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Reports of Governing and Major Subsidiary Bodies

IOC Regional Committee for the Central Indian Ocean

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1. OPENING

The Second Session of IOCINDIO, the IOC Regional Committee for the Central Indian Ocean was called to order in the Cidade de Goa Hotel, Goa, India on 20 November 1996 by Dr Sumitra. After the traditional prayer, Dr Sumitra gave the floor to Dr Desa, Director of NIO. On behalf of the host country and the local organizers, Dr Desa welcomed all participants to India and Goa, including the Delegates and the representatives from intergovernmental and non-governmental organizations. His address is given in Annex III. The list of participants is attached as Annex IV.

The Executive Secretary IOC, Dr Gunnar Kullenberg, then addressed the Session, welcoming all on behalf of IOC and UNESCO. He, in particular, thanked the host country, India, for hosting the Session and the local organizers of the National Institute of Oceanography, particularly the Director, Dr E. Desa and Dr Sumitra. He emphasized the importance of regional cooperation in marine research and observations, referred to other regional subsidiary bodies of IOC where the regional cooperative programmes are being implemented through donor support, and expressed the strong wish that IOCINDIO would now also be able to formulate a viable cooperative programme so that true regional cooperation could increase and play a role in the sustainable development of the region. His address is attached in Annex III.

Dr Sumitra introduced Dr A. E. Muthunayagam, Secretary DOD, who addressed the Session on behalf of the Government of India. He stressed the importance that his Government attaches to ocean studies, observations and the development of human resources. This is demonstrated through the very considerable funding provided to several national institutions and to the establishment of systematic observations along the coast of India. He referred to natural hazards and the need to improve forecasting and warning systems, also at a regional level. His address is provided in Annex III. Then, Dr Sumitra introduced Dr Qasim who apologized for Shri Eduardo Faleiro, Former Union Minister of State for Ocean Development, who was not able to attend. Dr Qasim then inaugurated the Session.

Dr Qasim thereafter delivered his presidential address, recalling, inter alia, the development of Indian Ocean oceanography. He also stressed the need for stronger cooperation and emphasized the importance of the IOC in this context. He concluded by formally declaring the Second Session of IOCINDIO opened. Shri Krishnamurthy thereafter expressed the vote of thanks which concluded the Opening Session.

2. ADMINISTRATIVE ARRANGEMENTS

2.1. ELECTION OF CHAIRPERSONS FOR THE SESSION

The Executive Secretary IOC recalled that the Officers elected at the First Session of the Committee were no longer in service. He expressed his sincere appreciation for their dedicated work over a number of years in the service of the IOC, above and beyond their national duties. He then explained that a chairperson should be elected by the Committee at this time to serve during this Session and he invited nominations. The Delegate of the Islamic Republic of Iran nominated the Secretary, Dr D. Muthunayagam, as Chairman of the Session. This was seconded by the Delegate of Bangladesh, and he was elected with acclamation. The elected Chairperson then took the chair. He invited proposals for Vice Chairman; the Delegate of India proposed the Delegate of the Islamic Republic of Iran, Dr Zomorrodian. This was seconded by the Delegate of the Maldives, and accepted with acclamation.

2.2 ADOPTION OF THE AGENDA

The Chairman recalled that the provisional Agenda had been circulated from the IOC Secretariat through IOC Circular Letter 1501 of 6 September 1996. He invited comments. The Delegate of India proposed that an

item on projects related to storm surges, sea-level observations and evaluation of impacts of oil spills be added. This was agreed in the form of specific sub items of Item 7.

The Delegate of India also emphasized that the Committee should consider specific programme actions to note the 1998 International Year of the Ocean and suggested that a dedicated Indian Ocean Expo be arranged through the support of India. The Committee agreed to discuss this matter under Agenda Item 7. The Delegate of the Maldives suggested that an item on coral reefs be included in Item 7, in view of the Global Coral Reef Monitoring Network (GCRMN) and 1997 being the Year of the Reef. This was endorsed.

The Delegate of Iran proposed that data directories and data management be included. This was introduced in Item 6 as Item 6.2. The Committee then adopted the Agenda as given in Annex I.

2.3. DESIGNATION OF RAPPORTEUR

The Chairman invited nominations, and the Delegate of India nominated Dr P. Govinda Rao from DST. This was unanimously seconded and he was elected. The Executive Secretary briefly informed the Committee about the role of the Rapporteur and the process of drafting the sessional report. He recalled that the IOC Assembly through its Resolution XVII-20 had requested all IOC Subsidiary bodies to prepare an Executive Summary and one programme recommendation for submission to the Assembly. This should facilitate the adoption of the biannual programme and budget of the IOC.

2.4. CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

Dr Sumitra informed the Session about the documentation, reviewed the list of documents, and the proposed time schedule. The Executive Secretary IOC recalled that the Committee is expected to work in plenary. The time schedule should lead the Committee to a concluding afternoon session on 22 November, for adoption of the Session Report and Recommendations.

3. REPORT ON ACTIVITIES AND DEVELOPMENTS SINCE THE FIRST SESSION OF IOCINDIO

The Executive Secretary IOC drew attention to the report of the First Session of the Committee in which the framework programme adopted by the Committee is presented. He summarized the actions which had been taken within each of the programme areas. He noted that the cooperative activities at the regional level had so far been rather limited. However, several actions of importance to the programme areas had been implemented at national and sub-regional levels. He also recalled the global developments over the last 5 years, in particular, UNCED 1992 and its importance, and UNCLOS entering into force November 1994, almost exactly 2 years ago.

