Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Regional Committee for the Central Eastern Atlantic

First Session

Praia, Cape Verde, 19-23 January 1987

Unesco

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In this Series

Reports of Governing and Major Subsidiary Bodies, which was initiated at the beginning of 1984, the reports of the following meetings have already been issued:

- Eleventh Session of the Working Committee on International Oceanographic Data Exchange
- Seventeenth Session of the Executive Council
- Fourth Session of the Working Committee for Training, Education and Mutual Assistance
- Fifth Session of the Working Committee for the Global Investigation of Pollution in the Marine Environment
- First Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions
- Third Session of the *ad hoc* Task Team to Study the Implications, for the Commission, of the UN Convention on the Law of the Sea and the New Ocean Regime
- First Session of the Programme Group on Ocean Processes and Climate
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SUMMARY REPORT

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1. OPENING

The First Session of the IOC Regional Committee for the Central Eastern Atlantic (IOCEA-I) was opened at 10:00 on Monday 19 January 1987, at the Assembleia Nacional Popular in Praia, Cape Verde, in the presence of the Minister of Rural Development and Fisheries, Eng. João Pereira Silva, and the Secretary of State for Fisheries, Mr. Miguel Lima, as well as other invited Cape Verde personalities connected with marine affairs. 1

The Secretary of IOC, Dr. Mario Ruivo, on behalf of the Chairman of IOC, Prof. Inocencio Ronquillo, and his own behalf, thanked the Cape Verde authorities for having offered to host this Session. He evoked the sustained effort of the people of Cape Verde to advance their development. The Secretary of IOC recalled that the first international co-operative marine research programme organized and carried out by the IOC was the International Co-operative Investigation of the Tropical Atlantic - ICITA - which itself was an expansion of the "Year of West Africa and the Gulf of Guinea" proposed at the first session of the IOC in 1961. The present session, the first of the IOC Regional Committee for the Central Eastern Atlantic, can therefore be said to have deep roots in IOC's philosophy and shows that its activities are close to the needs of its Member States and of this region as a whole. 2

After a long and detailed preparatory work, the state of marine scientific knowledge and co-operation in the region was assessed; an assessment took place at an IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa) in Tenerife, Spain, in December 1983. Now, at the present session, the time for decisions and undertakings has arrived. We shall consider the meeting successful if the Committee can identify a few activities that take into account the needs and capacities of this region. 3

The difficulties are considerable; the absence of certain Member States, although they have on many occasions manifested their interest in regional marine science, attests to these difficulties: lack of experts, infrastructure, financial resources. These difficulties can only be solved through training, education and mutual assistance, and with the close collaboration of Unesco through its Division of Marine Sciences whose work in this field is well known. It is for this reason that Unesco and the Commission have adopted a Comprehensive Plan for a Major Assistance Programme to Enhance the Marine Science Capabilities of Developing Countries. 4

Another important approach to building up national capabilities is through increased co-ordination, internally, and better liaison between the Member States and the Commission. This could be achieved through the creation of national oceanographic committees (or similar bodies), as recommended by the Governing Bodies of the IOC. 5

6 The Secretary IOC wished the participants every success in their work.

7 The Minister of Rural Development and Fisheries then welcomed the Delegates and other participants and thanked the Intergovernmental Oceanographic Commission for having agreed to hold this Session in his country, since it allowed Cape Verde to become more directly involved in international co-operation in marine science, which would assist it in obtaining the fullest possible benefit from the sea. Following Cape Verde's independence in 1975, and the subsequent acquisition of an Exclusive Economic Zone - a leap from an area of 4 033 km2 to some 600 000 km2 - changed Cape Verde's perspectives; Cape Verde must now make a big effort to develop its marine science and technology. For this, it will need international aid. The rational exploration and exploitation of marine resources, living and non-living, require it. The Agenda of this session addresses a wide range of subjects all of which are relevant to Cape Verde's needs. The work the Committee will undertake here will contribute to increasing Cape Verde's production through improved understanding and prediction of enviromental changes.

8 The Delegates of Brazil and Portugal asked for the floor to make general statements regarding the Session and its overall purposes.

9 The Delegate of Brazil referred first to the fundamental role IOC can play in setting up mechanisms for collaboration, whether at the global or the regional level. This First Session of the Regional Committee for the Central Eastern Atlantic, in Cape Verde, is an example of that. It would be difficult for an individual Member State to establish such a system of co-operation. He noted, however, that the Provisional Agenda proposed by the Secretariat reflected the major programmes of the IOC. It could therefore be accepted as a basis for proceeding. However, a co-operative programme for the central eastern Atlantic should not be expected to be a miniature of the global programme of IOC. The Committee should concentrate on activities that meet the interests of the countries of the region. He reminded the participants that the United Nations' General Assembly, at its 41st Session, in 1986, at the instigation of all the countries of the South Atlantic region, adopted a Declaration on the South Atlantic as a zone of peace and co-operation. The First Session of IOCEA is the first international meeting, since the adoption of that Declaration, to deal with co-operation in a particular part of the South Atlantic.

10 The Delegate of Portugal addressed a friendly and brotherly salute to the Republic of Cape Verde for its effort in organizing this important First Session of the IOC Regional Committee in Praia. Echoing the statement of the Minister of Rural Development and Fisheries, he reminded the Regional Committee that an archipelago, with an Economic Exclusive Zone, offers opportunities for socio-economic development, mainly based on the use of living and non-living marine resources, as well as on the utilization of the coastal zone for tourism and other purposes. However, as we are all aware, such goals require an adequate scientific and technical infrastructure and specialized personnel can only be developed relatively quickly with strong international co-operation. In this context, Portugal is aware that a special effort is

required to assist Member States in this region in acquiring such capability, and is ready, within its own possibilities and with the support of IOC, to share knowledge and information of mutual interest, particularly with the Portuguese-speaking countries, with which Portugal has already established bi-lateral co-operative agreements.

The Delegate of Angola reminded the Regional Committee that 20 January 1987 was the National Heros Day in Cape Verde, which marked the anniversary of the death of Amilcar Cabral, the architect of Cape Verde's Independence. He recalled Cabral's efforts to achieve independence in a spirit of peace and collaboration and he hoped that the deliberations of this First Session would be in the same spirit. He asked the Regional Committee to observe a minute of silence in memory of Cabral's death on 20 January 1973. *11*

The Secretary of IOC also added his expression of solidarity with the Cape Verde people on this special day, recalling that he had had the honour to know Amilcal Cabral. *12*

The Delegate of Guinea-Conakry expressed similar sentiments. *13*

The Delegate of Cape Verde expressed the appreciation of her government for these tokens of friendship and respect for Amilcar Cabral. *14*

The List of Participants is attached as Annex VI hereto. *15*

2. ADMINISTRATIVE ARRANGEMENTS

2.1 DESIGNATION OF THE CHAIRMAN AND RAPPORTEUR FOR THE SESSION

The Regional Committee was requested to choose a Chairman for the Session and a Rapporteur, bearing in mind that it will elect a Chairman and a Vice-Chairman for the forthcoming intersessional period and the Second Session; at the Second Session there will be a similar election for which both incumbents will be eligible for re-election for one more intersessional period and the Third Session of the Committee. *16*

2.2 ADOPTION OF THE AGENDA

The Provisional Agenda (Document IOCEA-I/1 prov.) was distributed with Circular Letters Nos. 1104 (to Member States) and 1103 (to Organizations), in September 1986. The Regional Committee was invited to adopt the Agenda for the Session, as is or as amended by it. *17*

The Regional Committee adopted the Agenda for the Session; it is attached as Annex I hereto. *18*

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

The IOC Senior Assistant Secretary, Mr. Ray C. Griffiths, acting as Technical Secretary for the Session, proposed a modus operandi and a timetable. He also reviewed the documentation. The List *19*

of Working Documents is given in Annex VII hereto. He apologized for the failure of the background and reference documents to arrive in time, noting the priority given to ensuring the safe and timely arrival of persons and personal luggage. He informed the Regional Committee of the availability of the Working Documents, including the Report of the expert consultation held immediately prior to the present Session.

3. MARINE SCIENCE ACTIVITIES IN THE REGION

3.1 OCEAN DYNAMICS AND CLIMATE

20 The IOC Senior Technical Secretary in charge of Ocean Processes and Climate, Dr. Albert Tolkachev, introduced this subject. He recalled that a number of devastating interannual climate variations occur in the countries of the region: droughts in the Sahel and southern Africa, and failure of coastal upwelling and the associated fisheries. The understanding of, and the ability to predict, such events is of crucial importance for the western African countries.

21 Several studies have shown the connection between the record 1982-1983 El Niño event in the tropical eastern Pacific with unusual oceanographic conditions in other oceans, including the tropical Atlantic, and with global atmospheric processes. To make significant progress in understanding and predicting these climatic events, an international programme, entitled the Tropical Ocean and Global Atmosphere (TOGA) [1], was launched in 1985. TOGA is part of the World Climate Research programme, established by WMO and ICSU in 1979. The scientific planning of the TOGA is undertaken by the JSC-CCCO TOGA Scientific Steering Group. Intergovernmental co-ordination of the implementation of the study will be undertaken by the WMO-IOC Intergovernmental TOGA Board established in 1986, the First Session of which is scheduled for the second half of 1987.

22 TOGA is a study of the interannual variability of the tropical oceans and global atmosphere. It includes a ten-year measurement programme, real-time assessment of large-scale climate variations in the tropical oceans and global atmosphere, and modelling studies. The Scientific Plan for TOGA was published in the WCRP Publications Series No. 3. Implementation of TOGA was considered at the First Informal Planning Meeting on the WCRP (Geneva, 12-16 May 1986) co-sponsored by WMO, ICSU and IOC, which reviewed the First Implementation Plan for the WCRP (including TOGA) and national plans for activities contributing to the implementation of the WCRP and of TOGA in particular.

23 The overall intergovernmental co-ordination of the oceanographic components of the WCRP is carried out by the IOC Technical Committee on Ocean Processes and Climate, the Second Session of which will be held in Paris from 10 to 13 March 1987. Dr. Tolkachev emphasized that the major efforts by Member States in the TOGA

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[1] A List of Acronyms and Abbreviations is given in Annex VIII hereto.

programme will require the considerable expansion of oceanographic observations in the tropical zones of the oceans, particularly observations of the thermal field of the upper layer (0-500m) and sea level, as well as surface salinity, geopotential differences, and currents. Two special oceanographic data centres have already been established to collect, analyse and provide data products within the framework of the TOGA Study: the TOGA Sea-Level Centre (USA) and the TOGA Tropical Ocean Sub-surface Centre (France). Countries will benefit from TOGA through improved warning of climate changes. The TOGA study will increase our understanding of the physical causes of these changes and therefore improve, in the short term, advice to Member States on climate-dependent activities. By a joint IOC-WMO Circular Letter, Member States have been invited to designate National Contact Points for the TOGA Study.

24 The IOC Senior Technical Secretary also informed the Regional Committee about the World Ocean Circulation Experiment (WOCE) which is a major project in Stream Three of the WCRP which is aimed at characterizing variations of climate over periods of several decades.

25 The Scientific Plan for WOCE, prepared by the JSC-CCCO Scientific Steering Group, has been published in the WCRP Publications Series No. 6. The Group is now preparing the draft Implementation Plan for WOCE which will be discussed at an International Conference on WOCE in 1988.

26 The IOC Senior Technical Secretary recalled that the IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa), held in Tenerife in December 1983, had recommended the establishment, if necessary, or the improvement, of coastal oceanographic/meteorological stations in each Member State of the region, with a view to measuring local variations in key oceanographic parameters from which improved prediction of variations in oceanic and climatic phenomena could be expected. He also stressed the importance of participation in the XBT ship-of-opportunity programme, and the installation of sea-level stations in the tropical oceans.

27 The Delegate of France informed the Regional Committee of the study of the tropical Atlantic by France within the framework of the FOCAL Programme, and gave an expose of the main findings and how they relate to climate variability and its prediction. Another project on the role of energetically active zones of the ocean (particularly in the tropical Atlantic) in climate changes and variability, known as SECTIONS, was also mentioned as an important relevant study.

28 Several Delegates informed the Regional Committee of the activities of their countries in the tropical Atlantic and in the TOGA Programme, or expressed their interest in oceanographic elements of the TOGA Study; they requested the Secretary IOC to provide them with all the available documentation and publications on TOGA.

29 The Regional Committee expressed its appreciation for the valuable scientific background provided.

30 It urged its Member States to declare their interest in participating in, or being associated with, IOC's activities in the field of Ocean Dynamics and Climate and in the context of the World Climate Research Programme, notably TOGA, by: (i) nominating National Contact Points for TOGA; (ii) giving effect to the recommendation of the IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Tenerife, December 1983) to establish, if necessary, or improve coastal oceanographic-meteorological stations; (iii) study the feasibility of their participation in the IOC-WMO BT Ship-of-Opportunity Programme; and (iv) by identifying their needs for the relevant training, education and mutual assistance.

31 To this effect, the Regional Committee instructed the Secretary to provide all interested marine scientific and technical institutions in the Member States of the region with the relevant documentation and other advice on participation.

3.2 MARINE ECOSYSTEMS AND LIVING RESOURCES

32 The IOC Senior Assistant Secretary in charge of Ocean Science in Relation to Living Resources (OSLR), Dr. Fernando Robles, introduced this subject. He explained that OSLR is aimed at obtaining an understanding of the relationships between fish stocks and ocean environmental variability, to provide an improved scientific basis for fishery development and management. Variations in recruitment have been identified as a major cause of fluctuations of fishery resources; these variations are most often attributed to environmental fluctuations. This consideration led to the development of an International Recruitment Programme (IREP) as one of the primary initial research thrusts of OSLR. IREP has two main components: one related to experiments being implemented in regions presenting pelagic species complexes (e.g., SARP, the Sardine/Anchovy Recruitment Project); the other deals with coastal demersal resources of the intertropical belt (e.g., TRODERP, the Tropical Demersal Recruitment Project).

