPOL and has been participating in all related meetings. The IOC was also represented at the Meeting of the Contracting Parties to the Barcelona Convention, Montpellier, France, 1-4 July 1996, and at the First Meeting of the Mediterranean Commission on Sustainable Development, Rabat, Morocco, 15-18 December 1996. The MCSD decided on its work programme, and the IOC may report on its relevant activities at the Third meeting planned for October 1997, in France.

At the Twenty-ninth Session of the IOC Executive Council, the Delegate of Greece pointed out the importance of research activities such as POEM and recalled the need expressed by the IOC Assembly at its Eighteenth Session to involve Member States from the Southern Mediterranean in such activities. Through the IOC involvement with the Barcelona Convention and the Mediterranean MAST programme this aim may be gradually achieved.

The IOC has also been interacting with the Mediterranean insular centre in Malta, with respect to establishing a network on small islands marine and coastal research in the Mediterranean (MEDISLE). This process is going on.

The IOC was represented at the IAEA Seminar on the use of isotope techniques in the marine environment (Athens, November 1996), that identified possible areas of cooperation with IAEA in the Mediterranean programme.

At the Twenty-ninth Session of the Executive Council, the Delegate of Greece also offered the establishment of an IOC Project Office for the Eastern Mediterranean at the National Institute of Oceanography in Greece. This is presently under development on the basis of the Executive Secretary's visit to Greece in 1996.

5.10 BLACK SEA

As a contribution to "GEF Project RER/93/G31, Environmental Management and Protection of the Black Sea", the IOC, as an "Associated Agency" provides services in the form of training and methodological exercises, development of standards for chemical and selected biological analyses, practical studies on biological effects and investigations along pollution gradients.

During 1996 this input took the form of provision of consultant services (Dr G. Topping, Dr T. Wade, Dr M. Moore, Dr N. Anderson) to examine progress made by the project and lay plans for practical assessment procedures using *Mytilus edulis* as a sentinel organism. This effort was designed as part of the overall IOC "Mussel Watch" activity.

The Planning Group for the Black Sea Mussel Watch also conducted a training course in Odessa, 20-25 September 1996, with participants from Bulgaria, Georgia, Russia and Ukraine on biological effects of pollutants and chemical analysis. The participants from all countries agreed on the sampling stations to be used for future studies which would also involve monitoring for polycyclic aromatic hydrocarbons, organochlorines and trace metals. A subsequent activity covering the same ground was held from October 12-13, 1996, Istanbul, Turkey, to accommodate participants from Turkey and Romania.

The Executive Council at its Twenty-ninth Session reviewed the summary report of the First Session of the Black Sea Regional Committee and the related resolution (Document IOC/BS-RG-I/3), held in Varna, Bulgaria, 10-13 September 1996. The Committee was established through Resolution XVIII-17. The workplan for the subsequent two years is attached to the report of the First Session.

The programme is being gradually implemented. An MOU on cooperation has been established with the Black Sea Environmental Programme. In addition, the IOC is contributing towards the implementation of related Black Sea programmes. The two pilot projects adopted by the Committee are pursued and activities are planned for 1997.

5.11 PERSIAN GULF, RED SEA AND GULF OF ADEN

The IOC cooperates with the regional organizations - ROPME and PERSGA. These were also represented at the Second Session of IOCINDIO. Several activities have been carried out in

cooperation with ROPME, including within the programmes of IODE, GIPME, GOOS. The IOC has been represented at relevant meetings of ROPME.

5.12 CASPIAN SEA

There were no specific IOC projects in this region. The Secretariat of IOC participated in the intersectorial working group on the Interdisciplinary Caspian Sea Programme, set up within UNESCO to implement resolutions submitted by Azerbaijan, Islamic Respublic of Iran and Kazakhstan, and adopted by the Twenty-eighth session of the General Conference. Its work was coordinated by the UNESCO Division of Water Sciences. The IOC also provides advice to UNESCO on the implementation of the UNDP-funded project on technical support to Iran for the assessment of negative impacts of the Caspian sea level rise. The IOC representative, Dr A. Metalnikov, participated in the UNEP Meeting of Experts on Basic Elements for a Framework Convention for the Protection of the Marine Environment of the Caspian Sea, Geneva, 5-8 November 1996. The IOC maintained contacts with the IAEA Caspian Sea Project aimed at understanding sea level fluctuations using nuclear techniques.

Among five riparian countries of the Caspian Sea only the Russian Federation and the Islamic Republic of Iran are members of IOC.