He also informed the Committee briefly about the developments of IOC within UNESCO over the last 4-5 years. This development has confirmed that IOC is a body with functional autonomy established as an integral part of UNESCO; it has provided IOC with operational and administrative flexibility and an incompressible budget. The Director-General conveyed certain of his responsibilities to the Secretary of IOC and provided him the level of Assistant Director General (ADG) of UNESCO with the title Executive Secretary IOC. He also informed the Committee about the establishment of the interdisciplinary project on coastal zones and small islands in UNESCO for 3 biennial periods as of 1996-97. All the natural sciences programmes, IOC, and the social sciences programme, MOST, cooperate in this new interdisciplinary project. The summary of the presentation as regards programme development is given in Annex V.

In the subsequent discussion, it was emphasized that the coastal zone constituted a common problem as an area of multiple uses, with several sectors being involved and with considerable socio-economic consequence.

These uses are often conflictual and in competition. It was therefore suggested that the Committee emphasize to all countries that they look into the multiple uses of their coastal zones, and obtain a pro-active management which will ensure a balanced use of the coastal zone. The coastal zone must be maintained so that it keeps functioning as a natural ecosystem. In this context, the exchange and sharing of data was also stressed as a critical need for the region as a whole.

4. NATIONAL PROGRAMMES AND PRIORITIES

Delegates were invited to present information on their national marine research programmes, capacity for undertaking marine science activities, priorities and areas that might require strengthening. This information was utilised later in the meeting for purposes of determining the future programme of IOCINDIO. A summary of the presentations is given in Annex VI.

5. STATE OF MARINE RESEARCH AND SYSTEMATIC OBSERVATIONS IN THE CENTRAL INDIAN OCEAN AND RELATED FOLLOW-UP TO UNCED

The Chairman introduced the item by stating that it logically followed from the information presented under Agenda Item 4. The Committee should aim to prepare a synthesis of that information with required explanations on the adequacy of the data and information. It should emphasize that the overview resulting from this initial effort may not be complete, and that more information will be added intersessionally. However, this was a necessary beginning. Intersessionally, the members of the Committee could also prepare in cooperation an assessment of the existing results of research and observations in a form suitable for presentation to managers, decision makers and politicians. The Committee should aim to have such a report ready for presentation in 1998, the International Year of the Ocean.

The Executive Secretary IOC supplemented the statement of the Chairman by recalling the Annotated Agenda, in particular, the importance of highlighting in reporting the follow-up to UNCED, including the Conventions and Chapter 17 of Agenda 21. He recalled the information provided under Item 3 (see summary in Annex V) and the programme adopted at the First Session of the Committee (Islamabad, June 1988). He also stressed the need to relate the synthesis information to the current main issues, e.g., climate change, food from the sea, coastal zone degradation, impact of land-based activities on the marine environment, marine biological diversity, non-living resources and tourism, with the aim of helping to achieve sustainable development. This is also relevant to efforts by Member States to implement UNCLOS.

The Chairman invited the Delegation of India to present the summary of the responses received on the questionnaire which had been circulated to Member States of the Indian Ocean Region before the Session (Document 5.2(Rev), entitled: Status of Marine Sciences in the Region, a briefing based on questionnaire). In presenting this material the Delegation emphasized that responses had been grouped in 3 regional sub-groups: Northern, Eastern and Western Indian Ocean. In all, responses had been received from 10 countries. Human and infra-structure resources were highlighted, and needs for external support identified. Priority projects were identified, by and large corresponding to the major current issues: living resources; management, marine pollution and coastal problems; sea level and climate and physical oceanography. The summary is provided in Annex VI. The Committee then agreed to present the national information given in Item 4 on a series of maps, showing the on-going and planned activities in the IOCINDIO Region. The resulting maps are given in Annex VI.

The Committee noted with great appreciation that substantial development of marine research and ocean observations had occurred over the past decade in the Indian Ocean Region. This demonstrates considerable capacity and interest in marine environmental problems and conditions in the countries. There is also much interest in some countries outside the region, and donor support is being provided to many parts of the Indian

Ocean region (see information under Item 3 and in Annex III(1)). The IOC should also see this development as an encouragement for its efforts to facilitate regional cooperation in marine research and observations as a basis for sustainable development.

6. CAPACITY BUILDING REQUIREMENTS AND TECHNICAL ASSISTANCE IN A REGIONAL COOPERATION PERSPECTIVE

6.1 SUMMARY OF GOOS CAPACITY BUILDING WORKSHOP

Mr. Erb, IOC Senior Advisor, made an overall introduction on TEMA and capacity building. He referred to the basic principle within the IOC that TEMA/Capacity Building activities form an intrinsic part of all activities of the IOC. He reiterated that there is a need for a new strategy for TEMA/Capacity Building and that a group of experts has recently been set up to address this issue. The group has already met once and will meet again early next year. For successful TEMA/Capacity Building activities donor funding has to be attracted. In relation to GOOS a series of capacity building workshops, such as the one organized in Goa prior to this IOCINDIO meeting, are being organized to identify the needs of other regions.

Dr. Krishnamurthy, co-chairman of the GOOS Capacity Building Panel, and Chairman of the GOOS Capacity Building Workshop, summarized the report of this workshop. Delegates from IOCINDIO and experts from the IOC, ROPME and the Netherlands participated in the workshop. He stated that a prioritization of the GOOS modules was made resulting in the following order : coastal, living marine resources, climate, health of the ocean and marine services. In the coastal module discussions, a network of tide gauges for sea level observations and the destructive nature of storm surges were the main issues. The discussion in relation to the living marine resources module was concentrated on coral reefs, mangroves and fisheries, which are all highly relevant to the region. Within the climate module there is a need for a reliable long term observation system. Under the health of the ocean module, oil pollution and the land-based sources of coastal pollution are of high importance in the region. Finally the draft recommendations of the workshop to IOCINDIO were presented.