33 The scientific and operational framework for SARP projects was developed at, among other seminars and workshops, an IOC-FAO consultation on SARP at the Southwest Fisheries Center, la Jolla, California, USA (November 1984). Three initial proposals were prepared for major upwelling complexes in the eastern Pacific boundary current system. Another SARP project is being implemented in the upwelling area off the coast of the Iberian peninsula. SARP has, from the beginning, had a strong Training, Education and Mutual Assistance (TEMA) component, with regional field and laboratory courses organized at institutions in various Member States. The implementation of SARP regional exercices, including TEMA components, could be extended to similar complexes in the central eastern Atlantic.

34 The main research lines for TRODERP were established and recommended by an IOC-FAO Workshop on Recruitment in Tropical Coastal Demersal Communities (Ciudad del Carmen, Mexico, April 1986). Recommendations were made to initiate regional and inter-regional comparative studies of various types: (i) on the relatiohship between environmental cycles and reproductive and recruitment dynamics of

tropical penaeids; (ii) comparative studies in focal areas (such as the western Atlantic coast, from Mexico to northern Brazil); (iii) recruitment studies in soft-bottom communities focussing on the use or non-use of estuaries; and (iv) larval retention in hard-bottom (reef) systems. Here, the Regional Committee for the Central Eastern Atlantic could also identify relevant project proposals, including the corresponding TEMA component.

35 The IOC Senior Assistant Secretary reminded participants that one of the areas of activity of the Division of Marine Sciences of Unesco is highly relevant to OSLR in terms of research and training in coastal marine systems under the Unesco Major Inter-regional Project on Research and Training Leading to the Integrated Management of Coastal Systems (COMAR). In western Africa, activities under COMAR have been going on since 1979, and have included training workshops, study and research grants, fellowships and provision of scientific equipment and literature.

36 Several Delegates manifested their interest in the research topics undertaken under the IOC-FAO programme on OSLR. Some Delegates pointed out the need to study those species that have a higher priority in the regional context, but which nevertheless comply with the terms of the IREP Minimum Plan.

37 The Regional Committee endorsed the development of SARP components addressing pelagic species complexes found in upwelling systems off western Africa.

38 The Regional Committee also endorsed the development, at the regional and/or sub-regional levels, of scientific studies such as those proposed in TRODERP, although it recognized that these studies are of a rather more complex character and therefore require more detailed consideration.

39 The Regional Committee stressed the importance of co-ordination of its activities in this field and those of the FAO Committee on Eastern Central Atlantic Fisheries (CECAF).

40 The Regional Committee recommended the establishment of a Group of Experts on Ocean Science in Relation to Living Resources in the Central Eastern Atlantic to develop regional OSLR project proposals (particularly under the International Recruitment Programme) and requested the IOC Assembly, at its Fourteenth Session, to create this Group of Experts.

41 The Regional Committee emphasized the importance of Member States supporting the scientific studies recommended by this Group of Experts in due course.

42 It also stressed the importance of a strong TEMA component and requested the Division of Marine Sciences of Unesco to collaborate with IOC to meet these specific training requirements.

The Regional Committee adopted Recommendation IOCEA-I.1 [1]

3.3 CONTINENTAL MARGIN AND NON-LIVING RESOURCES

43 An IOC Consultant, Dr. Michael Collins, introduced this subject. He drew the attention of the participants to three documents providing a basis for the development of a proposal on ocean science in relation to non-living resources in the IOCEA region:

(i) the IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa) (Tenerife, December 1983). This Workshop noted, inter alia, that ".... (a) feature of the marine research in the region is that, with few exceptions, it is all oriented towards the study of the nearshore zone, with a view to improving the exploitation of marine resources, living and non-living, and to guaranteeing their conservation as well as the protection of the marine environment" (Section 3.1, paragraph 11) and "the preparation of a precise bathymetric chart is an essential prior operation in all forms of utilization of the sea bed ..." (Section 3.4, paragraph 24). These statements emphasize the importance of the coastal zone, including movement of sediment/water and the associated bathymetric characteristics of the adjacent continental shelf, within the context of present and future research in western Africa.

(ii) The UNEP Regional Seas Reports and Studies No. 67 (1985) is a literature review of coastal erosion in west and central Africa undertaken, in the framework of the Unesco-UN(DIESA)-UNEP WACAF/3 project, by a group of scientists in the U.K. (for use in English-speaking countries) and similarly in France (for French-speaking countries). Various controls and aspects of coastal erosion are reviewed and areas of severe erosion identified for the region. One particular area of intense erosion is the Bight of Benin.

(iii) The Report of an OAU Meeting on the Formulation of a Regional Pilot Project against Coastal Erosion in West and Central Africa (Accra, 11-15 August 1986) emphasizes the solution to coastal erosion along this section of coastline and examines the possible adoption of a number of labour-intensive technologies utilizing local material to overcome the problem of severe erosion. Four of the five schemes proposed are located within the Bight of Benin, in Ghana, Benin and Nigeria.

(iv) The UN, through its Ocean Economics and Technology

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1 The Recommendations are given in Annex II of the present Summary Report.

Branch, published a Report on Unconsolidated Mineral Deposits in the Exclusive Economic Zone, for the UN Department of International Economic and Social Affairs and as a contribution to the joint IOC-UN(OETB) Programme on Ocean Science in Relation to Non-Living Resources (OSNLR). This publication identified areas that are favourable to the recovery of offshore mineral deposits, based upon the assessment of continental geology, sediment sources and transport paths, and the proximity of ports and harbours. Other publications relevant to the development of OSNLR in the region include the report of a UNESCO-UN(DIESA)-UNEP Workshop on Control of Coastal Erosion in West and Central Africa (Dakar, March 1985), and a UNEP Bibliography on Coastal Erosion.

(v) The Summary report of the First Session on the IOC-UN(OETB) Guiding Group of Experts on OSNLR drew up the objectives, priority areas and strategy for implementing the OSNLR Programme at global and regional levels. Recommendation 1 of the Guiding Group, in particular, emphasizes the importance of the coastal zone and its resources as being of primary interest for the OSNLR Programme, and a general framework for the relevant studies is defined under the sub-programme entitled Sea-level changes, Environments and Tectonics during the past Million Years (SETMY).

Within the programme arising out of the First Session of the Guiding Group, the following types of resources have been considered: (i) placers (including sand and gravels); (ii) phosphorites; (iii) carbonates; and (iv) the coastal zone [1] as a resource (CZAR). CZAR was seen as addressing, for example, the problems of erosion, siltation and the impact of man on the physical environment of the coastal zone.

The strategy for developing OSNLR is based upon the need to improve the basic scientific knowledge of the origin of these resources and the dynamics of their formation. Therefore, sea-level changes, environments of deposition, and (neo)tectonics were seen as topics that form the common scientific link.

The following proposals are relevant to OSNLR in the central eastern Atlantic: *44*

(i) The development of the scientific basis for coastal management and protection from coastal erosion and/or siltation. This proposal concerns more particularly States that have a narrow continental shelf and high-

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1 Littoral zone and shallow marine area extending to the shelf break.

energy waves with coastal currents; these forces induce active erosion of the littoral zone.

(ii) Economic deposits (sand and gravels, placers, carbonates, phosphorites). This proposal concerns more particularly coastal States with a wide and sandy shelf and/or with coastal upwelling systems.

45 The proposed activities would be based upon an overall assessment of the physical oceanographic and sedimentological conditions in the coastal zone, with particular reference to non-living resources. The scientific objectives have been identified also from previous research undertaken for specific projects in the region.

46 The first objective is coastal management and protection. The shoreface of Nigeria has been identified already as one in which coastal erosion is observed, with rates of up to 20 m/y at Lagos (Victoria Beach) and 2-4 m/y at narrow locations on the shoreline of the Niger delta. Intense erosion has been related, on a regional scale, to: the construction of dams, for irrigation and hydroelectric power generation; the presence of harbours; and the construction of groyne systems at right angles to the coastline. Erosion is a regional phenomenon in the Gulf (Bight) of Benin, with coastlines of the various adjoining countries forming part of a single longshore transport system. Against this background, the study and monitoring of coastal erosion in the Gulf, including observations of waves, would provide scientific data for the protection and management of a specific section of the central eastern Atlantic coastline.

47 The second objective is economic and has two parts, concerning phosphorites and detrital minerals:

(a) Phosphorites: Coastal upwelling occurs off the western coasts of the African continent, with the deep oceanic waters moving upwards towards the coastline, whilst surface waters flow offshore as a drift current due to wind action. The most favourable conditions for coastal upwelling occur off the coasts of Mauritania, Morocco and Senegal, in the north, in the Gulf of Guinea, and off Angola, in the south. Phosphorites, which are composed of calcium fluoro-apatite, could be associated with such upwelling systems. Hence, recent phosphoritic deposits may exist on the continental shelf area off Morocco. Similarly, relict deposits may be present in the same area in connection with the well known continental phosphorite deposits of Morocco. This would be a specific project to develop within the framework of IOC's co-operation with the International Geological Correlation Programme.

(b) Detrital minerals: a resource-search methodology was applied to the West African coastal zone recently (see above-mentioned UN report). The following geological factors were related to the presence of offshore mineral resources: the source rocks; the processes by which the mineral is transported to the ocean; and the marine processes required to concentrate the useful minerals. The mouths of both the major rivers of Sierra Leone (the Rokel and the confluence at

Sherbo island) and the adjacent continental shelf were assessed, by the recommended methods, as being "favourable offshore zones".

Consequently, an investigation of the Sierra Leone region and comparison with shelf areas in Liberia, Ghana and Gabon, could: (i) identify areas of present-day concentrations of minerals; (ii) act as a model for palaeo-environmental reconstruction of mineral deposits; and (iii) a provide the source for relict mineral deposits being reworked under present hydrodynamic conditions. *48*

The Regional Committee recognized that, if these proposals were to be implemented, certain types of data sets would be required from the continental and marine environments. From the continent, information would be needed on: geological characteristics of river catchments; water and sediment discharge from the rivers (including any observations on historical variation), particularly in relation to the damming of rivers and/or climatic variability. At sea, the following observations would be useful: satellite imagery or aerial photography; currents and waves (including height, angle of approach and breaking characteristics) which will be fundamental to the understanding of the evolution of the coastline. The collection of offshore geophysical data, particularly from high-resolution sub-bottom profiling, although presenting more logistical difficulties, would be most useful and provide essential information on the structure and thickness of sediments and a guideline for continental-shelf sampling programmes. *49*

The Regional Committee noted that some Member States, notably Brazil and Portugal, have broad and sometimes hard-won experience in dealing with coastal erosion, especially in relation to major river discharges (e.g., the Amazon River in Brazil) and adverse effects of some forms of coastal engineering. *50*

The Regional Committee agreed that even relatively unsophisticated techniques of measuring wave parameters (especially height, angle of approach to the coastline, breaking characteristics, etc.) and coastal bathymetry yield worthwhile indications of erosion problems at an early stage of their evolution. *51*

The Regional Committee also agreed that bathymetric data (see end of this Section) can be used for geomorphological studies from which ancient shorelines, fossil fluvial channels, and sedimentary prisms can be recognized. *52*

For offshore investigations, including the use of oceanographic and sediment sampling equipment, the Regional Committee noted that ship time will be required. There are two options for the provision of this facility: (i) the use of local fishery or research vessels (from fishery or oceanographic institutions), or those of the region's Port/Harbour Authorities or Navies; and (ii) the use of a major research vessel of one of the IOC Member States (e.g., UK, France, Germany (Federal Republic)). *53*

The Regional Committee stressed the importance of ensuring that scientists from IOCEA Member States are involved in cruise planning at the outset, in data and sample collection, and in *54*

subsequent laboratory analysis of the sediments and the data collected.

55 The Regional Committee adopted the following pilot projects:

(i) Coastal Erosion in the Bight of Benin. The countries mainly concerned are Cote d'Ivoire, Ghana, Togo, Benin and Nigeria. However, such a sub-regional pilot project need not exclude other Member States having similar concerns and having acquired an experience that could be shared or being in a position to offer training, education or mutual assistance. The Member States of the Bight of Benin have acquired appreciable experience and capabilities in the study of this phenomenon. The phenomenen is complex, with various aspects: socio-economic (e.g., land loss), coastal engineering (e.g., problems of coastal construction) and scientific (e.g., sediment supply and transport variations, hydrodynamic factors, especially wave parameters).

(ii) The Effect of Damming Rivers on the Supply of Sediment to the Coastal Zone. This is of particular concern in respect of the Niger River and rivers to the west in the Bight of Benin, but is also an important consideration in the northernmost IOCEA Member States: Morocco, Mauritania, Senegal, the Gambia, Guinea-Bissau and Guinea-Conakry.

(iii) The Relationship Between Upwelling and Phosphorite Deposits. The accumulation of deposits supposes a long-term upwelling regime, which implies the possibility of phosphorite deposits not necessarily associated closely with present-day upwelling. Brazil, for example, has phosphorite deposits on the coast but not over the continental shelf. Nevertheless, upwelling has been observed along the edge of the Brazilian continental shelf. A similar situation may exist in the central eastern Atlantic.

56 The Regional Committee noted that, if Member States of the IOCEA region wish to undertake exploration for phosphorite deposits, they may find it convenient to generalize such exploration to placer deposits of economically important minerals including gold and diamonds.

57 The Regional Committee believed that regional co-operation could be established, in the framework of the adopted projects, particularly between the Member States bordering the Bight of Benin, for Projects (i), and (ii), and between Morocco, Mauritania, Senegal, the Gambia, Guinea-Bissau and Guinea-Conakry, for Project (ii). For Project (iii), co-operation could develop between those Member States with upwelling zones or with interest in exploration for phosphorite deposits.