C. CO-OPERATION AND DEVELOPMENT

6. COOPERATION WITH OTHER ORGANIZATIONS OF THE UNITED NATIONS SYSTEM AND OTHER BODIES: ICSPRO, GESAMP, ICSU-SCOR, OTHER BODIES AND PROGRAMMES

6.1 ICSPRO, GESAMP AND RELATED MATTERS

The Executive Council at its Twenty-ninth Session reviewed the inter-agency coooperation through ICSPRO and the IOC association with GESAMP. It was noted that through the ICSPRO mechanism the co-sponsorship of several programmes has been established. This is the case for e.g. GIPME (IOC, UNEP, IMO, IAEA); WCRP (WMO, IOC, ICSU); GOOS (IOC, WMO, UNEP, ICSU); GCOS (WMO, IOC, UNEP, ICSU); ASFA/ASFIS (FAO, UN, IOC); OSNLR (IOC, UN (DOALOS)). The IOC is also, together with UNESCO, a co-sponsor of GESAMP. The ICSPRO mechanism is being used as a supplement to the ACC Sub-Committee mechanism in ensuring exchange of information, cooperation and harmonization with respect to actions and programme responsibilities not falling within the Sub-Committee mandate, which is strictly related to follow-up to UNCED and, in particular, joint implementation of Chapter 17 of Agenda 21.

The Executive Council at its Twenty-ninth Session was informed about a potential Treaty on Intellectual Property in Respect to Databases, and gave several instructions to the Executive Secretary in this regard (see paragraph 301 of Report IOC/EC-XXIX/3). These have all been carried out, including consultations within UNESCO, with WIPO and with ICSPRO. These consultations have resulted in a reasonably coordinated effort to provide information and to establish dialogue between parties concerned.

Following the results of the WIPO Diplomatic Conference, December 1996, the IOC may have the option of participating in an *ad hoc* observer capacity in the further deliberations within WIPO of a possible treaty as regards databases.

The Executive Council at its Twenty-ninth Session also received a proposal from WMO to investigate concrete cooperative relationships in form of IOC-WMO co-sponsorship of the CMM. This was viewed by the Executive Council in a cautious but positive light and it was decided to make a joint IOC-WMO effort to assess implications. This has been initiated.

The IOC is a co-sponsor of GESAMP, and hosted the Session of GESAMP in 1996 at UNESCO Headquarters. The session agreed on launching the third GESAMP review of the state of the marine environment, and the IOC is a co-sponsor of this activity accordingly. This review is also expected to contribute to the implementation of the Global Programme of Action to protect the marine environment against Land-Based Activities (GPA-LBA). The IOC is accordingly associated with this process. Specifically, a series of regional assessments are underway.

6.2 COOPERATION WITH ICSU AND SCOR

Cooperation between ICSU and IOC occurs mainly through SCOR, IGBP, WCRP, GCOS, GOOS. During 1996-1997 cooperation has also been initiated with the International Geographic Union (IGU). Occasional interaction also occurs with Associations, e.g. IAPSO, and SCAR.

These cooperative efforts are considered under the relevant sections. The interactions with IGBP mainly occur in the context of OSLR through GLOBEC, JGOFS through GIPME and WCRP, and LOICZ through GIPME and OSNLR. Some cooperation has also been sought with START at specific regional levels.

Cooperation with SCOR is also associated with specific programmes, including the co-sponsored ones, like some IGBP core programmes. IOC is providing contractual support to SCOR for selected working groups and joint programmes, e.g. GLOBEC. Independent scientific advice is provided through SCOR and its working groups. The SCOR mechanism could also be used for evaluation of selected IOC activities, since SCOR is an advisory body for IOC. However, the interaction between SCOR and IOC could perhaps be increased in order to make the optimum use of SCOR as an advisory body. This will require a dedicated effort and an increased interaction between the constituencies of the bodies at the national level.

With respect to GOOS development, the IOC is providing support to J-GOOS actions through contract to ICSU, in view of the shortage of staff in the GOOS Support Office, to provide satisfactory operational service to J-GOOS.

Cooperation with IGU is being established in preparation of joint workshop in 1998, which may lead to joint activities of IOC and IGU.

The IOC has also been invited to cooperate with SCOPE in its efforts to prepare an assessment of the marine environment, and participated in initial discussions. In order to help ensure coordination between the different assessment initiatives, the IOC organized a consultation between parties concerned, hosted at IMO, 31 May 1996, after the session of the ACC Sub-Committee.

6.3 COOPERATION WITH OTHER BODIES, INCLUDING EU, MAST, UNU, ICES AND ECOR

The IOC cooperates with several other bodies within specific activities. This cooperation is normally specified through activities of common interest, and implemented on a co-financing basis. In the case of EU and MAST the major cooperation is within IODE, and at regional level through joint training courses, workshops and networking.