The Delegate from ROPME stressed the need for a mechanism such as an ad-hoc subcommittee to implement the recommendations of the GOOS Capacity Building workshop. This suggestion was supported by the Committee. A delegate from India noted that in the workshop report no recommendations occur under the marine services module. The Chairman asked that such a recommendation be drafted. The report of the GOOS Capacity Building workshop was accepted and the recommendations were approved.

6.2 CAPACITY BUILDING BY EXCHANGE AND SHARING BASED ON THE RECOSIX-WIO MODEL

Dr. M.P. Tapaswi of India introduced a proposal for regional co-operation for scientific information exchange based on the RECOSCIX-WIO model. He indicated that the development of referral databases at the level of institutions, projects, personnel and bibliographic databases is one of the most essential parts of the exchange of scientific information. Such data bases are developed at national or sub-regional levels using common communication formats and other standard software which is freely available and widely used in the region. This is a prerequisite for open exchange of information. He recommended the use of standards developed by the Group of Experts in Marine Information Management (GE-MIM). He stressed that in most regions of the world, mechanisms for the exchange of information have been implemented and are in operation. For the IOCINDIO Region, such a mechanism is, however, still lacking. Therefore, he proposed to form a small (2-3 persons) committee which will survey the specific requirements of the countries of the IOCINDIO Region and propose steps to be taken. He suggested that the representative could coordinate this effort.

The representative of ROPME suggested that this initiative should be based upon existing subregional systems which are, among others, operational in the ROPME Sea Area and PERSGA (Red Sea and Gulf of Aden). This suggestion was welcomed and a linkage between national, subregional and regional systems for the exchange of data and information was supported by the IOCINDIO delegates.

Dr Sumitra introduced the experience of India in relation to capacity building. She indicated that the Indian Ocean countries largely depend on the sea. Many countries however lack threshold facilities to carry out systematic and long-term oceanographic research. Since the International Indian Ocean Expedition (IIOE), no major oceanographic programmes have been organized during the last 3 decades. A widening gap in oceanographic research capabilities is noted and the quantity of human resources is not evolving fast enough to effectively implement regional programmes.

Dr Sumitra concluded that a capacity building activity should aim at laying a sound foundation for a multi disciplinary approach in oceanography so as to fully benefit from the new ocean regime.

Threshold capacity needed:

(i) Realistic and futuristic marine science education.
(ii) Investments for in situ measurements
(iii) Observation Platforms
    access to research vessels
    permanent Stations
    maintenance
(iv) Access to RS data

.(v) Data analysis capabilities
    local work stations/hardware
    image processing
    model software
    interpretational skills
    information network

(vi) Captive users; identified, motivated
(vii) Linkages with peers; locally, regionally and globally

The delegate from Canada informed the Session that the MAMCOMP:IOC sponsored course on Monitoring and Modelling of Coastal Marine Processes was conducted at the Indian Institute of Technology Centre for Atmospheric Sciences - Delhi. MAMCOMP courses have been conducted in 1994, 1995 and 1996. In 1994 and 1995 MAMCOMP was only a national activity. In 1996 MAMCOMP has been expanded to include regional participation. The course was conducted over two weeks with thirty participants. In 1997, MAMCOMP will include marine policy aspects for senior policy makers.

Dr Quasim drew the attention of the meeting to the report prepared by the German delegate, concerning their TEMA activities since 1981 and indicating the German priority for this issue. The German delegate informed the Session that at present the German priorities had been adjusted because of the economic situation. He also mentioned that the RV Sonne will return to the Bengal Fan area in the Indian Ocean and that the RV Meteor will also return to the Indian Ocean. He stressed that German scientists are not only interested in deep ocean research but in research concerning the source area of deep sea sediments such as the coast of Bangladesh. In the German report, a summary of IOC sponsored training programmes, bilateral training programmes and training programmes of other international organizations such as IOI, is given. Mr Erb of the

IOC added that this report will be published shortly and that it will be distributed to the IOCINDIO members.

A delegate from India indicated that there is a need for a regional marine reference centre. He also informed the committee that an International Society for Mangrove Ecosystems with a secretariat in Japan, has been formed. He suggested that the IOC should collaborate with this society which has at present 70 countries with 600 members participating in it.

The delegate from ROPME suggested with reference to the climate issue that the carbon cycle and carbon uptake were important to the region, particularly the Gulf region.

6.3 CAPACITY BUILDING FOR DATA

The delegate of the Islamic Republic of Iran introduced this item. He suggested that to solve the problem of data exchange, each country of the region should possess or establish a National Oceanographic Data Center (NODC), which could be identified as the focal point for the provision of data. The requirements for such a center are:

(i) to provide consistent oceanographic baseline data;

(ii) to provide research and training facilities specially in the coastal area management and implementation, data processing, analysing and modelling;

(iii) to improve the existing marine remote sensing technology;

(iv) to improve the educational status in the field of marine science and technology;

(v) to develop and promote the Iranian NODC in order to serve as a Regional Data Centre (RNODC) in the North-Western part of the Indian Ocean.