The Regional Committee also stressed the need for training, education and mutual assistance in relation to the proposed projects and called on the Member States of the region or outside it to inform the Secretary IOC of the details of any training opportunities in this field and of any training or technical assistance needs to enhance participation in the proposed projects. 58

The Delegate of Brazil offered specialized short-term courses (up to six months) to scientists and technicians in the field of OSNLR from the IOCEA region; these courses would be given normally in Portugueuse and/or Spanish in certain cases. 59

The Delegate of Portugal also offered medium- to high-level courses on wave measurement, possibly as part of coastal hydrography and bathymetry courses. 60

The Regional Committee thanked the Delegates of Brazil and Portugal for these generous offers. 61

The Regional Committee adopted Recommendation IOCEA-I.2. 62

Regarding ocean mapping and bathymetric charts, the IOC Senior Technical Secretary reminded participants that a conclusion of the IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa) (Tenerife, Spain, December 1983) was that the demand for exploration and exploitation of ocean resources is such that the existing hydrographic charts for navigation and fisheries are clearly inadequate and should be supplemented by charts giving the best representation of the sea bed, and that this is particularly important for the continental margin and the Exclusive Economic Zones (EEZ) of the developing countries. 63

The Senior Technical Secretary pointed out that ocean mapping has been receiving increased attention by IOC in recent years, since it constitutes an important component of any oceanographic scientific studies and a basis for exploration and exploitation of living and non-living resources. Knowledge of ocean-bottom topography is needed for the study of ocean water-mass characteristics (such as sea temperature, salinity, oxygen and nutrients), deep-ocean circulation, upwelling, migration of living organisms, bottom-sediment formation, geological and geophysical investigations. It is also necessary for underwater engineering and for rational planning of scientific investigations in specific oceanic regions. Overall co-ordination of ocean mapping within the IOC is provided by the IOC Consultative Group on Ocean Mapping, the Second Session of which will be held in Paris, 12-13 February 1987. 64

The major activities of IOC in this field are the publication of the 5th edition of GEBCO in 1982, the 1st edition of the International Bathymetric Chart of the Mediterranean in 1981, and initiation of the preparation of an International Bathymetric Chart of the Carribean Sea and part of the Pacific Ocean off Central America (IBCCA), and of the Northern and Central Western Indian Ocean (IBCWIO). IOC also co-ordinates preparation of the Geological-Geophysical Atlases of the Atlantic and Pacific Oceans (GAPA). 65

66 The Senior Technical Secretary also outlined the possibility of promoting a project on the preparation and printing of an International Bathymetric Chart of the Central Eastern Atlantic (IBCEA), and described briefly the general make-up of such a Chart through a number of sub-regional sheets, on a scale of 1:1 000 000. He invited Delegates to express their interest in the proposed Chart, particularly if they were able to offer assistance in the various steps of the process (assembly of available data, identification of gaps in the data, eventual collection of new data, quality control, preparation of master plotting sheets, printing and distribution), recalling that France had, at the Seventeenth Session of the IOC Executive Council, and at the Thirteenth Session of the Assembly, expressed its willingness to assist in the preparation of such a chart.

67 The Regional Committee recognized that, for the IOCEA projects it had adopted at the present session, as well as for numerous other purposes, there was a need for a high-quality bathymetric map on a scale of 1:1 000 000 for the IOCEA region.

68 It welcomed the initiatives of IOC in this field and recommended to the IOC the convening of a meeting of regional experts in coastal marine bathymetry to study the feasibility of preparing an International bathymetric Chart of the Central Eastern Atlantic IBCEA, with a view to the formation of an Editorial Board for IBCEA, if the conditions for such a project were found to be met.

69 The Delegate of France confirmed his country's offer at the above-mentioned sessions of IOC Governing Bodies to take the lead in the preparation and publication of the Chart, if the Member States of the region so wished.

70 The Regional Committee welcomed this generous offer.

71 The Regional Committee adopted Recommendation IOCEA-I.3.

3.4 MARINE POLLUTION RESEARCH AND MONITORING

72 The Technical Secretary introduced this subject. He recalled that, within the framework of the IOC's Marine Pollution Monitoring System (MARPOLMON), and as a follow-up of the IOC-FAO-WHO-UNEP International Workshop on Marine Pollution in the Gulf of Guinea and Adjacent Areas (Abidjan, Cote d'Ivoire, May 1978), the IOC is co-operating in the joint FAO-IOC-WHO-IAEA-UNEP Project on Monitoring of Pollution in the Marine Environment of the West and Central African Region (WACAF/2) which is carried out in the framework of the UNEP Action Plan for the Protection and Development of the Marine Environment and Coastal Areas of the West and Central African Region (which includes the coastal States from Mauritania, in the north, to Angola, in the south).

73 In the WACAF/2 Project, the following observations or analyses are being made: (i) metals; (ii) organochlorines; (iii) oil slicks and tar on beaches; (iv) floating tar balls; and (v) basic

oceanographic parameters necessary for the understanding of pollutant transport and distribution in the region. The latter observations are of special significance, since the dynamic processes to be observed also determine coastal erosion which is of major concern in many countries of the region. FAO, in collaboration with IAEA, co-ordinates activities related to contaminant levels in commercially important marine organisms, and WHO is responsible for monitoring of contamination by micro-organisms.

74 The Technical Secretary recalled that the above-mentioned IOC-FAO-WHO-UNEP Workshop in Abidjan had also identified the release of sewage and solid waste in the region, sometimes directly onto the beaches, as a significant regional pollution problem

75 The First Workshop of Participating Scientists in the WACAF/2 Project (Dakar, Senegal, 28 October - 1 November 1985), stressed the importance of analysing bivalve molluscs, because of their role as sentinel organisms in the determination of contaminant burdens, and that the results of such activities would be relevant to the world-wide Musselwatch programme that is being implemented by IOC in collaboration with UNEP within the framework of the Marine Pollution Monitoring System (MARPOLMON) under the IOC's Global Investigation of Pollution in the Marine Environment (GIMPE). The Workshop also stated that, as a useful voluntary regional research component, necessary for the understanding of the fate of contaminants, analyses of sediment samples for heavy metals, organochlorines and petroleum hydrocarbons should be attempted. At a later stage of the project, analyses of sea-water samples may also be envisaged. Some fifteen institutions from nine countries are now participating in one or another component of WACAF/2.

76 Several Delegates described national problems and activities in the field, including sub-regional co-operation. Senegal, the Gambia, Cape Verde, Mauritania and Guinea-Conakry have constituted a regional committee which is considering adding a marine pollution project to its other activities.

77 Discharges by oil tankers continue to constitute one of the main sources of marine pollution in the region.

78 Some Delegates stressed the competition between the need to expand the use of living marine resources, on the one hand, and the increasing adverse impact of man on the marine and coastal environment, on the other hand. One Delegate emphasized the logistical difficulties of taking samples at sea and transporting them to the laboratory for analysis.

79 The Regional Committee recognized that the human and logistical resources available in the region were not sufficient to allow it to address regional marine pollution problems easily. It agreed that some progress was being made in dealing with the pollution problems through the relevant projects, notably WACAF/2 of the UNEP Regional Action Plan, but stressed the importance of developing analytical capabilities in the region, particularly with a view to assessing marine pollution problems in the region, especially in the coastal zone, so as to provide, in due course, a regional contribution

to an assessment of the state of health of the oceans. It also stressed the importance of scientific and technical advice through the Groups of Experts on Methods, Standards and Intercalibration, and on the Effect of Pollutants, of the IOC Scientific Committee for the Global Investigation of Pollution in the Marine Environment (GIPME).

80 It called on the Scientific Committee for GIPME to give special attention to the central eastern Atlantic and to assisting IOCEA in this field.

4. REQUIREMENTS FOR, AND DEVELOPMENT OF, IOC OCEAN SERVICES IN THE REGION

4.1 DOCUMENTATION AND INFORMATION EXCHANGE

81 The IOC Senior Technical Secretary introduced this subject. He reminded the Regional Committee that, 25 years ago, the IOC established the Working (now Technical) Committee on International Oceanographic Data Exchange. Since then, the IODE system has developed significantly. A large amount of oceanographic data has been assembled in the World Data Centres A and B (Oceanography). The international marine data base now contains data from more than 2 000 000 observations. The number of oceanographic stations for which data are held by the WDCs now exceeds 900 000. Other data holdings at the WDCs include in excess of 400 000 bathythermograph profiles, 120 000 biological observations and series of current observations comprising 630 000 individual measurements. All data held by the WDCs (Oceanography) are identified and described in the Data Catalogue issued annually and available free of charge to qualified registers in the scientific community.

82 Description of the WDCs' functions are given in the IOC Manual on IODE (IOC Manual and Guides No. 9) and the ICSU Users' Guide on World Data Centres.

83 Forty Member States have established their own National Oceanographic Data Centres (NODCs) or Declared National Agencies (DNAs); more than 50 countries have contributed to the IODE system; international standards have been set for processing, quality control and exchange of data; and data are frequently used by customers. Several Responsible Oceanographic Data Centres have been established to assist in data collection, processing and data-product preparation for specific types of data, projects or regions.

84 The IOC Technical Committee on IODE, at its Twelfth Session (Moscow, December 1986), proposed a number of actions regarding:

- IODE support to the World Climate Research Programme, in particular the TOGA and WOCE projects;
- management of marine biological data to meet the needs of the IOC-FAO Programme on Ocean Science in Relation to Living Resources (OSLR);

- geological and geophysical data management in support of the IOC-UN(OETB) Programme on Ocean Science in Relation to Non-Living Resources (OSNLR);

- data-management and product-preparation requirements for GIPME and MARPOLMON;

- development of formats for international exchange of oceanographic data (IOC General Format 3, GF3, and its subsets) and the adaptation of IODE to development in computers and communications;

- management and exchange of data from new types of sea-going and shore-based sensors;

- development of marine information management, including MEDI and ASFIS (see below).

85 In the field of international oceanographic data and information management, IOC co-operates closely with WMO, FAO, UN(OETB), IMO, ICES, UNEP, ICSU (SCAR, the WDCs), CCOP(SOPAC).

86 Special attention is being given to training and mutual assistance in marine information and data management, including support for related workshops, training courses and individual training in data and information management in national centres, establishment of NODCs, and publication services.

87 In the IOCEA region, only one country, Ghana, has established a Designated National Agency. Nigeria, Cameroon and Cote d'Ivoire have recently designated National Co-ordinators for IODE.

88 The Marine Environmental Data and Information (MEDI) Referral System provides information on the location and availability of oceanographic data through a printed catalogue and a referral service based on a computerized database. The MEDI Co-ordination Centre is in Unesco Headquarters (Paris) and is operated by IOC. The MEDI is designed to provide the marine community with referrals concerning the availability and location of the many inter-disciplinary, as well as traiditonal, marine science data collections held by marine-oriented organizations and centres. Besides IOC, the UN, FAO, ICES, IMO, WMO, Unesco and UNEP participate in MEDI.

89 The second edition of the MEDI Referral Catalogue (IOC Manuals and Guides No. 16) was published in January 1981. It contains entries for international organizations and for national organizations in 24 countries. In all, 64 organizations are included and descriptions are given of 219 files.

90 The MEDI is related to other systems, particularly INFOTERRA, of UNEP, and INFOCLIMA, of WMO. For those who wish to contribute to the MEDI System, information should be submitted on a MEDI Input Registration Form either directly to IOC or through a MEDI point of contact in one of the participating organizations. The input form is in two sections; the first section contains instructions indentical to

UNEP's INFOTERRA input form (organizational), and the second section is a data file description; a separate decription is completed for each data file and includes the name of the file, period of record, the availability of the file (restrictions, cost, etc.), type of observation platform, parameters, geographic location, mode of data storage and names and addresses of data contacts. The catalogue and any additional information on MEDI can be received upon request from the MEDI Co-ordination Centre (IOC, Paris).

91 The further development of MEDI to meet growing demands of scientists and data managers was discussed at the Twelfth Session of the IOC Technical Committee on IODE (Moscow, USSR, 10-17 December 1986).

92 The Aquatic Sciences and Fisheries Information System (ASFIS) is an international information system that is jointly sponsored by the FAO, IOC and the UN (Ocean Economics and Technology Branch). The main basis of ASFIS is ASFA (Aquatic Sciences and Fisheries Abstracts) which is a bibliographic data-base that covers the world's literature on the science, technology and management of marine and freshwater environments. ASFA covers approximately 5 000 journals and other serials, as well as books, reports and conference proceedings. Over 24 000 abstracts are added to the data-base each year. ASFA seeks to provide comprehensive coverage of published information on the marine and fresh-water environments and resources, ocean engineering, ocean law, policy, economics and social sciences, and ocean commerce and trade.

93 ASFA is available as a printed journal, on magnetic tape, through an on-line system and now on laser compact disk with a read-only memory (CD-ROM) (available from Cambridge Scientific Abstracts). The latter technique offers exciting possibilities, particularly for developing countries, as the successful installation of such a system in China has proved.

94 Other ASFIS products are the publication and updating of an International Directory of Marine Scientists, an Institutions Register; List of Acronyms and Abbreviations, and Marine Science Content Tables.

95 Several Delegates pointed out that there is a shortage of documentation on marine science. The few libraries in the region that are best off in this regard do not, in many cases, have up-to-date holdings. Also, the majority of the results of scientific studies are published only in one language, which makes them relatively less accessible to workers in the region not familiar with that language. It would appear essential, then, to establish a regional or sub-regional mechanism for the exchange of documents, information and bibliographies in the marine sciences.

96 Some Delegates pointed out that scientists and scientific laboratories in their countries often do not receive scientific information and IOC documentation.

97 The Regional Committee therefore recommended that the IOC review the concept, purposes and functioning of IOC Depository Centres

so as to enable them to fulfil their principal purposes to inform their respective national marine scientific communities of the availability of IOC publications, and to make them available to these scientists.