With UNU the major cooperation concerns actions in WESTPAC, mainly the regional component of the International Mussel Watch.

Cooperation with ICES concerns mainly OSLR-HAB and GIPME, including the joint Ballast Water working group, also involving IMO. Interactions with ECOR is rather sporadic. A meeting with the officers of ECOR at the IOC Secretariat in spring 1997 may generate some further specific cooperative activities.

6.4 REGIONAL COOPERATION

The IOC cooperates with many regional bodies, mainly through its own regional subsidiary bodies. This is based on the IOC regional programmes. In some cases, cooperation is supplementing the actions of the regional partner, especially in those regions where the IOC has no regional subsidiary body.

7. FOLLOW-UP TO UNCED AND UNCLOS

7.1 FOLLOW-UP TO UNCED

Several activities of the IOC relevant to the follow-up to UNCED are presented in other sections of this report, e.g. relating to the UN-FCCC, the Convention on Biological Diversity and implementation of Chapter 17 of Agenda 21, concerning ICAM, Marine Pollution, Oceans and Climate, including CO_2, Living Resources and GOOS. Here follows a brief summary of specific institutional arrangements. It is noted that the IOC continues to provide secretariat support to the ACC Sub-Committee on Oceans and Coastal Areas.

At the Eighteenth Session of the Assembly information was provided on the establishment and work of this Sub-Committee since its creation in 1994. Further information will be provided on the work of the Sub-Committee during 1996 and 1997. This has focused, in particular, on providing the report for the Special Session of the UN General Assembly (June 1997), the preparation of inter-agency programme for 1998 International Year of the Ocean, including preparatory work for an electronic UN Ocean Atlas, contributions to EXPO'98, consideration of the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities and the related inter-agency cooperation, the interaction of the Sub-Committee with GESAMP, and the strengthening of the efficiency of the Sub-Committee in response to the recommendation of CSD-IV. The Sub-Committee has also considered implementation of Chapter 17 of Agenda 21 through the on-going joint programmes, several of which are also IOC programmes.

In addition to its regular sessions in May 1996 (at IMO) and January 1997 (at the World Bank) the Sub-Committee organized an informal meeting in November 1996 (at IMO). At these

occasions informal ICSPRO consultations have also been held. At the meetings in November 1996 and January 1997 information consultations with interested governmental and non-governmental institutions have been organized outside of the sessions of the Sub-Committee. This was done with a view to improve the dialogue with such institutions. These actions are part of the efforts made to find the most appropriate inter-agency means for strengthened cooperation and coordination using the existing mechanisms.

The United Nations General Assembly Resolution A/51/189 adopted on 16 December 1996 specifies the institutional arrangements for the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities.

The IOC has participated in the preparations for the Special Session of the United Nations General Assembly on the implementation of Agenda 21 (New York, 23-28 June 1997), through the ACC Sub-Committee and through participation in the relevant CSD meetings.

In 1995 and 1996 the IOC organized several activities responding to the recommendations of the International Conference on Small Island Developing States. Some of these actions have been undertaken in cooperation with other bodies, e.g. the workshops in Barbados, December 1995, Madagascar, October 1996 and Comores, December 1996.

Several of the actions also contribute to the development of the UNESCO interdisciplinary project on coastal zones and small islands which was initiated in 1996, as approved by the Twenty-eighth Session of the General Conference. The Assembly, through its Resolution XVIII-7 welcomed this initiative.

Subsequent to the 28th General Conference the Director-General issued instructions on the implementation of the project, the establishment of a related unit in the Science Sector referred to as the Coastal Zones and Small Islands (CSI) unit. This corresponds to the MRI part of the former Office of the IOC/MRI.

The corresponding funds were likewise transferred to the CSI. The Director-General also established a management committee for the project with the Executive Secretary IOC as vice-chair and with the participation of all cooperating programmes. The instructions also addressed the follow-up of the Joint Statement of the Chairs of IOC, MAB, IHP, IGCP and MOST, from their meeting on 3 November 1995. This emphasizes cooperation in selected substantive areas and programmes.

In the development of the CSI project, the IOC contributes also through two pilot projects: coastal erosion in East Africa and small island coastal area management in the Caribbean. These are related to the IOCINCWIO and IOCARIBE programmes respectively. It is too early to judge the value added to these activities through their partnership in the CSI project.

The IOC also participated in the CSI Expert Meeting, Paris, 25-28 November 1996, and provided two experts. The results of this meeting will help shape and focus further the CSI project.

The re-arrangement of the UNESCO programme in marine sciences has implied that the IOC has taken over some activities, e.g. the Floating University programme, and some publication activities.