He also suggested that each country should provide information on which kind of data they would be able to provide. This would then enable the IOCINDIO to create a proper mechanism to determine how data exchange could be further facilitated.

The Chairman concluded that a system at the subregional level was proposed and asked the delegate of the Islamic Republic of Iran to draft a recommendation. Finally, he asked Dr Krishnamurthy to include proposals concerning meteorological observations in the recommendations under the climate module of the GOOS Workshop Report.

7. PROGRAMME OF THE REGIONAL COMMITTEE 1997-1998/99, INCLUDING 1998 INTERNATIONAL YEAR OF THE OCEAN, IDENTIFICATION OF RESOURCES AND LIAISON ARRANGEMENTS

The Committee decided to discuss several sub-programmes in sequence, and subsequently establish a small sub-group to prepare an integrated programme in tabular form. This should include specification of activities, schedules, places, participating nations, responsibilities, resources requirements and sources of funds, and relationship or relevance to current issues and related international agreements such as Conventions, the Global Programme of Action for the protection of the Marine Environment against Land-based Activities (GPA-LBA), and Chapter 17 of Agenda 21. Cooperative partners could also be identified. A brief summary is presented here about some of the individual sub-programmes.

7.1. OIL POLLUTION AND ITS IMPACT ON THE INDIAN OCEAN

The delegation of India introduced the subject, emphasizing the large transportation of petroleum hydrocarbons across the Indian Ocean and related potential hazards. Results of oil spill trajectory modelling was presented. The use of various toxic materials in ship and pleasure craft painting was also referred to as potentially harmful to the marine environment. The lack of quantitative information and knowledge of the impacts of contamination by oil and toxic substances was emphasized. The implications of ballast water releases were also highlighted.

Following the presentation and discussion, the Committee decided that:

(I) a regional workshop on oil spill drift modelling should be organized; prior to this, an inventory of existing modelling work and related experiences should be made, to be used as background material for the workshop. The delegations of India and Indonesia were invited to take the lead in this effort, which should be done in cooperation with ROPME;

(ii) an effort should be made to prepare an inventory of use of toxic materials in ship and pleasure craft painting, and of ballast water releases. This should be initiated jointly by the IOC and ROPME Secretariats; training activities on taxonomy with reference to HAB should be organized, in the framework of the IOC-HAB programme; this action should be initiated through the IOC-HAB centre in Denmark; possibly a regional IOC-HAB Centre could be established in India through NIO;

(iii) following a proposal from the Delegate of the Islamic Republic of Iran, the Committee concurred that systematic observations of oil contamination in selected parts of the region should be established as a cooperative international project; this could be part of the Health of the Ocean Module of GOOS.

7.2 REGIONAL COOPERATION TO STUDY SEA-LEVEL VARIATIONS AND STORM SURGES

The delegation of India presented an overview of sea-level observations, the need for upgrading of some existing stations and establishment of new stations in order to obtain an adequate regional network. A proposal for a sub-regional cooperative project on storm surge forecasting with emphasis on the Bay of Bengal was also introduced.

The considerable progress in the regional component of GLOSS was emphasized recalling the establishment of sea-level observing cells, workshops and training courses on sea-level observations and data analysis organized in the region as part of the GLOSS activities. The training course in 1995 in India was specifically recalled. The need for adequate input data for storm surge models and the necessity of adopting models to the local conditions as regards bathymetry and topography was stressed. The delegate of Bangladesh presented studies of the sediment layering in the Bay of Bengal which showed the varying sea-level regimes over the last 10,000 years (since the last glaciation).

Following the presentations and discussion, the Committee decided that a cooperative storm surge forecasting project should be established and supported as part of the Committee programme. It was recalled that this had already been agreed at the first session of the Committee, that the IOC Assembly had endorsed it and that WMO had agreed to cooperate in this effort. The IOC workshop in Tirupati in India, 5 - 6 December 1996, is expected to specify the activities of this project. Introduction, adaptation of and training in use of forecasting modelling, and exchange of input data should be essential parts of the project. The project specification is being prepared and is expected to be completed in mid-1997.

7.3 1998 INTERNATIONAL YEAR OF THE OCEAN

Mr William Erb (IOC) presented the background on the 1998 International Year of the Ocean. The IOC initiated the Year of the Ocean (YOTO), and it was subsequently endorsed by the UNESCO General Conference in 1993 and the United Nations' General Assembly. The YOTO is designated as 1998 and will be celebrated concurrently with Portugal's World Exposition in Lisbon, EXPO '98. Its theme is also focused on the oceans, and a pavilion will be set up to house UN events and exhibits. It is expected that the IOC will have an opportunity to participate in the world exposition in various ways.

The IOC, at its Executive Council in September 1996, discussed various ways in which the IOC, its regional bodies, and individual member states might celebrate YOTO. IOC's objective is to utilize YOTO for education and public awareness purposes. It is viewed as an opportunity to emphasize the importance of the ocean in all communities, including the public, industry, governments, science, education, cultural, etc. YOTO is a rare opportunity that should not be lost.

Funds are limited, and the IOC is dependent on earmarked funds donated to its trust fund. For this reason, individual countries, funding agencies, and sponsors are needed to provide the required funds. Much can be done simply by raising the consciousness of people who can bring attention to YOTO by including the IOC YOTO logo on correspondence, meeting arrangements, etc. Conferences and seminars which are already planned and funded can be identified as YOTO events and therefore public awareness can be achieved at virtually no cost.