The Regional Committee urged its Member States to provide the Secretary IOC with information on their capabilities in providing information and documentation to their national marine scientific communities, and on their needs for such information and documentation. *98*

The Regional Committee called on the Unesco Division of Marine Sciences to collaborate with the IOC in assisting the countries of western Africa in developing their marine information capabilities, possibly by creating an appropriate regional centre and developing a special assistance project. *99*

4.2 REGIONAL COMPONENT OF THE GLOBAL SEA-LEVEL OBSERVING SYSTEM

The IOC Senior Technical Secretary introduced this subject. He described the major activities of IOC that have led to the formulation of a proposal on the development of an IOCEA regional component of the IOC Global Sea-level Observing System (GLOSS). *100*

The IOC Assembly, at its Thirteenth Session, by Resolution XIII-7, approved the development of the Global Sea-Level Observing System. The IOC Executive Council, at its Nineteenth Session, by Resolution EC-XIX.6, approved, in principle, the Global Sea-Level Observing System Implementation Plan. Resolutions XIII-7 and EC-XIX.6 called on the IOC regional subsidiary bodies to consider the development of regional components of GLOSS. A mission by an IOC Consultant, Mr. Jean-Marc Verstraete, to several countries of the IOCEA region in April 1986 demonstrated the general interest and support of these countries in developing a regional project on sea-level observations within the framework of GLOSS. *101*

Referring specifically to the GLobal Sea-Level Observing System Implementation Plan (Doc. IOC/INF-663 rev.), the Senior Technical Secretary pointed out that GLOSS is based on an international global network of about 300 permanent sea-level measuring stations, co-ordinated by IOC, for making standardized sea-level observations. It includes data collection for international exchange, with unified formats and procedures in accordance with the provisions of the GLOSS Implementation Plan. GLOSS forms a primary framework to which regional and national sea-level networks can be related, as well as an essential adjunct to international scientific study, such as TOGA and WOCE, and regional scientific studies. *102*

The Senior Technical Secretary then introduced Document IOCEA-I/8 Annex 4 (Project for Implementation of the IOCEA Regional Component of the Global Sea-Level Observing System), prepared at a consultation of experts immediately prior to the present Session of the Regional Committee, and based on the GLOSS Implementation Plan (Doc. IOC/INF-663 rev) and Document IOCEA-I/8 Annex 1 (IOCEA Regional Component of the Global Sea-Level Observing System). He emphasized that acceptance of the proposed project would require the following actions *103*

by Member States:

(i) the installation within the next 3-4 years of new stations and/or the up-grading of existing stations, as indicated in the proposed project, giving highest priority to those stations required for the TOGA and WOCE studies;

(ii) submission to the Permanent Service for Mean Sea Level (PSMSL), within one year of acquisition, monthly mean-sea-level values from existing GLOSS stations;

(iii) making monthly values of sea-level data available for international exchange in support of TOGA and WOCE;

(iv) identification of TEMA requirements, as indicated in the proposed project, or bilateral and/or multilateral assistance, through the IOC Voluntary Co-operation Programme if appropriate.

104 The Delegate of France presented information on the use of autonomous pressure-type tide gauges used in support of the FOCAL Programme (1982-1984) as well as in support of the TOGA Study in the tropical Atlantic; such gauges have proved to be very reliable, easily installed and to provide valuable and high-quality information (together with recording of sea temperature) for use in the study of mean-sea-level changes, within the framework of TOGA. He also informed the participants of the new methods, particularly acoustic methods, for sea-level measurements and the future use of Argos for transmission, on a real-time basis via satellites, of data from pressure-type tide gauges and float-type tide gauges in the Atlantic Ocean. He also emphasized the importance of sea-level measurements for scientific and practical applications in the countries of the IOCEA region. Mr. Verstraete's presentation is given in Annex III hereto.

105 The participants then discussed the type of tide gauges to be used within the framework of the proposed project. In accordance with the requirements of the GLOSS Implementation Plan, float-type tide gauges or pressure-type tide gauges with remote coastal registration are preferred for GLOSS stations. These types of gauge will be needed for regular recording and submission of duly checked and corrected data to the international TOGA Sea-level Centre on a monthly basis, as well as for national practical application.

106 The Delegate of France explained that all gauges must measure sea levels relative to a fixed and permanent local gauge bench mark, which is connected to a number of auxiliary marks to guard against its movement or destruction. It was also realized that pressure-type tide gauges will play a very useful complementary role in the expanded regional network of sea-level stations.

107 Several Delegates expressed the interest of their countries in participating in the project and informed the Regional Committee of

their need for assistance in the provision and installation of tide gauges. Some Delegates indicated the existence of tide gauges or their efforts to install them in the near future.

The Delegate of Portugal informed the participants that the Hydrographic Institute of Portugal has historic sea-level records on magnetic tape for several stations in Angola: (Santo Antonio do Zaire, 1967-1970, 1972-1975; Luanda, 1954, 1969-1970 and 1972-1975, Lobito, 1971-1975; and Mocamedes, 1971-1975). Also, recorded data, not yet processed (on a page tape), are available for Santo Antonio do Zaire (1970-1972) and Luanda (1971-1972). This information will be made available to the countries concerned. *108*

The Regional Committee endorsed the proposed project on the implementation of an IOCEA regional component of GLOSS (as shown in Annex IV hereto; this Annex also gives national requirements for assistance identified so far). *109*

The Regional Committee adopted Recommendation IOCEA-I.4. *110*

4.3 REGIONAL COMPONENT OF THE IOC-WMO INTEGRATED GLOBAL OCEAN SERVICES SYSTEM

The Senior Technical Secretary, introduced Document IOCEA-I/8 Annex 2 (Regional Component of the Integrated Global Ocean Services System). He described the major objectives and activities of IGOSS which was launched almost 20 years ago. IGOSS is a world-wide ocean services programme planned, developed and co-ordinated jointly by IOC and WMO, through the joint IOC-WMO Working Committee on IGOSS. The primary purpose of IGOSS is to make available to the Member States of IOC and the Members of WMO, oceanographic information required by them in the provision of efficient and effective oceanographic services, for applications and research purposes. The fields of national economic interest that could benefit from products and services made available through IGOSS include: fisheries, marine aquaculture, shipping (safety of navigation), ocean and offshore engineering, meteorological services, short-range oceanic forecasting, pollution abatement, recreation planning; search-and-rescue operations. IGOSS is considered as one of the major oceanic activities in support of oceanographic and meteorological research, particularly within the framework of the World Climate Research Programme. *111*

IGOSS comprises the following major elements: (i) IGOSS Observing System (IOS), consisting of various facilities and arrangements for making standardized oceanographic observations from voluntary observing ships, research vessels, ocean weather stations, buoys, satellites and other platforms; (ii) IGOSS Data Processing and Service System (IDPSS), which includes National Oceanographic Data Centres (NODCs) and Specialized Oceanographic Centres (SOCs), two World Data Centres (Oceanography); and (iii) IGOSS Telecommunication Arrangements. *112*

From October to December 1984, 312 ships from 18 countries participated in the BATHY/TESAC Programme (40 396 BATHY/TESAC reports *113*

were submitted by 15 Member States and were exchanged through the Global Telecommunications System (GTS)). Seventeen Member States operated or planned buoy and platform programmes. Thirty-six Member States operated National Oceanographic Data Centres or National Meteorological Centres. Three Member States established Specialized Oceanographic Centres. The USSR and USA continued to operate the two World Data Centres (Oceanography). Thirty-six Member States prepared and disseminated a total of 363 different marine meteorological and oceanographic products. New telecommunication systems, such as the geostationary meteorological satellites, INMARSAT and Argos systems have proved to be efficient tools for the transmission of ocean data from buoys and platforms. The Working Committee for IGOSS also considered the use of new technology for ocean-observing systems, such as specialized oceanographic satellites (carrying scatterometer, altimeter and synthetic aperture radar), automated and semi-automated measurement and communications systems aboard ships of opportunity, acoustic techniques, neutrally buoyant floats, etc.

114 Although some progress has been made in the development of IGOSS, the number of observations made and transmitted for international exchange is still small, especially in tropical zones, which is of great importance for the achievement of the scientific goals of the TOGA Study. The expansion of the IGOSS Observing System was considered at the joint IOC-WMO Meeting on Implementation of IGOSS XBT Ship-of-opportunity Programmes (Seattle, USA, 9-13 September 1985); a global ship-of-opportunity programme in support of the WCRP, particularly TOGA, was designed. All sections proposed in the tropical zone of the Atlantic Ocean were considered to be of great importance for the determination of seasonal and interannual variability of equatorial currents and for thermocline-development studies.

115 The training and assistance elements include participation in IDPSS seminars and workshops, regional training seminars, training of specialists in other countries, training courses, provision of instruments and equipment, preparation of guides and manuals, etc. The Senior Technical Secretary drew the attention of the participants to Resolution EC-XIX.5, by which the Executive Council urged Member States to maintain and implement new ship-of-opportunity programmes through national, bilateral or multilateral efforts.

116 The Regional Committee noted with interest the development of IGOSS, but believed that the participation in IGOSS of many of the Member States from the region would require further internal discussions with specialists and active support through TEMA, particularly the provision of equipment under VCP or other appropriate arrangements (e.g., bilateral aid).

117 It requested the Secretary of IOC to provide documentation and publications on IGOSS, to as wide a range of addressess as possible, with a view to encouraging participation in IGOSS.

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

5.1 IDENTIFICATION OF TRAINING NEEDS IN SUPPORT OF RECOMMENDED PROGRAMMES IN OCEAN SCIENCE AND OCEAN SERVICES

118 The Technical Secretary introduced this subject. He reminded participants that the TEMA components of each activity had been discussed under the relevant previous Agenda Items, and that the point of the present Agenda Item was to summarize the overall view of the Regional Committee in this respect. He noted that experience has shown that the degree of success of IOC programmes is largely conditioned by factors such as availability, in participating countries, of a critical mass of manpower, facilities and institutional arrangements, which are necessary if the Member States are to benefit from the assistance provided; it is also conditioned by the degree of commitment of Member States to participate in these IOC programmes.

119 Some Delegates explained that, at least in certain fields, their countries have some difficulty in defining their training and related needs. Nevertheless, they recognized that IOC could only assume a catalytic and co-ordinating role, the real tasks resting with the Member States. Also, there is a need to train trainers so as to provide a multiplying effect.

120 Several Delegates who had offered training courses under individual Agenda Items restated these offers.

121 The Delegate of France reminded participants that the University of Bordeaux offers regular courses in coastal geology for scientists from developing countries.

122 The Delegate of Brazil circulated a detailed list of training opportunities in his country in various fields of marine science and technology. He expressed some concern that the Regional Committee might have to devote too much of its effort to highly technical global programmes of the Commission and therefore not enough towards specific problems of the region.

123 Several Delegates believed that many of the IOC global programmes, although highly technical in some cases, were generally relevant to the IOCEA region, especially those dealing with oceanic variability and climate prediction. They felt that it was through TEMA that Member State participation - in global or in regional activities - could be enhanced.

124 The Regional Committee agreed that, in some cases, the impact of TEMA was lost through poor liaison between Member States and the IOC Secretariat and inadequate communications. Notifications of courses, in particular, even if sent to IOC Action Addresses, did not reach interested institutions and potential candidates at all or only at too late a date for effective response. It urged the Secretary IOC to provide as much advance notice as possible of training opportunities to IOC contact points in the Member States of the region, and called on

the Member States especially to improve their liaison mechanisms and arrangements for communication with the IOC; e.g., by establishing, when necessary, National Oceanographic Commissions or similar bodies (see Section 5.3). It also called on Member States to ensure an adequate internal distribution of training course announcements.

125 The Regional Committee invited the Unesco Division of Marine Sciences to collaborate, particularly through COMAR, in the provision of the necessary training, education and mutual assistance to enable Member States to participate more effectively in regional co-operative research, particularly in the context of OSLR and marine scientific information exchange.

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

126 The Technical Secretary introduced this subject. He reminded the Committee of the main components of this Comprehensive Plan:

(i) compilation of information required for the preparation of Marine Science Country Profiles, with the co-operation of interested Member States;

(ii) facilitation of the participation of Member States in co-operative marine research programmes, so as to strengthen national ocean science and services infrastructures as a basis for development;

(iii) establishment, by Member States, of a high-level National Oceanographic Commission or equivalent body (see Section 5.3, below);

(iv) formulation and promotion of regional and sub-regional technical assistance projects, upon request of the governments directly concerned, to: (a) respond to national priorities and to commitment to development of marine sciences; (b) aim at contributing to the solution of identified major scientific problems and to the better understanding of oceanic phenomena having a bearing upon development of socio-economic activities in a given region; (c) be directed to strengthening capabilities of States to allow their full participation in ocean science and service programmes of Unesco and IOC programmes

127 The Regional Committee expressed some concern about the difficulty of identifying suitable funding sources for carrying out regional or sub-regional projects.

128 It believed that marine science institutions in the region could assist by identifying the elements of such projects through an assessment of each institution's needs for infrastructure development,

and assisting in the preparation of IOC Marine Science Country Profiles. It invited these institutions to submit suggestions to the Secretary IOC.

It decided to include TEMA and the Unesco-IOC Comprehensive Plan as specific Agenda Items for its next Session. *129*

5.3 IMPROVEMENT OF PRESENT LIAISON ARRANGEMENTS BETWEEN MEMBER STATES AND THE COMMISSION

The Technical Secretary introduced this subject. He reminded the Committee that the IOC Assembly, at its Thirteenth Session, decided by Resolution XIII-12 that "there was a major need for improving liaison between Member States and the Commission Secretariat, and called on Member States to consider creating, if not existing, National Oceanographic Commissions or similar national co-ordinating bodies, and nominating National Representatives to IOC." This liaison needs strengthening, to avoid existing communication and operational difficulties, resulting from, inter alia, frequent changes in the names and/or addresses of IOC Action Addressees, and a lack, in many Member States, of a national co-ordinating mechanism and of a national representative to the Commission, in the field of marine scientific and related technical affairs. *130*

Some Delegates recognized that there were real problems in communications, internally, between concerned institutions, and externally, between the Member States and the IOC Secretariat. It is clearly important to have a definite contact point for the IOC, in general, and for specific IOC programmes. Besides sending correspondence to an IOC contact point, a copy of a letter or cable should be sent to the person or institution directly concerned with a particular activity. *131*

The Regional Committee believed that the responsibility for improving liaison and communication lies with the Member States, individually, the Secretariat of IOC, and with itself. It called on the Member States to assist the Secretary in updating the IOC Correspondence Manual and to adapt it, as far as possible, to include the actively co-operating national institutions. *132*

The Regional Committee endorsed the concept of a National Oceanographic Commission, or similar high-level co-ordinating bodies, as a good one, and called on the Member States to establish such bodies if they did not already have an appropriate mechanism for co-ordinating marine scientific affairs and for liaison with the IOC Secretariat. *133*

6. CO-OPERATION WITH OTHER ORGANIZATIONS

134 The Technical Secretary introduced this subject. He stressed the importance the IOC attaches to co-operation with other international organizations and regional bodies directly concerned with marine scientific and technical affairs, and reminded the Regional Committee of the various IOC programmes that are jointly conducted with other organizations, notably those that are members of the Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO): with FAO in OSLR, with the UN in OSNLR, with WMO in IGOSS and the WCRP, and in training and education with Unesco through the Division of Marine Sciences. He also referred to the close co-operation with UNEP, in marine pollution research and monitoring and in the West and Central African Regional Seas Action Plan.