On the basis of a proposal from the Executive Secretary the Executive Council at its Twenty-ninth Session, Paris, 24 September - 2 October 1996, considered the role of IOC in integrated assessment of available scientific understanding, observations and data for sustainable development and ocean management. The background and proposal were presented in the Expanded Annotated Agenda (Document IOC/EC-XXIX/2).

The members of the Executive Council in general expressed a positive reaction to this proposal. They emphasized that the IOC should continue to cooperate with on-going efforts in this direction within GESAMP and SCOPE-ICSU-SCOR. Since then the efforts of SCOPE and GESAMP have been joined. The IOC is a co-sponsor of GESAMP and of the assessment within GESAMP, and hence in this overall joint work. The IOC is also an active partner in the regional assessments which are currently being carried out as part of the implementation of the Global Programme of Action to protect the Marine Environment against Land-Based Activities (GPA-LBA). These are also providing input to the global GESAMP assessment.

The Executive Council made a series of specific suggestions on the IOC scientific and capacity assessment. It established a small *ad hoc* sessional group which further elaborated the proposal. This elaboration has been used by the Executive Council and the 2nd Vice-Chairman to prepare a more detailed specification of an IOC scientific assessment procedure and how such an assessment could be initiated so as to deliver some results for the 1998 International Year of the Ocean.

7.2 FOLLOW-UP TO UNCLOS

In the light of Resolution XVIII-4 adopted by the Eighteenth Session of the IOC Assembly, June 1995, an Intersessional Working Group on IOC's Possible Role in Relation to the UN Convention on the Law of the Sea was established with its first meeting in Paris, 13 - 15 May 1996. The Summary Report of the Working Group is presented in document IOC/INF-1035.

Based on a working document prepared by the IOC Secretariat, the Working Group considered all the UNCLOS provisions which may have explicit and implicit relevance to IOC, and agreed on a table describing IOC's role in relation to UNCLOS. The Group confirmed the following IOC role and responsibilities under the Convention which are explicitly mentioned in the Convention: (i) upon express request from CLCS, IOC should assist the CLCS through exchange of scientific and technical information in accordance with Article 3(2) of Annex II of UNCLOS); (ii) IOC shall draw up and maintain a list of experts in the field of marine research in accordance with 2(2) of Annex VIII, who can serve as arbitrators in the Special Arbitral Tribunal, or act as experts in compulsory procedures entailing binding decisions in light of Article 289 of UNCLOS.

The Working Group also confirmed that apart from its right to conduct marine scientific research pursuant to Part XIII of UNCLOS, IOC, as a competent international organization in the field of marine scientific research, has a major role to play in promoting and facilitating the development and conduct of marine scientific research through the establishment of necessary guidelines, procedures and criteria.

The Working Group identified IOC's specific role in the development of marine science and technology, especially through strengthening its TEMA programme, including the cooperative establishment of regional marine research centres, and in the management and rational use of marine living and non-living resources, as well as in protection and preservation of the marine

environment, mainly through provision of scientific information and data and dissemination of scientific results.

The Working Group also made recommendations on the following issues:

a. IOC present activities relevant to the Law of the Sea but not based on UNCLOS provisions;

b. Liability/responsibility of competent international organizations actually conducting MSR and settlement of disputes to which an international organization conducting MSR is a party;

c. Establishment of criteria and guidelines for ascertaining the nature and implications of MSR;

d. IOC Secretariat acting as a depository of national legislation/rules/administrative practices and making such information available to Member States;

e. IOC regional bodies to promote projects on national legislation/rule/administrative practices;

f. ODAS: a study on the actual need for drafting an international instrument; and

g. Article 247: lay down procedures to be followed within international organizations to invoke Article 247 in future cases;

Further to the list of experts in the field of marine scientific research submitted by IOC to the United Nations Secretary-General on 10 January 1995, a new Circular Letter 1477 was sent to IOC Member States on 28 December 1995, urging those who have ratified the Convention but not yet nominated their experts for the Special Arbitration to do so accordingly. Based on the responses of the Member States, an updated list of experts composed of 59 members from 29 countries has been submitted to the UN Secretary-General.