IOC is seeking to develop a circum-navigation of the globe by linking together research/training cruises through its various regions. Regions and countries must come forward and offer to dedicate their ships for these purposes. These would be, in most cases, cruises that were already planned. Countries would be requested to provide training opportunities on the cruise legs and IOC would seek to video tape parts of the cruises, piece them together, and present the film as an education aid or at Expo '98. Consideration is being given to an interactive satellite hook-up for a research cruise, wherein school children could experience the excitement of being at sea, or under the sea, doing research.

The Chairman of IOC, Geoff Holland, is personally committed to making YOTO a success and he is anticipating various activities such as an ocean charter which Ministers might sign in Lisbon or a "person's" charter designed for individuals. National governments might issue medals or stamps to honour individuals who have dedicated themselves to ocean activities such as educators, scientists, government administrators, sportsmen, artists, musicians, etc.

Plans of the Independent World Commission on the Ocean (IWCO) were mentioned with respect to persons requested to assess various factors related to the ocean and the eventual presentation of such papers at EXPO '98. It also plans a meeting of Ministers at EXPO '98. The delegate of the Netherlands expanded on the interests of the IWCO, and additionally plans for a global cruise and its use of Internet to transmit information.

Canada is planning three major scientific conferences on WOCE, GLOBEC and coastal zone management to celebrate 1998. EXPO'98 has offered 600 square
metres to India for an exhibition. India will also launch an ocean satellite in 1998 (and one in 1999) which will measure ocean colour, aerosol, surface wind, atmospheric vapour and water. The data will be shared throughout the region and globe. The delegates of Qatar and Kenya mentioned the need to cooperate more on making ship time available to others especially during YOTO. A workshop on ship time could tie the Indian Ocean regions together. The Islamic Republic of Iran is planning a national cruise in the Persian Gulf, Gulf of Oman and Caspian Sea, and there will be various public education events carried out in connection with these activities.

The meeting agreed that there was a need to develop a mechanism to coordinate the YOTO events within IOCINDIO. As such, it was agreed to establish a YOTO Co-ordinating Committee.

Dr Andrew Forbes agreed to chair the Committee and delegates should provide the name of their country's representative to him by the end of December 1996. The Committee should include public relations persons.

7.4. OTHER PROGRAMME ELEMENTS

7.4.1 Coastal Zone Management

The Executive Secretary IOC recalled the importance of the coastal zone and the strong need for an integrated approach to coastal zone management, including a scientific and systematic observation input. The need to pursue the development of the coastal module of GOOS was emphasized. He recalled that much work is being done in the coastal zone, including systematic observations such as GLOSS, river-inputs, and moored stations, e.g., in India (see item 4). He recalled the workshops organized by IOC in this respect, e.g., in Karachi, Pakistan, October 1994.

The delegate from Canada informed the meeting about the on-going training course at IIT, Delhi, India on coastal zone oceanography and dispersion modelling, with reference to coastal zone management (MAMCOMP). He also informed it about coastal ocean programmes being initiated in North America and other parts of the world, and suggested that a regional project on coastal ocean studies be organized. This should aim to provide the required scientific input and understanding for integrated coastal zone management.

The Committee noted that there is much effort in coastal zone research and that a harmonized joint programming effort could be of great benefit to all coastal states in the region.

The Committee decided that an expert workshop should be organized to prepare a harmonized coastal zone studies programme for the region. This could also provide an input to the development of the coastal module of GOOS for the region. The delegates of India, Indonesia and Canada agreed to take the lead in this effort. The workshop could possibly be organized in conjunction with the MAMCOMP training course in Delhi in November 1997.

7.4.2 Demarcation of the Outer Limit of the (legal) Continental Shelf

India introduced a proposal for scientific capacity building in the IOCINDIO region in connection with the demarcation of the outer limit of the (legal) continental shelf according to the provision of the UNCLOS. During the presentation it was pointed out that demarcation of the continental shelf is a complex technology and capital endeavour. However, coastal states will benefit economically if they can obtain additional offshore areas as a result of this demarcation. They will also acquire a large amount of valuable geoscientific data for future exploration and exploitation of their continental shelf. This task is also urgent because the coastal states have to complete the demarcation work within a period of 10 years from the date of their ratification of the treaty.

It has therefore been proposed that this be considered as an important item for capacity building and mutual assistance. The IOC may arrange training courses, training workshops dealing with various scientific and technical aspects of the demarcation of the (legal) continental shelf. IOC may also offer fellowships to the representatives of IOCINDIO countries to undergo training in the various scientific and technological investigation methods required from this task.

The Executive Secretary IOC informed the Committee about the on-going preparation of a synthesis of the scientific basis for the demarcation of the continental shelf. This is a joint effort of IHO and IOC, following

a proposal from an intergovernmental group of experts meeting convened by the UN-DOALOS in 1995. The report is expected in 1997.

The Committee decided that in due course, regional training and expert meetings could be arranged using the synthesis report as one essential input to obtain common methods.

7.4.3 Coral Reef Monitoring and Related Matters

The delegate of the Maldives presented the subject, proposing that a joint project be organized as part of the Committee programme to ensure proper observations of the health of coral reefs in the region. He informed the meeting about the Global Coral Reef Monitoring Network and the International Coral Reef Initiative. The need to study the biological diversity of coral reefs was stressed as part of the Biological Diversity Convention.

The Executive Secretary IOC informed the Committee about cooperation in relation to GCRMN of IOC, UNEP and IUCN; and the agreement of UK-ODA to provide an expert to IOC possibly to be stationed in Sri Lanka to prepare and initiate the regional GCRMN component with focus on India, Sri Lanka and the Maldives. This will be harmonized and coordinated with the other components of the GCRMN being developed in the Indian Ocean. The Committee decided that this effort should be included as part of the programme of work of the Committee. Cooperation should be organized through the IOC Secretariat with the relevant bodies in this matter.