135 The Representative of the Economic Community of Western African States (ECOWAS) thanked the IOC for the invitation to attend this First Session of the Regional Committee . He informed the participants that ECOWAS had sixteen Member States and is ready to co-operate with IOCEA in the field of marine scientific and technical research and the related ocean services.

136 The Regional Committee recognized the importance of co-operation with other bodies, whether other organizations at the regional level or subsidiary bodies of the IOC, to the successful development of its programmes.

137 It particularly stressed the importance of collaboration, as appropriate, with: (i) ECOWAS; (ii) the FAO Committee on Eastern Central Atlantic Fisheries (CECAF); (iii) UNEP through the Regional Seas Action Plan for the Protection and Development of the Marine Environment and Coastal Areas of the West and Central African Region; and (iv) the International Commission for the Conservation of Atlantic Tunas (ICCAT).

7. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN

138 The Technical Secretary invited proposals for the post of Chairman, reminding the Committee that under the present Guidelines for the Structure and Responsibilities of IOC Subsidiary Bodies, the Chairman and Vice-Chairman should be elected for the following intersessional period and the next Session of the Regional Committee, at which time the incumbents would be eligible for re-election.

139 The Delegate of Nigeria proposed Dr. Sekou Konate of Guinea-Conakry as Chairman. This motion was seconded by the Delegate of Cote d'Ivoire, Senegal and Mauritania. No other candidate being presented, Dr. Konate was elected unanimously.

140 The Delegate of Gambia proposed Dr. Chidi Ibe of Nigeria as Vice-Chairman, and was seconded by the Delegates of Guinea-Conakry, Côte d'Ivoire and Mauritania. There being no other candidate, Dr. Ibe was elected unanimously .

8. DATES AND PLACE OF THE NEXT SESSION

141 The Technical Secretary reminded the Regional Committee that, under the present Guidelines, it should meet not less than once every two years, and that, as a young subsidiary body, it could be expected to meet more frequently at first to develop its activities. However, he also pointed out that IOC has an extremely heavy schedule of governing and subsidiary body meetings and is required to identify such meetings in its biennial Programme of Work and Budget; at present, the Second Session of IOCEA was included in the Programme for 1988-89.

142 The Technical Secretary also invited potential host countries to discuss the requirements with the Secretary of IOC before making a formal offer to host IOCEA-II, since the expected responsibilities of a host country were considerable and should be clearly understood in advance of a proposal.

143 In view of the heavy IOC meeting schedule (and the reduced IOC Secretariat staff) and the possible competition for particular months and years amongst the numerous meetings (including those of the IOC Assembly and Executive Council, and, indeed, of the Unesco General Conference and Executive Board, the Regional Committee decided to call on the Secretary to seek appropriate dates in late 1988 or early 1989, if at all feasible, and urged its Member States to be represented at the Fourteenth Session of the IOC Assembly (17 March - 1 April 1987) in order to make known to the Assembly not only their views on the need for an early Second Session but also on regional programme needs.

144 The Delegate of Nigeria indicated that his country was considering offering to host the Second Session but would discuss requirements first with the Secretary of IOC.

9. ADOPTION OF THE SUMMARY REPORT

145 The Regional Committee, when considering the draft Summary Report, while appreciating the effort of the Secretariat to produce some of the key parts in French, observed that the French version was not of an adequate quality, for certain sections, and regretted that it was not possible to have a formal French version as well as an English version to work from. It called on the Secretary to make arrangements, at subsequent sessions, if possible, for formal translation of the base text (whether in English or French) into the other main working language of the Committee.

146 In view of the logistical difficulties of providing copies of the draft Summary Report on Agenda Items 5 and 6 and the lack of time to prepare text on Agenda Items 7-9, the Regional Committee accepted spoken text, reserving the right of its Member States to comment on the written text, noting that there would be insufficient time for this purpose if the Summary Report was to be ready in French and English for submission to the Fourteenth Session of the IOC Assembly, in which case, specific reservations, if any, could be made at the Assembly.

147 The Regional Committee authorized the Technical Secretary to complete, edit and correct the draft Summary Report at IOC in Paris, including the incorporation of its Terms of Reference presented in accordance with the Guidelines for the Structure and Responsibilities of the Subsidiary Bodies of the Commission approved by the Executive Council at its Nineteenth Session. These redrafted Terms of Reference are given in Annex V hereto.

148 With the aforementioned reservations, the Regional Committee adopted the Summary Report of the Session.

10. CLOSURE

149 The Delegate of Senegal requested the floor to address a motion of thanks to the President of Cape Verde:

> "The Delegations of the following countries: Angola, Brazil, Côte d'Ivoire, the Gambia, Guinea-Conakry, France, Mauritania, Morocco[1] Nigeria, Portugal, Senegal and Togo, participating in the First Session of the IOC Regional Committee for the Central Eastern Atlantic (IOCEA-I), held in Praia, from 19 to 23 January 1987:
>
> address their thanks to the President of the Republic of Cape Verde and, through him, to the Government and the People, for the welcome, the concern and the attention given to them during their stay in Praia;
>
> support the actions of the President and the Government in favour of the development of marine science in the subregion;
>
> congratulate the officials of the Department of Rural Development and Fisheries, notably Mrs. Maria Helena Santa Rita Vieira and all those who, closely or otherwise, have contributed to the perfect organization of the Session.
>
> Praia, 23 January 1987"

150 The Delegate of Mauritania then took the floor to address a similar motion to the Director-General of Unesco:

> "The participants at the First Session of the IOC Regional Committee for the Central Eastern Atlantic (IOCEA-I), held in Praia, from 19 to 23 January 1987, address their warm thanks to the Director-General of Unesco for his openness, his sense of organization and his dynamism, and wish that all marine science projects in the subregion receive the closest attention from Unesco and its Director-General.
>
> Praia, 23 January 1987"

---

1 In fact, present only as an Observer.

The Chairman welcomed these motions and added his personal thanks to the supporting staff, interpreters and Secretariat. *151*

The Vice-Chairman echoed these sentiments. *152*

The Chairman closed the Session at approximately 20:00 on 23 January 1987. *153*

ANNEX I

AGENDA

1. OPENING

2. ADMINISTRATIVE ARRANGEMENTS

   2.1 Designation of the Chairman and Rapporteur for the Session
   2.2 Adoption of the Agenda
   2.3 Conduct of the Session, Timetable and Documentation

3. MARINE SCIENCE ACTIVITIES IN THE REGION

   3.1 Ocean Dynamics and Climate
   3.2 Marine Ecosystems and Living Resources
   3.3 Continental Margin and Non-living Resources
   3.4 Marine Pollution Research and Monitoring

4. REQUIREMENTS FOR, AND DEVELOPMENT OF, IOC OCEAN SERVICES IN THE REGION

   4.1 Documentation and Information Exchange
   4.2 Regional Component of the Global Sea-level Observing System
   4.3 Regional Component of the IOC-WMO Integrated Global Ocean Services System

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

   5.1 Identification of Training Needs in Support of Recommended Programmes in Ocean Science and Ocean Services
   5.2 The UNESCO-IOC Comprehensive Plan for a Major Assistance Programme to Enhance the Marine Science Capabilities of Developing Countries
   5.3 Improvement of Present Liaison Arrangements Between Member States and the Commission

6. CO-OPERATION WITH OTHER ORGANIZATIONS

7. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN

8. DATES AND PLACE OF THE NEXT SESSION

9. ADOPTION OF THE SUMMARY REPORT

10. CLOSURE

ANNEX II

ADOPTED RECOMMENDATIONS

Resolution number	Agenda item	Title
IOCEA-I.1	3.2	Regional Component of the IOC-FAO Programme of Ocean Science in Relation to Living Resources
IOCEA-I.2	3.3	Regional Component of the IOC-FAO Programme of Ocean Science in Relation to Non-Living Resources
IOCEA-I.3	3.3	Bathymetric Chart of the Central Eastern Atlantic
IOCEA-I.4	4.2	IOCEA Regional Component of GLOSS

ADOPTED RECOMMENDATIONS

Recommendation IOCEA-I.1

REGIONAL COMPONENT OF THE IOC-FAO PROGRAMME OF OCEAN SCIENCE IN RELATION TO LIVING RESOURCES

The IOC Regional Committee for the Central Eastern Atlantic (IOCEA),

Recalling Resolution XII-I of the IOC Assembly approving the development of a Programme of Ocean Science in Relation to Living Resources (OSLR),

Recalling further the recommendations of the IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa) (IOC Workshop Report No. 34),

Acknowledging that a major objective of the IOC-FAO Programme on OSLR is to gain a better understanding of the effect of environmental conditions on recruitment to fish stocks,

Noting that progress towards this objective would be of direct assistance to IOCEA Member States in the management of marine living resources and in support of FAO activities in the region,

Requests the IOC Assembly, at its Fourteenth Session, to approve the establishment of a Group of Experts on Ocean Science in Relation to Living Resources in the Central Eastern Atlantic, with the Terms of Reference in the Annex to this Recommendation.

Annex to Recommendation IOCEA-I.1

TERMS OF REFERENCE OF THE GROUP OF EXPERTS ON OCEAN SCIENCE IN RELATION TO LIVING RESOURCES IN THE CENTRAL EASTERN ATLANTIC [1]

The Group of Experts on Ocean Science in Relation to Living Resources in the Central Eastern Atlantic shall:

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1. These Terms of Reference have been drafted in the light of the Guidelines on the Structure and Responsibilities of the Subsidiary Bodies of the Commission approved by the IOC Executive Council at its Nineteenth Session.

1. BASIC FUNCTION

Assist the IOC Regional Committee for the Central Eastern Atlantic in the implementation of co-operative regional and/or sub-regional studies in the framework of the IOC-FAO Programme of Ocean Science in Relation to Living Resources.

2. PROGRAMME DEVELOPMENT

2.1 PLANNING

Prepare a detailed plan of action for carrying out the projects and activities adopted or approved by the Regional Committee for IOCEA in this field.

2.2 PROMOTION

Promote in the Member States of the IOC Regional Committee for IOCEA and in their marine scientific communities the agreed projects or activities.

2.3 CO-ORDINATION

Identify the participating entities (institutions, individual scientists, as the case may be), inform them of the actions each is expected to undertake in the implementation of the agreed projects and activities, and generally inform each participating entity of the actions being taken by the other participating entities, so as to avoid unnecessary duplication of effort.

2.4 SCIENTIFIC AND TECHNICAL ADVICE

Advise the Regional Committee on the methods and procedures to be preferred in carrying out the work relating to the agreed projects and activities.

Advise the participating entities, as appropriate, of such methods and procedures, and on any methodological question falling within the Group of Experts' sphere of competence.

Advise the Regional Committee on the requirements for Training, Education and Mutual Assistance in the Marine Sciences (TEMA) relative to OSLR in the region.

2.5 COLLABORATION

Collaborate with the IOC-FAO Guiding Groups of Experts on OSLR, in the implementation of activities relevant to OSLR in the region, and, when appropriate, with similar expert groups active in the field of ocean science in relation to living resources.

2.6 EVALUATION

Evaluate progress in the implementation of agreed projects and activities with a view to proposing new approaches or new directions in the light of results achieved.

3. OTHER FUNCTIONS

3.1 TECHNICAL POLICY

Advise the Regional Committee for the Central Eastern Atlantic on the technical requirements for the effective implementation of agreed projects and activities and for the achievement of the Regional Committee's objectives in this field.

3.2 REPORTING

Report to the Regional Committee for the Central Eastern Atlantic at each Session of the Committee, and to the IOC-FAO Guiding Group of Experts on OSLR, on the scientific and technical aspects of its activities.

Recommendation IOCEA-I.2

REGIONAL COMPONENT OF THE IOC-FAO PROGRAMME OF OCEAN SCIENCE IN RELATION TO NON-LIVING RESOURCES

The IOC Regional Committee for the Central Eastern Atlantic (IOCEA),

Recalling Resolution XII-2 of the IOC Assembly approving the development of a Programme of Ocean Science in Relation to Non-Living Resources (OSNLR),

Recalling further the recommendations of the IOC Workshop on Regional Co-operation in Marine Science in the Central Eastern Atlantic (Western Africa) (IOC Workshop Report No. 34),

Acknowledging that a major objective of the IOC-UN(OETB) Programme on OSNLR is to acquire a better scientific basis for the exploration and exploitation of non-living marine resources,

Noting that progress towards this objective would be of direct assistance to IOCEA Member States in the management of marine non-living resources, and in support of UN(OETB) activities in the region,

Requests the IOC Assembly, at its Fourteenth Session, to approve the establishment of a Group of Experts on Ocean Science in Relation to Non-Living Resources in the Central Eastern Atlantic, with the Terms of Reference in the Annex to this Recommendation.

Annex to Recommendation IOCEA-I.2

TERMS OF REFERENCE OF THE GROUP OF EXPERTS ON OCEAN SCIENCE IN RELATION TO NON-LIVING RESOURCES IN THE CENTRAL EASTERN ATLANTIC[1]

The Group of Experts on Ocean Science in Relation to Non-Living Resources in the Central Eastern Atlantic shall:

1. BASIC FUNCTION

Assist the IOC Regional Committee for the Central Eastern Atlantic in the implementation of co-operative regional and/or sub-regional studies in the framework of the IOC-UN(OETB) Programme on Ocean Science in Relation to Non-Living Resources.

2. PROGRAMME DEVELOPMENT

2.1 PLANNING

Prepare a detailed plan of action for carrying out the projects and activities adopted or approved by the Regional Committee for IOCEA in this field.

2.2 PROMOTION

Promote in the Member States of the IOC Regional Committee for IOCEA and in their marine scientific communities the agreed projects or activities.

2.3 CO-ORDINATION

Identify the participating entities (institutions, individual scientists, as the case may be), inform them of the actions each is expected to undertake in the implementation of the agreed projects and activities, and generally inform each participating entity of the actions being taken by the other participating entities, so as to avoid unnecessary duplication of effort.

2.4 SCIENTIFIC AND TECHNICAL ADVICE

Advise the Regional Committee on the methods and procedures to be preferred in carrying out the work relating to the agreed projects and activities.

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1 See footnote on page 2 of Annex II to the present Report.