Further to the establishment, in response to an initiative of the UN - DOALOS Group of Experts on the Preparation of the Commission on the Limits of the Continental Shelf, of the Joint IOC-IHO Editorial Board on the preparation of a synthesis on Science and Technology Associated with the Definition of the Continental Shelf, the first meeting of the Editorial Board was held in Paris, 31 January - 2 February 1996. The Editorial Board prepared a detailed outline of the synthesis, with main emphasis laid on such scientific and technical issues as characteristics of continental shelf, methods of positioning, distance determination, general bathymetric data collection, geological and geophysical techniques, and data sources and management. The meeting also identified the coordinating editors of each chapter and agreed on a timetable for publishing the synthesis. The meeting report is provided in document IOC/INF-1040. The synthesis is expected to be particularly helpful to developing countries who may lack the expertise and capability to design and implement survey of their continental shelf. It could also be helpful to the CLCS as a possible scientific and technical reference during the initial period after its establishment. However, this synthesis will not be prescriptive for either States or the CLCS as to what should or should not be done in their implementation of Article 76.

In response to the invitation of the United Nations, IOC, as a competent international organization in marine scientific research under the Convention, submitted to the UN on 25 June 1996 a report on its actions taken in relation to UNCLOS, which serves as an input to the Report of the UN Secretary-General to the Fifty-first Session of the UN General Assembly.

The IOC Executive Council, at its 29th session, 24 September - 2 October 1996, reviewed the IOC activities as follow-up to UNCLOS. The Executive Council expressed its satisfaction with the work of the Intersessional Working Group on IOC's Possible Role in Relation to UNCLOS and endorsed the Progress Report of Working Group, together with the table identifying IOC's role in relation to UNCLOS as well as the recommendations therein.

The Executive Council, having considered the invitation from the IHO to the IOC, to co-sponsor, with the IHO and the International Association on Geodesy, the joint Advisory Board on the Law of the Sea, instructed the Executive Secretary IOC to accept the invitation.

The Executive Council considered it necessary to plan the short-term and medium-term priority actions to be taken by the IOC, based on the conclusions of the Working Group on IOC's Possible Role in Relation to UNCLOS. It recognized, in particular, the IOC's role within the framework of Part XIV of the Convention on Development and Transfer of Technology, and considered it useful to formulate guidelines on transfer of marine technology within the IOC fields of competence. The Executive Council also discussed such issues as the establishment of an open-ended intersessional working group to analyze the procedures mentioned in Article 247, further consideration of existing guidelines on the identification, markings and warning signals of oceanographic equipment and facilities, and the system of publicizing the development of oceanographic equipment and facilities in EEZ, on the Continental Shelf and in the High Seas, which might hamper international navigation, including an update of present ODAS draft proposals in co-operation with the International Maritime Organization, as well as updating the list of experts in marine scientific research for use in Special Arbitration.

The Executive Council expressed its general support for IOC to co-ordinate and co-operate with other international bodies, particularly UN-DOALOS, IHO and CLCS in the implementation of the provisions of the UNCLOS, especially with regard to avoiding duplication.

The Executive Council acknowledged that the review proposed by the Joint IOC-IHO Editorial Board addresses the scientific and technical issues within the purview of the IOC, but considered that actions in this connection should be handled with special care. The Executive Council also considered that the policy with regard to IOC's implementation of UNCLOS based on the conclusions of the IOC Working Group on UNCLOS should be addressed by the IOC Assembly at its Nineteenth Session in 1997.

8. THE 1998 INTERNATIONAL YEAR OF THE OCEAN

The Executive Council at its Twenty-ninth Session considered progress achieved in preparing the programme for the 1998 International Year of the Ocean based on proposals made in Document IOC/EC-XXIX/2 Annex 3 and its Addendum.

During the ensuing discussion, a large number of Member States reiterated their commitment to this endeavour and referred to planning that had already begun at the national

level, both in regard to the international year as well as to participation at EXPO'98 in Lisbon. Examples include dedicated research cruises, special scientific publications, travelling exhibits, educational materials for schools and the general public, national scientific conferences, etc. In many member states, events such as that of the proposed launching of ocean satellite by India, are being planned to take place in 1998, to fittingly commemorate the celebration of the International Year of the Ocean. Japan will host the Fourth WESTPAC Scientific Symposium in early 1998 in connection with the celebration, and Cuba will host the First IOCARIBE Scientific Symposium, also for 1998.

In agreeing with the view of the Chair regarding the need for development of a management plan, numerous Member States expressed interest in providing support and facilities. The Delegations of Argentina and France reminded the Executive Council that, in accordance with UN rules, no costs should be borne through the regular programme budget for celebration of the international year.

Noting the value of sharing information in stimulating further action at the national level by all IOC Member States, the Executive Council instructed the Executive Secretary to solicit reports from national contacts for compilation and dissemination to all interested parties. Such information should also be included in the progress report that will be presented to the Nineteenth Session of the Assembly.