The delegate of the International Society for Mangrove Ecosystems (ISME) raised the reference mechanism for marine biological diversity and the need for related training, especially in taxonomy. This was supported by several delegations. The delegate of India mentioned the very considerable efforts of NIO in the context of taxonomy and related training, including new finger-printing techniques. The Executive Secretary IOC recalled the very considerable progress of the IOC Harmful Algal Bloom programme, including its large training component, with taxonomy. He also informed the Committee about the preparation of a biodiversity species inventory through the expert group in the Netherlands. This was initiated as an IOC contribution to the implementation of the Convention on Biological Diversity.

The Committee decided that training courses in marine taxonomy should be organized at the regional or sub-regional level within the context of the IOC-HAB programme. The delegate of India agreed to take the lead in this matter. A first training course should be organized in 1997. The Committee also agreed that the possibility of establishing an IOC-HAB Centre in India within the NIO should be pursued, modelled after the existing centres in Denmark and Spain.

8. COOPERATION OF THE REGIONAL COMMITTEE WITH OTHER ORGANIZATIONS AND OTHER UNESCO PROGRAMMES

The Executive Secretary introduced the item referring to the very considerable cooperation of the IOC with other bodies, including the UN system (e.g., UNEP, IMO, WMO, IAEA, UN-DOALOS); non-governmental organizations, in particular, ICSU, SCOR, and IUCN; regional bodies, e.g., ROPME and PERSGA. He also referred to the other regional subsidiary bodies of IOC of relevance to IOCINDIO, namely WESTPAC and IOCINCWIO. The Vice-Chairman of IOCINCWIO informed the Committee about the development and programme of IOCINCWIO, and emphasized the need for cooperation and coordination with IOCINDIO. He also informed about the creation of the Western Indian Ocean Marine Science Association (WIOMSA) as an NGO, with support from Swedish SIDA(SAREC) and IOC. In particular, he mentioned the provision of research grants through this mechanism.

The delegate of ISME informed the Committee about this organization and presented a proposal from

ISME on a cooperative project for study and restoration of mangrove ecosystems in the Gulf of Kutch in India. This would serve as a model study. He invited the cooperation of IOC and IOCINDIO in this project.

The Committee decided to accept this invitation and to include modest financial support for this model study in its programme, with the provision that IOCINDIO will be acknowledged, and the study results will be presented to the Committee at its next session, if possible.

The delegate of ROPME expressed the strong need for proper coordination within the Indian Ocean Region. He asked for information about existing coordination mechanisms, and in particular the need for integration of such mechanisms. The Executive Secretary IOC spoke about the UN system-wide ACC Sub-Committee on Oceans and Coastal Areas, which was established in 1994 in order to specifically address the follow-up to UNCED 1992. This mechanism provides for coordination and cooperation. Through the presence of UNEP, the regional seas programme is also represented. He also mentioned the Inter-Secretariat Committee on Programmes Related to Oceanography (ICSPRO), which is based on an agreement between the Executive Heads of the member organizations to cooperate and coordinate their activities in this field. Finally, he also stressed the need for adequate coordination and harmonization mechanisms at the national level. He invited Member States of the Committee to strengthen or establish such national mechanisms recalling the recommendations to this effect of the IOC Assembly. The 1998 International Year of the Ocean could be used to obtain the commitment of governments to such national mechanisms. The Committee decided to recommend this procedure to its Member States, recognizing the benefits which will be obtained for scientific endeavours through such an inter-sectoral coordination mechanism.

The delegation of India referred to the IGBP programme as one mechanism for international research coordination, and informed the Committee about the provision of training and fellowships within the IGBP framework.

A proposal prepared by the Indian Ocean Marine Affairs Cooperation (IOMAC) organization, based in Sri Lanka, was presented to the meeting by Mr William Erb on behalf of Dr Hiran Jayewardene, Secretary General of IOMAC. It is titled, Management of the Indian Ocean Environment: Identification of Priority Areas and Programmes of Concerted Action in the Context of Integrated Regional Management of Marine and Coastal Biodiversity, and Prevention and Protection of Pollution of International Waters. The project is regional in scope and will be implemented by individual countries in the Indian Ocean with support primarily from IOMAC and the IOC(IOCINDIO and IOCINCWIO). It will be submitted to the Global Environmental Facility (GEF) for Program Development Funds (PDF). The endorsement of IOCINDIO was invited. India endorsed the IOMAC proposal in principle, but expressed reservations about India's participation in it.

After discussion and review of the proposal, IOCINDIO agreed in principle to endorse the proposal and requested that the IOC secretariat inform Dr Jayewardene of its decision. The endorsement of IOCINDIO is predicated on the understanding that the project will be open to countries in the region. This could be achieved through IOCINDIO, IOCINCWIO, and possibly ROPME as a mechanism to provide the required input to Member States which may wish to participate but are not eligible for GEF support.

9. ELECTION OF OFFICERS

The Committee re-elected with acclamation the officers who had served the Second Session for the inter-sessional period and the Third Session: Dr Muthunayagam as Chairman and Dr Zommorrodian as Vice Chairman.