Advise the participating entities, as appropriate, of such methods and procedures, and on any methodological question falling within the Group of Experts' sphere of competence.

Advise the Regional Committee on the requirements for Training, Education and Mutual Assistance in the Marine Sciences (TEMA) relative to OSNLR in the region.

2.5 COLLABORATION

Collaborate with the IOC-UN(OETB) Guiding Groups of Experts on OSNLR, in the implementation of activities relevant to OSNLR in the region, and, when appropriate, with similar expert groups active in the field of ocean science in relation to non-living resources.

2.6 EVALUATION

Evaluate progress in the implementation of agreed projects and activities with a view to proposing new approaches or new directions in the light of results achieved.

3. OTHER FUNCTIONS

3.1 TECHNICAL POLICY

Advise the Regional Committee for the Central Eastern Atlantic on the technical requirements for the effective implementation of agreed projects and activities and for the achievement of the Regional Committee's objectives in this field.

3.2 REPORTING

Report to the Regional Committee for the Central Eastern Atlantic at each Session of the Committee, and to the IOC-UN(OETB) Guiding Group of Experts on OSNLR, on the scientific and technical aspects of its activities.

Recommendation IOCEA-I.3

BATHYMETRIC CHART OF THE CENTRAL EASTERN ATLANTIC

The IOC Regional Committee for the Central Eastern Atlantic,

A

Recognizing the importance of bathymetric charts, and relevant overlay sheets, of nearshore and offshore areas, as a basis for

multidisciplinary and co-operative marine research and for mineral resource exploitation,

Noting that a high-precision International Bathymetric Chart of the Mediterranean on a scale of 1:1 000 000 has been edited in the Soviet Union, that the First Session of the Editorial Board for the International Bathymetric Chart of the Caribbean Sea and Part of the Pacific Ocean off Central America was held in September 1986, and that Mexico offered to assume responsibility for final drafting and printing of the Chart,

Recommends that the Intergovernmental Oceanographic Commission undertake the preparation of an International Bathymetric Chart of the Central Eastern Atlantic;

Requests the IOC Assembly, at its Fourteenth Session, to authorize the Secretary to convene a consultation of governmental experts from the region and from other interested Member States of the Commission, to decide on the feasibility of preparing an IBCEA and to draft Terms of Reference for an Editorial Board for IBCEA;

Also requests the Assembly, in the light of the recommendations that emerge from the aforementioned consultation, to consider the need to establish an Editorial Board for IBCEA consisting of a Chairman, a Chief Editor and one suitably qualified expert from each of the participating countries.

B

Being aware that France has offered to assist in the preparation and publication of such a chart, in the form of mutual assistance under TEMA,

Thanks France for this generous offer,

Requests France to assist in the production of IBCEA by assisting with an exploratory expert mission to countries of the region to identify concerned institutions and by assuming responsibility for final drafting and printing of the Chart;

Urges Member States of IOC to assist Member States of the region in the implementation of bathymetric surveys, if necessary and if requested by individual Member States of the region.

Recommendation IOCEA-I.4

IOCEA REGIONAL COMPONENT OF GLOSS

The IOC Regional Committee for the Central Eastern Atlantic,

A

Noting Resolution XII-7 of the IOC Assembly and Resolution EC-XIX.6 of the IOC Executive Council, by which the Global Sea-Level Observing System was adopted and regional subsidiary bodies of IOC invited to

consider the development of regional sea-level projects as components of GLOSS,

Having examined a draft project on the IOCEA regional component of GLOSS prepared by a group of experts during consultations immediately preceding the First Session of the Regional Committee, in the light of Document IOC/INF-663 rev. (The Global Sea-Level Observing System Implementation Plan) and Document IOCEA-I/8 Annex I (IOCEA Regional Component of the Global Sea-Level Observing System),

Recommends that the IOC Assembly, at its Fourteenth Session,

(i) endorse the IOCEA regional component of GLOSS as an IOCEA regional project,

(ii) consider ways and means to assist the IOC Member States of the region in the installation of tide gauges and in the training of their specialists within the framework of TEMA,

(iii) approve the establishment of a Task Team on the Implementation of the IOCEA Regional Component of the Global Sea-Level Observing System, with the Terms of Reference annexed to the present Recommendation;

Urges Member States of the IOCEA region to participate actively in the implementation of the IOCEA Regional Component of GLOSS, by installing or reactivating sea-level stations proposed in the project and by submitting sea-level data from those stations to the Permanent Service for Mean Sea Level (PSMSL) and to the TOGA Sea-level Centre, in accordance with the provisions of the GLOSS Implementation Plan;

Requests the IOC Technical Committee on IODE to consider the establishment of an RNODC for the IOCEA Regional Component of GLOSS to assist the Member States in data collection, analysis and preparation of data products and in liaison with other international sea-level centres - PSMSL and the TOGA Sea-Level Centre.

B

Having been informed of the willingness of France to provide training in the installation, operation and maintenance of sea-level gauges,

Instructs the Secretary to work out the details of such training with the French authorities concerned, with a view to offering such training to specialists from the IOCEA Member States at an early date;

Thanks France for this generous offer of assistance.

Annex to Recommendation IOCEA-I.4

TERMS OF REFERENCE OF THE TASK TEAM
ON THE IOCEA REGIONAL COMPONENT OF GLOSS [1]

The Group of Experts on the IOCEA Regional Component of GLOSS shall:

1. BASIC FUNCTION

Assist the IOC Regional Committee for the Central Eastern Atlantic in the implementation of the IOCEA regional component of GLOSS, in co-ordination with other appropriate bodies (e.g., IOC Task Team on GLOSS, the Scientific Steering Groups for TOGA and WOCE).

2. PROGRAMME DEVELOPMENT

2.1 PLANNING

Prepare a detailed plan of action for carrying out the projects and activities adopted or approved by the Regional Committee for IOCEA in this field.

2.2 PROMOTION

Promote in the Member States of the IOC Regional Committee for IOCEA the agreed projects or activities.

2.3 CO-ORDINATION

Identify the participating entities (institutions, individual scientists, as the case may be), inform them of the actions each is expected to undertake in the implementation of the agreed projects and activities, and generally inform each participating entity of the actions being taken by the other participating entities, so as to avoid unnecessary duplication of effort.

2.4 SCIENTIFIC AND TECHNICAL ADVICE

Advise the Regional Committee on the methods and procedures to be preferred in carrying out the work relating to the agreed projects and activities.

Advise the participating entities, as appropriate, of such methods and procedures, and on any methodological question falling within the Task Team's sphere of competence.

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1 See footnote on page 2 of Annex II to the present Report.

Advise the Regional Committee on the requirements for Training, Education and Mutual Assistance in the Marine Sciences (TEMA) relative to GLOSS in the region.

2.5 COLLABORATION

Collaborate with the IOC Task Team on GLOSS and the Scientific Steering Groups for TOGA and WOCE, in the implementation of activities relevant to GLOSS in the region, and with similar expert groups active in the field of sea-level measurement.

3. OTHER FUNCTIONS

3.1 TECHNICAL POLICY

Advise the Regional Committee for the Central Eastern Atlantic on the technical requirements for the effective implementation of agreed projects and activities and for the achievement of the Regional Committee's objectives in this field.

3.2 REPORTING

Report to the Regional Committee for the Central Eastern Atlantic at each Session of the Committee, and to the IOC Task Team on GLOSS, on the scientific and technical aspects of its activities.

ANNEX III

ESTABLISHMENT OF A REGIONAL SEA-LEVEL GAUGE NETWORK FOR GLOSS: CHOICE OF INSTRUMENTS AND DATA ACQUISITION

(by Jean-Marc Verstraete, Institut Oceanographique, Paris)

1. INTRODUCTION

First of all, care must be taken to ensure that the quality of readings taken by different stations is comparable. It would be no use to have an observation network made up of "sub-stations" of doubtful accuracy with "pilot stations" of the greatest precision. As regards the topography of the sea surface, variations from mean sea level are a few centimeters at most. In order to determine the absolute slope of the sea surface between two sea-level observation stations, it is vital that their observations be comparable.

2. INSTRUMENTS

2.1 FLOAT-TYPE SEA-LEVEL GAUGES

The float is located in a stilling well that damps out short-period wave motions. The installation is protected by a shelter.

This system has certain inherent drawbacks: (i) stilling well: the height of water in the well should be the same as that outside; (ii) mechanism: wear on gears, clockwork mechanism, etc.; (iii) digitization of tide-gauge records: time-consuming and tedious work; (iv) cost of installation: need for a fixed structure: quay, jetty, etc.

2.2 PRESSURE-TYPE GAUGES

A bubbler gauge is very difficult to maintain.

A strain gauge instrument is very sensitive to temperature and requires periodic calibration, which is a sensitive operation.

Quartz pressure-detector sea-level gauges are at present produced by only one manufacturer, PAROSCIENTIFIC. These instruments are simple, robust, require little attention and are equivalent in sensitivity and accuracy to the best float gauges. They are controlled by an extremely stable quartz clock.

2.3 LATEST DEVELOPMENTS IN SEA-LEVEL MEASUREMENT

Future research programmes and navigational needs require observations of great accuracy, reliability and autonomy. A study by the United States Naval Oceanographic Survey carried out with a view to replacing the present sea-level gauge network in the United States has shown acoustic measurement in the air to be the most suitable method, but it does not meet the above requirements at the lowest cost.

3. DATA ACQUISITION

3.1 SEA-LEVEL GAUGE RECORDS

Errors can creep into these records: (i) sea level scale: inaccurate fixing at the start, or inaccuracies due to shrinking or stretching of the chart caused by humidity or temperature; (ii) time measurement: inaccurate fixing of the chart, faulty clock or gearing; (iii) need for regular, careful inspection, when changing the chart and at least twice a week; (iv) level check against a graduated scale (accurate to 5 cm); (v) timing check, which implies that the observer must have an accurately set watch.

3.2 DIGITIZATION OF SEA-LEVEL GAUGE RECORDS

The digitization of sea-level gauge records requires noting the height every hour, which means 8,760 readings a year (365 x 24). This is boring work offering little satisfaction, and the consequent lack of motivation leads to many errors.

3.3 DIRECT DIGITIZATION

Float-type gauges were first fitted with punched tape encoders and recorders. Tests carried out at the French SHOM were negative (too high a rate of mechanical failure).

There are more modern instruments that permit computer-compatible recording, for example on punched ribbon (e.g. the Leupold Stevens model 7032 tide-gauge). Pressure-type gauges record on magnetic tape (AANDERAA) or on ROM (read-only memory) (SUBER).

The disadvantage is that, if power is accidentally switched off or fails, all the data can be lost. The advantage is that it is possible to empty the memory for transmission. EPROM (erasable programmable read-only memory) can be erased only by a special ultra-violet device. An operator must therefore change the memory cards periodically.

3.4 TELETRANSMISSION

Continuous, real-time sea level monitoring is possible if observation stations are fitted with teletransmission equipment. The observation platform (float or pressure-type sea-level gauge) transmits at predetermined intervals a carrier wave modulated by an encoded message. The message is relayed via satellite to the receiving station.

In the French Argos system, two satellites in heliosynchronic (i.e. always passing over a given point at the same time of day) polar orbit "see" any platform within a radius of 500 km of the point immediately below the satellite. Each day a given platform is "seen" a certain number of times, depending on latitude: 7 or 8 times at the equator, 28 times at the poles. The frequency of the carrier wave is 401.650 MHz. The messages received by the satellite are encoded and stored on a magnetic medium for retransmission to the Wallops Island, Gilmore Creek or Lannion satellite

receiving and relay stations.

They are sent to the user by telephone or telex through the Global Telecommunication System (GTS) of the WMO or through a direct link to the CNES computer. The data received are also stored in the computer centre (DISPOSE file).

In the United States DCS (Data Collection System), data transmission is via two satellites: GOES (Geostationary Operational Environment Satellite) West (135°W) and GOES East (75°W).

ANNEX IV

IMPLEMENTATION OF AN IOCEA REGIONAL COMPONENT OF THE GLOBAL SEA-LEVEL OBSERVING SYSTEM

1. INTRODUCTION

The IOC Assembly, at its Thirteenth Session, by Resolution XIII-7, approved the development of a Global Sea-Level Observing System (GLOSS), and urged Member States to participate in its implementation. In the same Resolution it requested "the regional subsidiary bodies of the Commission, as well as other co-operating regional bodies, to give priority to the implementation of sea-level observing networks in their respective ocean regions".

The Global Sea-Level Observing System (GLOSS) Implementation Plan (doc. IOC/INF-663) was approved in principle by the Executive Council of the IOC at its Nineteenth Session (Resolution EC-XIX.6). The System is based on an international network of sea-level measuring stations co-ordinated by IOC. It is to provide high quality standardized data from which valuable products are prepared for international and regional research programmes as well as for national practical applications.

In April 1986, an IOC consultant, Mr Jean-Marc Verstraete, carried out an inspection mission in the IOCEA countries to assess the state of the sites where it was proposed to establish GLOSS Sea-level measuring stations.

This project for the IOCEA regional component of the Global Sea-Level Observing System was prepared by a Group of Experts for submission to the First Session of the Regional Committee of the IOC Programme Group for the Central Eastern Atlantic (IOCEA-I).

2. GENERAL OBJECTIVES

The tropical Eastern Atlantic region extending between the Canary and Angola basins exhibits a broad range of oceanographic phenomena, from internal, semi-diurnal tides with wave-lengths of several dozen kilometres to the annual and interannual variations of the general currents, in particular the equatorial and coastal system of currents and counter-currents. In this region, there are strong seasonal upwellings, both coastal and equatorial, whose mechanisms are still not clearly understood, especially in the Gulf of Guinea. The international oceanographic campaigns of the last 20 years, including EQUALANT (1963), GATE (1974), FOCAL/SEQUAL (1983/84) and SECTIONS (1981/90) have shown very considerable seasonal and interannual variation in the tropical Atlantic and the impossibility of understanding the equatorial or coastal dynamics without reference to variations over the whole of the basin. It has become apparent that observation of the ocean needs to be continuous and to cover the whole of a basin, as is done in meteorology.