In endorsing the scope of the proposals presented in Document IOC/EC-XXIX/2 Annex 3 and its Addendum, the Executive Council emphasized that activities should be based upon the on-going programmes of the Commission, as had been suggested by the Officers. The Executive Council noted the plans to develop a logo and basic theme for the international year and encouraged that this be done as soon as possible.

Accordingly, the Executive Secretary has invited Member States to provide information on national plans. A dedicated part of the IOC homepage for the 1998 International Year of the Ocean has been established.

The draft programme has also been presented to ICSPRO and the ACC Sub-Committee on Oceans and Coastal Areas, at the meetings at the World Bnak, 7-10 January 1997. The draft was well received and will form the basis for an inter-agency programme.

The Executive Secretary has also organized several meetings in UNESCO so as to generate an inter-sectoral programme component for 1998. This has resulted in an association with other programmes in the Science Sector, as well as proposals for joint activities with the Social Sciences and the Education Sectors.

Contacts have been maintained indirectly with the EXPO'98 organization, in order to help ensure the visibility of IOC there, if at all possible.

Links have been maintained with the Independent World Commission on Oceans (IWCO), and some support has been provided in form of intellectual input and facilitation of links with other bodies and the scientific community.

9. DEVELOPMENT OF IOC WITHIN UNESCO

The 1995 IOC Annual Report provided a comprehensive summary of developments which had occurred since 1988, up to and including 1995 (IOC Annual Report Series 2, section 9, pages 63-67). This report covers developments which have occurred in 1996.

Ad hoc Study Group on IOC Development, Operations, Structure and Statutes (DOSS II)

In accordance with IOC Assembly Resolution XVIII-1, the revised *ad hoc* Study Group (DOSS II) was formed and met for the first time on 20-24 May 1996. At that meeting the Group discussed all of the issues encompassed by the terms of reference; produced an initial working document, agreed on a schedule and assignment of responsibilities for intersessional tasks, and held an open session of its meeting on the final day to which all permanent delegations and observer missions to UNESCO were invited. This provided an opportunity for the Group to inform about its deliberations at an early stage, and to benefit from comments and advice.

The intersessional working sub-group on Statutes, Rules of Procedure and Pledging System met in Lisbon, August 26-29th 1996, and considered, in particular, options for mobilisation of support for the IOC. Other sub-groups worked through correspondence to prepare working documents which provided the basis for discussions at the DOSS II meeting, January 1997, and consequently the Interim Report for the 19th Session of the IOC Assembly. Opportunity was taken at the Twenty-Ninth Session of the IOC Executive Council to hold *ad hoc* consultations.

A progress report, based essentially on the first meeting of DOSS II, was prepared for the 29th Session of the IOC Executive Council (Document IOC/EC-XXIX/6). The outcome of discussions at the Executive Council meeting is summarised below.

At its Twenty-Ninth Session (Paris, September/October 1996) the IOC Executive Council reiterated the commitment of their governments to the IOC, with ever-increasing recognition of the importance of the oceans and hence the need for a strong IOC, adequately resourced both financially and in its secretariat. It also emphasized the importance of finding the most appropriate internal structure and organization of the IOC Secretariat within UNESCO and the need to address the perception of IOC in the UN System.

The Council endorsed the general thrust of DOSS II's work, as reported in its Progress Report (IOC/EC-XXIX/6), and gave valuable advice and guidance. In particular it emphasized the need to examine ways to raise IOC's profile and image, noting the opportunities presented by the 1998 International Year of the Ocean, and the turn of the Century; to strengthen linkages to Member States through National Commissions/Committees and other mechanisms, and the responsibility of delegates to the IOC in this regard; and to prioritize and focus IOC activities given continuing budget constraints.

The Council also gave consideration to mechanisms to facilitate provision of dependable resources to the IOC. In this regard, it noted that two Member States of the IOC, non-members of UNESCO contribute to and participate in activities of the IOC which more than equals the contribution which would be provided by them if they were members of UNESCO. It welcomed the USA initiative to document its support to the IOC and invited all Member States to undertake

relevance of contributions to the IOC, and help to identify those programme areas in which more support is needed, either in cash or in kind.

At its 147th Session, October 1995, the Executive Board of UNESCO recommended that the Director-General submit to its 149th Session (May 1996) a detailed report on the measures he has taken or intends to take in order to ensure, on an experimental basis, IOC's operational flexibility in administrative and financial terms (147 EX/Decision 5.1 Part III (A)). The Director-General responded to this request in his report on the execution of the programme adopted by the General Conference (149 EX/INF.3, paras 8-17). The Executive Board, recognizing that DOSS II was addressing some of the relevant matters, requested the Director-General to submit a detailed report to its 150th Session (October 1996) specifying the scope of the measures aimed at conferring operational flexibility on the IOC at the administrative and financial level, and reviewing the work of the DOSS II Study Group.