10. DATE AND PLACE OF THE THIRD SESSION OF THE REGIONAL COMMITTEE

The Chairman invited proposals. The Islamic Republic of Iran invited the Third Session to be held in Iran in November or December 1998. The Committee expressed its appreciation and thanks for this offer. Saudi Arabia proposed a scientific meeting to be organized intersessionally as a cooperative activity between IOC-IOCINDIO and ROPME. The representative of ROPME seconded this proposal and stated that he would investigate it with the relevant ROPME authorities and cooperate with the Executive Secretary IOC on the matter. The scientific meeting could review the implementation of this and other related programmes.

11. ADOPTION OF REPORT AND CLOSURE

The Committee adopted its draft summary report and the recommendations. The Committee thanked India for its excellent arrangements, including: Dr A.E. Muthunayagam, Secretary DOD; Mr B.N. Krishnamurthy, Director DOD, Dr E. Desa, Director NIO; Dr Sumitra and the staff of NIO who made the meeting successful.

The Chairman closed the Session at 18:00 on 22 November 1996.

ANNEX I

AGENDA

1. **OPENING**

2.. **ADMINISTRATIVE ARRANGEMENTS**

- 2.1 ELECTION OF CHAIRPERSONS FOR THE SESSION
- 2.2 ADOPTION OF THE AGENDA
- 2.3 DESIGNATION OF RAPPORTEUR
- 2.4 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

3. **REPORT ON ACTIVITIES AND DEVELOPMENTS SINCE THE FIRST SESSION OF IOCINDIO**

4. **NATIONAL PROGRAMMES AND PRIORITIES**

5. **STATE OF MARINE RESEARCH AND SYSTEMATIC OBSERVATIONS IN THE CENTRAL INDIAN OCEAN AND RELATED FOLLOW-UP TO UNCED**

6. **CAPACITY BUILDING REQUIREMENTS AND TECHNICAL ASSISTANCE IN A REGIONAL COOPERATIVE PERSPECTIVE**

- 6.1 SUMMARY OF GOOS CAPACITY BUILDING WORKSHOP
- 6.2 CAPACITY BUILDING BY EXCHANGE AND SHARING BASED ON THE RECOSCIX-WIO MODEL
- 6.3 CAPACITY BUILDING FOR DATA

7. **PROGRAMME OF THE REGIONAL COMMITTEE 1996-98 INCLUDING 1998 INTERNATIONAL YEAR OF THE OCEAN, IDENTIFICATION OF RESOURCES AND LIAISON ARRANGEMENTS**

- 7.1 OIL POLLUTION AND ITS IMPACT IN THE INDIAN OCEAN
- 7.2 REGIONAL COOPERATION TO STUDY SEA LEVEL VARIATIONS AND STORM SURGES
- 7.3 1998 INTERNATIONAL YEAR OF THE OCEAN
- 7.4 OTHER PROGRAMME ELEMENTS

    - **7.4.1 Coastal Zone Management**
    - **7.4.2 Demarcation of the Outer Limit of the (legal) Continental shelf**
    - **7.4.3 Coral Reef Monitoring and Related Matters**

8. **COOPERATION OF THE REGIONAL COMMITTEE WITH OTHER ORGANIZATIONS AND OTHER UNESCO PROGRAMMES**

9. **ELECTION OF OFFICERS**

10. **DATE AND PLACE OF THE THIRD SESSION OF THE REGIONAL COMMITTEE**

11. **ADOPTION OF THE REPORT AND CLOSURE**

ANNEX II

RECOMMENDATION IOCINDIO-II.1

Programme of Work and Budget Estimate for 1997-1999.
The Regional Committee for the Central Indian Ocean,

Having reviewed the implementation of its programme agreed at the First Session,

Noting that a very considerable development of ocean and coastal zone research and observations has occurred in the region since its First Session,

Noting also that UNCLOS entered into force in November 1994,

Recognizing the importance of follow-up to UNCED and the opportunities provided by the 1998 International Year of the Ocean,

Emphasizes that the regional cooperation programme should address priority needs of the region, with related capacity building, including those of coastal areas, and support implementation of international agreements and conventions dealing with major issues of society where oceans and coasts play a central role, while maintaining its science base and ocean observation orientations,

Stresses the need for an increasing dialogue between the marine science and ocean observations communities in the region and social sciences, oceans and coastal area management communities, and decision makers,

Stresses also the need for adequate coordination of marine affairs at the national level,

Urges cooperation and coordination with other relevant global and regional organizations, in and adjacent to the IOCINDIO region,

Decides to adopt the Programme of Work for the Committee over the period 1997-1999 as indicated in the Table annexed to this Recommendation,

Decides furthermore to request its elected officers to have consultations with the IOCINCWIO officers so as to ensure adequate cooperation and coordination between the two committees, with possible consideration of proposals for a further strengthening of the cooperation mechanism for the Indian Ocean as a whole,

Urges Member States of the region to participate in, and support the implementation of the regional cooperation programme to the best of their interest and capabilities,

Further urges IOC, other bodies cooperating with the regional committee and donors to support the programme implementation and strengthen the role of the Committee through provision of adequate resources.

RECOMMENDATION IOCINDIO-II.2

Dates and Place of next session of The Regional Committee for the Central Indian Ocean.

Bearing in mind the need for a sufficient time period between sessions of the Committee to allow a reasonable implementation of its programme;

Recalling the too long period since its First Session;

Recognizing and **expressing** its thanks for the great effort made through DOD of the Government of India to revitalize the Committee;

Decides that its Third Session shall be held in December 1998 or early 1999 in the Islamic Republic of Iran;

Requests its elected officers in consultation with the Executive Secretary IOC to decide on further arrangements for the Third Session including a possible scientific workshop preceding the Session.