Nor can there now be any doubt that the climate, and in particular rainfall, is closely associated with the transfer of energy between the

ocean and the atmosphere. In 1984, a "warm event" of exceptional amplitude in the tropical Atlantic was observed, which resulted in the appearance of warm water at the equator and the east of the basin (and inhibition of coastal and equatorial upwellings) and exceptional rainfall at the Equator and to the South (this was also observed in 1963 during EQUALANT) in July-August 1984. This warm event in the Atlantic in 1984 is comparable to El Niño in the Pacific in 1982/83 and it seems very likely that there is a correlation between the two.

The whole of the scientific community (meteorologists, climatologists and oceanographers) is now aware that the problems with which we are concerned are global in nature and therefore require a multidisciplinary and international approach. Furthermore, the unpredictability of major phenomena of the El Niño type in the current state of our knowledge makes continuous monitoring of the ocean and the atmosphere even more important, and this is the purpose of TOGA (1985/95). It is well-known that continuous observation of the ocean is extremely difficult and at present there is no ocean equivalent of continuous atmospheric monitoring. States have not hitherto considered it necessary to organize a public service for permanent observation of the ocean, except as regards the sea level. The mean sea level is, however, a very useful parameter for climatic study, whether on the global scale (and this is the concern of the Global Sea-Level Observing System, GLOSS) or on the regional scale (IOCEA).

3. SCIENTIFIC BASIS

Why do we need a network of sea-level gauges? Observation of the mean sea level is important for several reasons. After eliminating the effects of tides and in the absence of any cyclonic perturbation, the mean sea level tells us the quantity of heat stored in the surface layers of the ocean (0-5000 m). More precisely, what is known as the steric level of the ocean depends on the thermal structure and salinity. When the ocean warms up, mean sea level rises due to simple heat expansion (to give an order of magnitude, a rise of 1°C over 4,000 m would produce a rise of 60 cm). During upwelling, when the ocean cools, the mean sea level falls due to contraction of the water column. Nor should the influence of the salt content of water masses be underestimated. An increase (or decrease) in salinity causes a fall (or rise) in mean sea level, the order of magnitude here being that a variation of 4 per thousand in salinity has the same effect as a variation of 1°C. Such variations (4‰) being exceptional in mid ocean, it can be seen that most steric variations are caused by thermal variation. However, in coastal areas and estuaries (Senegal, Niger and Zaire Rivers), freshening may have a substantial effect on the steric level of the sea.

Secondly, observation of mean sea level at several points by means of an observation network makes it possible to establish the topography of the sea surface. For the surface of the ocean is not "level", or in other words it does not match the geoid. To put it simply, the geoid represents the form the surface of the ocean would take if there were no currents: the major ocean currents create slopes on the free ocean surface that are superimposed on the geoid. Anomalies in the geoid (associated with plate tectonic structures) and steric heights (or dynamic heights) produce an ocean surface that is virtually invariable in time (over months or years). Sea-level in mid-ocean can be calculated by dynamic calculation on the basis

of hydrological observations (temperature and salinity from sea surface to sea bed, Nansen station and CTD profile). Many dynamic phenomena in the ocean itself and in ocean/atmosphere interaction are continuously modifying the mean sea-level. For example, the slope of the ocean surface is of the order of 1.50 m/100 km for the western boundary currents and 0.3 m/100 km for the eastern boundary currents. The equatorial slope of the central Atlantic can vary from 5 to 30 cm over a distance of 3,500 km. During the FOCAL experiment surface slope and the geostrophic surface current between Natal and the St Peter and Paul rocks were determined month by month in 1983/84. According to these measurements, the South Equatorial Current (SEC) was weak between August 1983 and January 1984. The seasonal variation of the SEC is practically in phase with wind tension.

Thirdly, the longer series of sea-level observations make it possible to detect global and/or regional trends. It appears that since the beginning of the century the mean level of the oceans has been rising by about 1 or 2 cm per year. Countries whose coasts are particularly vulnerable are thus well advised to monitor this parameter continuously.

Lastly, the forthcoming space programmes, TOPEX (USA) and POSEIDON (FRANCE) are planning global observation of sea surface topography for about 1991/92. Calibration of the on-board altimeters will require in situ observation stations that are fully operational and fully linked to the levelling network. It will be remembered that determination of the topography of the ocean surface makes it possible to calculate, by geostrophy, the surface geostrophic current (outside the equatorial band 1°N-1°S). In any event, a network of sea-level gauges will be particularly necessary where precise geostrophic currents need to be calculated in specific areas for example between two islands or between an island and the mainland. Only sea-level gauges can ensure continuous, highly accurate measurements of mean sea-level during the TOGA period (ten years) and beyond, for GLOSS, and provide continuity betwen successive altimetric programmes using satellites.

4. REGIONAL NETWORK OF SEA-LEVEL GAUGE STATIONS

4.1 GLOSS COMPONENT

The regional network of sea-level observation stations could be made up in the initial phase of the eighteen stations proposed for GLOSS, i.e.:

249	-	Ceuta	(Spain)
282	-	Tan Tan	(Morocco)
250	-	Funchal	(Portugal)
251	-	Las Palmas	(Spain)
252	-	Nouakchott	(Mauritania)
253	-	Dakar	(Senegal)
254	-	Porto Grande	(Cape Verde)
255	-	Conakry	(Guinea)
256	-	Aberdeen Point	(Sierra Leone)
257	-	Abidjan	(Cote d'Ivoire)
258	-	Tema	(Ghana)
259	-	Lagos	(Nigeria)

260	-	Sao Tome	(Sao Tome & Principe)
261	-	Pointe Noire	(Congo)
262	-	Luanda	(Angola)
263	-	Ascension	(UK)
264	-	St. Helena	(UK)
280	-	Douala	(Cameroon)

(see Appendices 1 and 2)

It should be pointed out that of these 18 stations only 8 have been fitted out and are operating normally:

1 - Funchal (250)
2 - Las Palmas (251)
3 - Conakry (255)
4 - Abidjan (257)
5 - Douala (280)
6 - Ascension (263)
7 - St. Helena (264)
8 - Lagos (259)

It would be helpful if the States concerned could make an effort to establish this network of observation stations within a reasonable period of time (by 1990).

In addition, some of these stations should be equipped with both float and pressure-type gauges to allow comparison between the different readings.

4.2 REGIONAL ASPECTS

From the regional standpoint, since the concern is with a relatively small scale (of the order of a few days as regards time and a few hundred kilometres as regards distance), two IOCEA stations could be established in the gap between two GLOSS stations. This would mean 24 stations in addition to the 13 mainland GLOSS stations, and the possibility of establishing about ten additional stations on islands. This would make a total of about 34 sea-level observation stations for IOCEA.

These stations could be equipped with pressure-type gauges as the phenomena concerned are above all regional.

5. PRESENT SITUATION OF THE NETWORK OF SEA-LEVEL GAUGE STATIONS

The list of GLOSS national contact points is reproduced in Appendix 3. At present 12 stations have still not come into existence. Twelve IOCEA Member States have indicated the type of assistance they require (Appendix 4) to establish GLOSS sea-level gauge stations and train specialists.

Two specialists from countries of the region - Nigeria and Sierra Leone - attended, with the financial support of the IOC, the fourth PSMSL training course on sea-level measurement techniques, held in June/July 1986 at the Bidston Observatory of the Institute of Oceanographic Sciences (IOS)

in the United Kingdom. In 1984, a Guinean specialist attended the sea level training course organized by the People's Republic of China (National Bureau of Oceanography).

6. ACTION PLAN FOR THE IMPLEMENTATION OF THE IOCEA REGIONAL COMPONENT OF GLOSS

Action	1986	1987	1988	1989	1990	1991	Remarks
1. Drafting of project for the IOCEA component of GLOSS and adoption by IOCEA	-	x	-	(x)	-	(x)	(x) to be reviewed at IOCEA-II and IOCEA-III
2. Approval by the Assembly	-	x	-	-	-	-	
3. Consultation of experts	-	-	x	x	x	(x)	(x) perhaps to be reviewed at IOC-XVI
4. Installation of sea-level gauges:							
4.1 GLOSS stations	-	x	x	x	x	-	
4.2 IOCEA stations	-	x	x	x	x	x	
5. Training courses	x	x	x	x	x	x	
6. Transmission of sea-level gauge data							
6.1 To the PSMLS	-	x	x	x	x	x	and so on
6.2 To the TOGA centre	x	x	x	x	x	x	and so on
7. Identification of an RNODC for IOCEA-GLOSS	-	x	x	-	-	-	

ANNEX IV

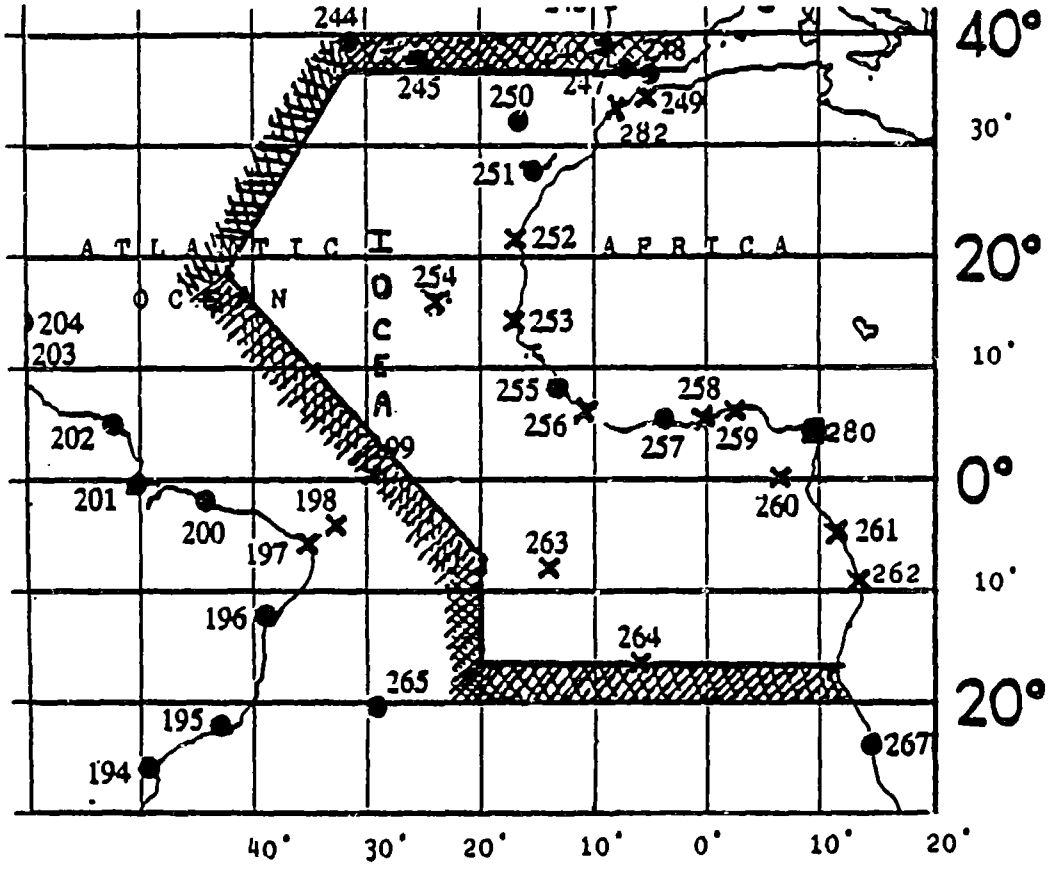
Appendix I

LIST OF GLOSS SEA-LEVEL STATIONS IN THE IOCEA REGION
(taken from the GLOSS Implementation Plan (doc. IOC/INF-663 rev.))

NN	STATION	COUNTRY	CO-ORDINATES	TYPE OF SEA-LEVEL GAUGE	O	PERIOD OF OBSERVATION FROM - TO	EXISTING STATION ***	Q **	C *	PARTICIPATION IN OTHER INTERNATIONAL ACTIVITIES (PSMSL, TOGA, ISLPP, ITSU)
262	Luanda	Angola	12-20S 13-34E		A		0			TOGA
280	Douala	Cameroon	04-03N 09-41E	FO	A	1985	+	Q	C	TOGA
254	Porto Grande	Cape Verde	16-52N 24-59W		A	1947-1950	0			TOGA
261	Pointe-Noire	Congo	04-47S 011-50E		A	1959-1979	+	Q	C	TOGA
258	Tema	Ghana	05-37N 00-00W		A		+	Q	C	TOGA
255	Conakry	Guinea	09-30N 13-15W		A		+			TOGA
257	Abidjan	Côte d'Ivoire	05-15N 004-00W		A	1971-1976	+			
252	Nouakchott	Mauritania	21-00N 17-00W		A	1981	+			TOGA
282	Tan Tan	Morocco	33-40N 7-37W	ASR	A	1957-1959	0	Q	C	
259	Lagos	Nigeria	06-25N 03-27E		A		0	Q	C	TOGA
250	Funchal, Madeira	Portugal	32-38N 16-54W	A. OTT	A		+	Q	C	
260	Sao Tome	Sao Tome and Principe	00- N 06-30E		A		0			TOGA
253	Dakar	Senegal	14-38N 17-27W		A	1957-1966				TOGA
256	Aberdeen Point	Sierra Leone	08-30N 13-14W	FO	A		0	Q	C	TOGA
249	Ceuta	Spain	35-54N 005-19W		A	1944-1964				
251	Las Palmas, Canary Is.	Spain	28-08N 015-25W		A	1949-1951				TOGA
263	Ascension	U.K.	07-57S 014-22W		A		0			TOGA
264	St. Helena	U.K.	15-55S 05-43W		A	1964-1974	0			TOGA

Ocean: P - Pacific; I - Indian; A - Atlantic; S - Southern; Ar - Arctic; M - Mediterranean Sea
* C - the station committed to GLOSS
** Q - questionnaire has been received
*** + station exist; 0 station does not exist

PROPOSED GLOSS SEA-LEVEL STATIONS IN THE IOCEA REGION



x proposed stations • stations in operation

GLOSS n°	GLOSS station	Sea-level data holdings in PSMSL
249	Ceuta (Spain)	1944-1964
282	Tan Tan (Morocco)	1957-1959
250	Funchal (Portugal)	1963-64 1976-78 1981-82
251	Las Palmas (Spain)	
252	Nouakchott	
253	Dakar (Senegal)	1942-45 1952-53 1958-60
254	Porto Grande (Cape Verde)	1947-1950
255	Conakry (Guinea)	
256	Aberdeen Point (Sierra Leone)	Freetown 1926 (new gauge expected soon)
257	Abidjan (Ivory Coast)	1971 1974-76
258	Tema (Ghana)	Takoradi 1929-1985
259	Lagos (Nigeria)	
260	Sao Tome (Sao Tome and Principe)	
261	Pointe Noire (Congo)	1959-60 1977-79
262	Luanda (Angola)	
263	Ascension (U.K.)	
264	St. Helena (U.K.)	
280	Douala (Cameroon)	

Appendix 3

LIST OF THE GLOSS NATIONAL CONTACTS OF THE IOCEA REGION
(extract from the GLOSS Implementation Plan (doc. IOC/INF-663 rev.)