This was done through paper 150 EX/9, which also responded to a decision of the 147th Session, that:

> *'a report be presented to the Executive Board at its 150th Session on the possibility of establishing also a financial allocation for the functioning of IOC, to which the Member States of IOC, non-members of UNESCO, will be invited, through an appropriate mechanism, to make a regular contribution'.*

Paper 150 EX/9 summarizes the proposals expressed by the IOC Assembly to provide the background, defines the scope and aims of the measures taken and proposed by the Director-General, summarizes the work of the DOSS II Study Group, and clarifies the position reached in regard to contributions from IOC Member States, non-members of UNESCO.

10. FINANCE

Support to IOC programmes

A wide spectrum of activities is described within the body of this report which highlights the relevant 1996 implementation phases of the IOC programmes. The intergovernmental decision to undertake these activities, and the support required to carry them out, is part of an interactive process between the Member States themselves through the IOC. The basis for all activities lies within the Statutes of the Commission which emphasize the importance of the *'concerted action of its members'* and the need *'to collaborate with all international organizations concerned'* (Article 1: (2 and 3) of the IOC Statutes).

IOC programmes emanate from these two key-stone principles through which the various activities are implemented. In this respect, the catalytic role of the IOC in fostering the intergovernmental basis for decision-making, coupled with direct and indirect support for programme implementation cannot be over-emphasized.

What does this catalytic role imply? IOC, as an intergovernmental body, maintains continual review of issues related to its mandate. Such reviews are generated by: national policy concerns; from the scientific community (often associated with national/regional policy); and intergovernmental decision reached through IOC and other UN fora, as a platform for concerted action.

Within this perspective, the work undertaken through the IOC encompasses a wide range of programmes, activities and initiatives, the large portion of which are carried out as a natural sequence of governmental and non-governmental decision, but linked to policy agreed upon within the IOC structure.

The catalytic role of the IOC generates action throughout a wider partnership so as to ensure that common goals are addressed. Throughout this process the direct funding of specific activities is but a small, albeit essential, factor by which far larger national ocean science and service resources are mobilized, including those of direct relation to coastal area concerns.

The following budgetary overview of the IOC provides information regarding direct income and expenditure provided through UNESCO, IOC Member States and other organizations, as a contribution to the catalytic role of the Commission. It should be borne in mind, however, that such support is based upon the whole of national commitment to *'promote marine scientific investigations and related ocean services with a view to learning more about the nature and resources of the oceans through the concerted action of its members'* (Article 1 of the IOC Statutes).

Overview of income and expenditure

In concert with national and non-governmental initiatives, implementation of IOC programmes and related staff costs during 1996 was financed through income from UNESCO as part of its regular programme allocation as approved by the UNESCO General Conference and from extrabudgetary resources, notably that provided by IOC Member States through their contributions to the IOC Trust Fund.

1996 income at $5,407,563 as found in Table 1, reflects provision of $3,067,600 (56.7%) through the UNESCO regular programme allocation and $2,339,963 (43.3%) through contributions to the IOC Trust Fund.

Table 1
1996 Income

	IOC Trust Fund		**UNESCO Regular Programme**	**Total**
	$		**$**	**$**
	Earmarked	General		
Programme funding	1,299,456	639,837	1,388,000	3,327,293
Extrabudgetary staff posts and consultancies for seconded staff	400,670			400,670
Regular programme staff posts			1,679,600	1,679,600
Total	1,700,126	639,837		2,339,963
Grand total	**2,339,963**		**3,067,600**	**5,407,563**

In regard to the funding of $3,067,600 provided by UNESCO, $1,679,600 was attributed to staff costs and $1,388,000 to programme implementation. Within the funding of $2,339,963 contributed through the IOC Trust Fund, $400,670 was attributed to staff costs (either through established posts or consultancy contracts) and $1,939,293 to programme implementation. Overall revenue and expenditure in regard to staff costs and programme implementation is found in Table 2.

Table 2
Revenue/Expenditure 1996

Source	Income		Expenditure		Remaining	
	Staff	**Programme**	**Staff**	**Programme**	**Staff**	**Programme**
UNESCO Regular Programme	1,679,600	1,388,000	1,656,325	1,383,353	23,275	4,647
	3,067,600		**3,039,678**		**27,922**	
IOC Trust Fund						
General contributions	-	639,837	-	480,919	-	158,918
Earmarked contributions	400,670	1,299,456	389,396	1,118,484	11,274	180,972
Total Trust Fund contributions	**2,339,963**		**1,988,799**		**351,164**	
GRAND TOTAL	**2,080,270**	**3,327,293**	**2,045,721**	**2,982,756**	**34,549**	**344,537**
	5,407,563		**5,028,477**		**379,086**	

Comparison between forecast, available and expended funding

At its Eighteenth Session (Paris, 13-26 June 1995), the IOC Assembly approved proposals for the 1996-97 biennium as the basis for its forecast programme implementation. Anticipated programme funding for the two-year period is found in Table 3.

Table 3
Anticipated Funding 1996-97

	Objective 1 [1] ($)	Objective 2 ($)	Objective 3 ($)	Objective 4 ($)	Total ($)
UNESCO Regular Programme	600,000	710,000	700,000	1,056,400	3,066,400
IOC Trust Fund	700,000	190,000	700,000	973,700	2,563,700
Total	**1,300,000**	**900,000**	**1,400,000**	**2,030,100**	**5,630,100**

Total funding received during 1996 of $ 3,327,293 reflects 59% of that anticipated for the whole two-year period. While this can be considered as a positive factor for the programme as a whole, two aspects of the funding situation have influenced the timing of implementation and the emphasis given to specific activities and regions. On the one hand, of the total 1996 income of the IOC Trust Fund (Table 4) for programme implementation, a significant amount was received as contributions for specific purposes which reflect the emphasis which donor Member States wish to place on a particular aspect of the programme. On the other, basic contributions for general purposes, while reaching the anticipated level, were received relatively late in the year. These two factors have had an obvious impact on both planning and implementation and, in some instances, have led to the postponement of activities pending provision of required resources.

While fluctuation in cash-flow is a common problem within the UN System, the IOC has benefitted this year from the decision of the 28th UNESCO General Conference to provide UNESCO regular programme support in such a way that IOC programme is not adversely effected by economy measures. Ways and means by which a similar dependability can be achieved in regard to contributions to the IOC Trust Fund are being investigated by the DOSS-II ad hoc Study Group (see section 9) within the overall goal of creating optimum conditions for pursuit of the IOC Programme as agreed upon by the Member States and as a basis for improved, effective concerted action.

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1) Objective 1: To reduce the scientific uncertainties on oceans and coastal areas: implementation of Agenda 21.
Objective 2 :To strengthen data exchange and ocean services
Objective 3 :To foster capacity building in developing for marine research and systematic ocean observations, in particular through TEMA
Objective 4: To stimulate international and regional cooperation in marine science and systematic ocean observations

Table 4
1996 Contributions to the IOC Trust Fund

Contributor	Total ($)	Component	Purpose
Australia	6,403		Equipment for GOOS
Canada	38,419	1,000	IGOSS Bulletin
		15,441	IOCINDIO
		11,029	General (1995)
		10,949	General (1996)
Chile	3,500		TIME
Denmark	243,400		Harmful Algae Bloom Centre (including personnel)
European Community	33,569	14,516	Chemical Oceanographic Data Management Workshop
		11,319	GODAR-V
		7,734	EURASLIC
France	124,185	27,944	Seconded personnel
		39,448	Follow-up to UNCED
		36,385	GOOS and seconded personnel
		20,408	Activities in the Comores
Korea (Republic of)	112,080		OSNLR: Seconded personnel
Netherlands	11,765		GOOS
Russian Federation	10,000		ITSU
Spain	31,140		Harmful Algae Bloom Centre in Vigo
Sweden	723,881	573,881	Co-operative programmes in East Africa (IOCINCWIO)
		150,000	Co-operative programmes in the Caribbean (IOCARIBE)
United Kingdom	256,423	10,000	GLOSS
		96,423	General activities (1995)
		150,000	General activities (1996)
United States	613,500	30,000	Coastal Zone'97
		5,000	GLOSS
		50,000	Activities in the WESTPAC region
		10,000	GETADE
		40,000	Ocean Color activities
		7,500	GLOSS CD-ROM
		6,000	IBCCA
		60,000	Seconded personnel for GOOS
		30,000	GODAR-VI
		20,000	Chemical Oceanographic Data Management Workshop
		355,000	General activities (1996)
WMO	121,314	120,564	Drifting Buoy Activities and personnel
		750	General
World Bank	10,000		IOC-World Bank-Sida/Sarec Workshop on Integrated Coastal Area Management
Miscellaneous	384		
	2,339,963 (1)		

(1) In addition, through UNESCO Funds-in-Trust arrangements, Japan provided $60,000 ($53,000 after deduction of UNESCO over-head) in support of WESTPAC and Near-GOOS and Denmark provided $78,200 ($69,664 after deduction of UNESCO over-head) in support of a Training Programme on Harmful Algal Blooms.