Country	Contact Point
ANGOLA	Centre des Recherches Maritimes Director, Mrs. Maria de Fatima Jardim Ministère des Pêches Luanda
CAMEROON	Mr. Jean-Calvin Njock Station de Recherches Halieutiques de Limbé (Département du Fako) PMB 77 Limbé
CAPE VERDE	Direccao General de Marinha e Portos C.P. 7 S. Vicente
CONGO	Directeur Centre ORSTOM Attn. M.P. Guerdat Pointe Noire Centre de Recherches Océanographiques B.P. 1286 Pointe-Noire
GHANA	Survey Department Attn. Director, I. Abu P.O. Box 191, Cantonments Accra
GUINEA	Centre de Recherches Scientifiques de Conakry-Rogbane Directeur du CERESCOR Dr. Sekou Konate B.P. 561 Conakry
COTE D'IVOIRE	Centre de Recherches Océanographiques ORSTOM 29, rue des Pêcheurs B.P. V-18 Abidjan

Country	Contact Point
MAURITANIA	Le Directeur Centre National de la Recherche Océanographique et des Pêches (CNROP) Nouadhibou
MOROCCO	Le Directeur Institut Scientifique des Pêches Maritimes 2 rue de Tiznit Casablanca 1
NIGERIA	The Director, Attn. Dr. A.C. Ibe Nigerian Institute for Oceanography and Marine Research Victoria Island P.M.B. 12789 Lagos
PORTUGAL	Director General Hydrographic Institute Rua das Trinas 49 P-1200 Lisboa
SAO TOME AND PRINCIPE	Secretaria de Estado das Pescas Ana Chaves
SENEGAL	Direction de l'Océanographie et des Pêches Maritimes Attn. Mr. Tahirou Badian 1 rue Joris Dakar
SIERRA LEONE	Institute of Marine Biology and Oceanography Fourah Bay College - Attn. C.V. Mustapha University of Sierra Leone Freetown
SPAIN	Director Instituto Hidrografico de la Marina Tolosa Latour No. 1 Cadiz Director del Centro Espanol de Datos Oceanograficos Instituto Espanol de Oceanografia Alcala 2704 Madrid 14
UNITED KINGDOM	Mr. G.A. Alcock Head, Tidal Computation & Statistics Institute of Oceanographic Sciences Bidston Observatory Birkenhead Merseyside L43 7RA

Country	Contact Point
	Dr. David T. Pugh Head, Oceanography, Hydrology and Atmospheric Sciences Science Division The Natural Environment Research Council Polaris House North Star Avenue Swindon Wilts. SN2 1EU

Appendix 4

IOCEA COMPONENT OF GLOSS - ASSISTANCE REQUIRED BY MEMBER STATES IN INSTALLING AND OPERATING SEA-LEVEL STATIONS

Country	Station	Supply Sea-level gauges	Supply spare parts	Assistance with installation	Improved levelling	Training	Consultant missions required	Documentation on GLOSS
Angola	Luanda	yes	yes	yes	-	yes	yes	yes
Cameroon	Douala							
Cape Verde	Porto Grande	yes	yes	yes	yes	yes	yes	yes
Congo	Pointe Noire							
Ghana	Tema							
Guinea	Conakry	Pressure sea-level gauges	yes	yes	yes	yes	yes	yes
Côte d'Ivoire	Abidjan							
Mauritania	Nouakchott	yes	yes	yes	yes	yes	yes	yes
Morocco	Tan Tan	yes	yes	yes	yes	yes	yes	yes
Nigeria	Lagos	yes	-	-	-	yes	-	yes
Sao Tome & Principe	São Tome							
Senegal	Dakar							
Sierra Leone	Aberdeen Point	yes	yes	yes	yes	yes	-	yes

Appendix 4

IOCEA COMPONENT OF GLOSS - ASSISTANCE REQUIRED BY MEMBER STATES IN INSTALLING AND OPERATING SEA-LEVEL STATIONS

Country	Station	Supply Sea-level gauges	Supply spare parts	Assistance with installation	Improved levelling	Training	Consultant missions required	Documentation on GLOSS
Angola	Luanda	yes	yes	yes	-	yes	yes	yes
Cameroon	Douala							
Cape Verde	Porto Grande	yes	yes	yes	yes	yes	yes	yes
Congo	Pointe Noire							
Ghana	Tema							
Guinea	Conakry	Pressure sea-level gauges	yes	yes	yes	yes	yes	yes
Côte d'Ivoire	Abidjan							
Mauritania	Nouakchott	yes	yes	yes	yes	yes	yes	yes
Morocco	Tan Tan	yes	yes	yes	yes	yes	yes	yes
Nigeria	Lagos	yes	-	-	-	yes	-	yes
Sao Tome & Principe	Sao Tome							
Senegal	Dakar							
Sierra Leone	Aberdeen Point	yes	yes	yes	yes	yes	-	yes

Appendix 5

REFERENCES

1. Global Sea-Level Observing System Implementation Plan
(Doc. IOC/INF-663 rev.)

2. Composante régionale IOCEA du Système Mondial d'observation
du niveau de la mer
(Doc. IOCEA-I/8 Annexe 1)

3. Unusual conditions in the tropical Atlantic Ocean in 1984
(Nature, Vol. 322, No. 6076, pp. 236)253).

ANNEX V

REDRAFTED TERMS OF REFERENCE FOR THE IOC REGIONAL COMMITTEE FOR THE CENTRAL EASTERN ATLANTIC (IOCEA)

The IOC Regional Committee for the Central Eastern Atlantic (IOCEA) shall:

1. BASIC FUNCTIONS

Be responsible for the promotion, co-ordination and monitoring of the scientific programmes and service activities of the Commission, and the related training, education and mutual assistance, in the central eastern Atlantic.

Give effect to the Commission's policy decisions, within its Terms of Reference, and make recommendations to the Governing Bodies of the Commission on policy matters within its Terms of Reference and on future actions required.

Develop programmes, projects and activities of direct interest to the IOC Member States of the region.

Assist in the implementation of the Commission's global programmes at the regional level.

2. PROGRAMME DEVELOPMENT

2.1 PLANNING

Prepare and keep up to date detailed plans of action for the implementation of adopted programmes, projects or activities.

2.2 PROMOTION

Within its field of responsibility, promote the adopted programmes, projects or activities among the interested Member States and/or the marine scientific community, as necessary, and make, if appropriate, recommendations to the Governing Bodies to this effect.

2.3 CO-ORDINATION

Identify the Member States' institutions, the collaborating organizations, or scientists, as the case may be, participating in the implementation of the adopted programmes, projects or activities and ensure that each such entity is made fully aware of the work it is expected to undertake and how it relates to the work of the other participating entities.

2.4 SCIENTIFIC AND TECHNICAL ADVICE AND GUIDANCE

(a) provide advice to the participating entities, as defined above, on appropriate methods, procedures and operations for the optimum implementation of the agreed programmes, projects or activities;

(b) undertake specific tasks (e.g., prepare scientific and technical reports, reviews, guidelines), as appropriate, to ensure optimum implementation of the agreed programmes, projects or activities.

2.5 CO-OPERATION

Co-operate, as appropriate, with other subsidiary bodies of the Commission or other international organizations, whether governmental or non-governmental, at any equivalent (or approximately equivalent) hierarchical level, as decided by the IOC Governing Bodies.

In particular, co-operate, as required, with, inter alia, the FAO Committee for the Eastern Central Atlantic Fisheries (CECAF), the UN Environmental Programme's Steering Committee for the Action Plan for the Protection and Development of the Marine Environment and Coastal Areas of the West and Central African Region, the International Commission for the Conservation of Atlantic Tuna (ICCAT), and the Economic Commission for Western African States.

2.6 EVALUATION

(a) examine the results of the adopted programmes, projects or activities at regular intervals determined by their nature;

(b) make recommendations to the Governing Bodies on the application of these results;

(c) provide advice to the Governing Bodies on desirable improvements in programme conception or execution

3. OTHER FUNCTIONS

3.1 PROGRAMME OF WORK AND FINANCIAL REQUIREMENTS

Prepare, within its field of responsibility, and with the assistance of the Secretary, proposals for a two-year programme of work and financial requirements, including an indication of priorities, for submission to the Secretary for his use in the preparation of the Programme and Budget of the Commission.

3.2 OVERALL POLICY RECOMMENDATIONS

Make recommendations to the Governing Bodies on the Commission's overall policy relevant to the Regional Committee's field of activity.

3.3 TECHNICAL POLICY-MAKING

Within the Terms of Reference, determine such technical policy as may be required to effect or enhance the implementation of adopted programmes or projects.

3.4 REPORTING

Report to the Governing Bodies at intervals to be decided by the Governing Bodies.

Normally, submit a written report on its activities to each session of the Assembly.

ANNEX VI

LIST OF PARTICIPANTS/LISTE DES PARTICIPANTS

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Wales
United Kingdom

ANNEX VII

LIST OF WORKING DOCUMENTS *

Document Code	Title
IOCEA-I/1 prov.	Provisional Agenda
IOCEA-I/2	Annotated Provisional Agenda
IOCEA-I/3 prov.	Draft Summary Report
IOCEA-I/4	Provisional List of Documents
IOCEA-I/5	Provisional List of Participants
IOCEA-I/6	(unassigned)
IOCEA-I/7	(unassigned)
IOCEA-I/8	Action Paper
IOCEA-I/8 Annex 1	IOCEA Regional Component of the Global Sea-Level Observing System
IOCEA-I/8 Annex 2	Regional Component of IGOSS
IOCEA-I/8 Annex 3	Proposal on OSMLR for the Central Eastern Atlantic Continental Shelf
IOCEA-I/8 Annex 4	La Mise en Oeuvre d'Une Composante Regionale IOCEA du Systeme Mondial d'Observation du Niveau de la Mer

* The Working Documents are those prepared specifically for the Session. No stocks are kept and these Documents cannot therefore be made available after the Session.

ANNEX VIII

LIST OF ACRONYMS

Argos	Name of the transmission and location system implemented by CLS (Collecte - Localisation-Satellite)
ASFA	Aquatic Sciences and Fisheries Abstracts
ASFIS	Aquatic Sciences and Fisheries Information System
BATHY/TESAC	Bathythermograph Report/Temperature, Salinity, Currents
CCOP(SOPAC)	Committee for the Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas
CD-ROM	Compact Disk with a Read-only Memory
CECAF(FAO)	Fishery Committee for the Eastern Central Atlantic
COMAR	Unesco Major Interregional Project on Research and Training Leading to the Integrated Management of Coastal System
CZAR	Coastal Zone as a Resource
DNA	Declared National Agency
ECOWAS	Economic Community of Western African States
EEZ	Exclusive Economic Zone
EQUALANT	Equatorial Atlantic Survey
FAO	Food and Agriculture Organization of the United States
FOCAL	Francais Ocean et Climat de l'Atlantique Equatorial

GARP	Global Atmospheric Research Programme
GATE	GARP Atlantic Tropical Experiment
GEMSI	GIPME Group on Experts on Methods, Standards and Intercalibration
GF3	IOC General Format 3
GIPME	IOC Working Committee for the Global Investigation of Pollution in the Marine Environment
GLOSS	Global Sea-Level Observing System
GTS	Global Telecommunications System
IAEA	International Atomic Energy Agency
IBCEA	International Bathymetric Chart of the Central Eastern Atlantic
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Commission for the Exploration of the Sea
ICITA	International Co-operative Investigation of the Tropical Atlantic
ICSU	International Council of Scientific Unions
IDPSS	IGOSS Data Processing and Services System
IGOSS	Integrated Global Ocean Services System
IMO	International Maritime Organization
INFOCLIMA	World Climate Data Referral System
INFOTERRA	International Referral System
INMARSAT	International Marine Satellite
IOC	Intergovernmental Oceanographic Commission
IOCEA	IOC Regional Committee for the Central Eastern Atlantic
IODE	International Oceanographic Data Exchange

IOS	IGOSS Observing System
IREP	International Recruitment Experiment
JSC-CCCO	Joint Scientific Committee-Joint SCOR-IOC Committee on Climatic Changes and the Oceans
MARPOLMON	Marine Pollution Monitoring System
MEDI	Marine Environmental Data Information Referral System
NODC	National Oceanographic Data Centre
OAU	Organization for African Unity
OETB	Ocean Economics and Technology Branch
OSLR	Ocean Science in Relation to Living Resources
OSNLR	Ocean Science in Relation to Non-Living Resources
PSMSL	Permanent Service for Mean Sea Level
SARP	Sardine-Anchovy Recruitment Project
SCOR	Scientific Committee on Oceanic Research
SCAR	Scientific Committee on Antarctic Research (of ICSU)
SECTIONS	Energetically Active Zones of the Ocean (EAZO) and Climate Variability
SEQUAL	Seasonal Equatorial Atlantic Experiment
SETMY	Sea-level Changes, Environments and Tectonics during the Past Million Years
TEMA	Training, Education and Mutual Assistance in the Marine Sciences
TOGA	Tropical Oceans and Global Atmosphere
TOPEX/POSEIDON	Ocean Topography Experiment
TRODERP	Tropical Demersal Recruitment Project
UN-DIESA	United Nations Department of International Economic and Social Affairs

UNESCO	United Nations Educational, Scientific and Cultural Organization
WACAF	UNEP Action Plan for the Protection and Development of the Marine Environment and Coastal Areas of the West and Central African Region
WCRP	World Climate Research Programme
WDC	World Data Centre
WHO	World Health Organization
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
XBT	Expendable Bathythermograph