TABLE I: PROGRAMME AND BUDGET ESTIMATION (1997-1999)
(Annexed to Recommendation .OCINDIO II.1)

Project	Action	Objective	Date and Place	Funding Required	Participation	Remarks
I. SEA LEVEL PROGRAMME (GLOSS)						
A. Instrumentation (tide gauges, meteorological sensors, modems)	1. Modernization of existing tide-gauge stations and establishment of new stations. 2. Training in use of modern instruments. 3. Exchange of visits.	1. To acquire high quality sea-level data from the IOCINDIO region. 2. To achieve uniformity in data acquisition in the IOCINDIO network.	1996-2000 1998-2000	1. Maximum $2,000,000 for 40 gauges; PCS should endeavour to find national funds. IOCINDIO to explore other sources. 2. Training: $30,000. 3. Exchange of visits: $10,000.	All countries	Network planning and priorities may be considered in detail by a coordinating committee to be set up by IOCINDIO based on suggestions from PCS. Linkages with GLOSS: IOC-UNEP-WMO-ROPME.
B. Sea Level Data Analysis	1. Short term regional workshops 2 .Exchange of visits 3. CD-ROM based training material	1. To develop analysis skills in PCS 2. To enable standardization of data format archival and dissemination.	1. Workshop in late 1997 or 1998. Adelaide, Australia 2. Exchange visits during 1996-1998.	1. $50,000. 2. $20,000. 3. $20,000.	Coordinator: Dr Shetye	Linkages with GLOSS, IOC-UNEP-WMO pilot activity in the Indian Ocean. ROPME. Coordinating committee to be set up under 1.1 to plan and review progress under the item, in conjunction with GLOSS.

II. STORM SURGE FORECASTING PROGRAMME	1. Preparation of high resolution coastal and near shore maps. 2. Scientific exchange for visits/training for numerical model development and validation. 3. Mechanism for implement-ation.	Development of real-time storm surge prediction system for IOCINDIO countries.	1996-2000 Concerned PCS	Travel: $30,000. Training: $30,000. Infrastructure: $40,000.	Initially India, Myanmar, Sri Lanka, Bangladesh, Australia. More countries may join later.	Linkage with Project 1. IOCINDIO may set up an expert group from PCS to define the mechanism for implementation.
III. CLIMATE MODULE	Regional workshop on oceans and climate.	Exchange of scientific expertise.	May precede or follow SCOR workshop to be held in Goa in November 1997.	Approximately $30,000. For travel and organization.	All countries.	Linkage to SCOR, CLIVAR, WCRP.

IV. COASTAL AREA MANAGEMENT	To develop expertise through workshops, training and exchange visits.	1. To monitor oil pollution and threats related to shipping and other events including microbial/ecological events. 2. Monitoring and modeling of coastal marine pollution inventory. 3. Workshop on oil spill drift modeling. 4. Inventory of use of toxic materials. 5. Expert Workshop to prepare harmonized coastal zone studies programme of the region.	1996-2000	1. $300,000 for hardware (setting up laboratory) plus travel and organization expenses. 2. MAMCOMP-IOCINDIO to explore sources - $20,000. 3. $20,000 4. ---- 5. $20,000	Initially India, Islamic Republic of Iran, Australia, Qatar, Indonesia, Sri Lanka, Saudi Arabia.	Linkage with ROPME activities and possibly PERSGA.
V. MARINE LIVING RESOURCES PROGRAMME	Training course in marine taxonomy and DNA fingerprinting, possibly at NIO, Goa 1997 ($20,000)	To establish a Marine Biological Reference Museum, with a possible linkage to HAB Centre, Denmark.	NIO, Goa, India 1997-1999.	1. Building: $200,000. 2. Infrastructure: $100,000. 3. Exchange of specimens: $75,000. US$375,000 (National Resources)	India, in collaboration with all interested countries.	May be a resource generating activity through admission fee. National resources linkage to ROPME.

VI. CORAL REEFS PROGRAMME	1. Establish monitoring stations in the IOCINDIO region. 2. Regional workshop, training, exchange visits.	To protect and manage coral reefs.	1997 onwards.	Initial expenses for establishment: $300,000. Recurring expenses basically for observations: $150,000. PCS may find their own resources with additional funding from IOCINDIO for Item (6ii).	Initially India, Maldives, Sri Lanka, Australia, Indonesia, Saudi Arabia.	Linkage with Global Coral Reef Monitoring Network and ICRI and ROPME. IOCINDIO requested setup of an expert group for planning and implementation.
VII. ONE TIME EXPEDITION OF THE INDIAN OCEAN	To complete survey through triangular cruise across the flanks of the Indian Ocean.	1. To revisit and supplement earlier hydrographic sections. 2. To study inter-annual variability of the Indian Ocean. 3. To raise public awareness through the Year of the Ocean.	1997-1998 (southern summer)	US$850,000 for ship time. US$75,000 contribution of Common Wealth funds. US$175,000 for equipment. IOCINDIO may explore.	India, Australia, South Africa, Indonesia, Maldives, Islamic Republic of Iran, Qatar, Sri Lanka, initially.	Linkage with WOCL, ROPME IOCINDIO requested set up of expert group for planning and implementation. NIO is the contact.

VIII. IOCINDIO YEAR OF THE OCEAN	1. Launch ocean satellite-India.	Measure ocean color, aerosol, winds, atmosphere, vapor and water.	1998	None	All countries	
	2. Research cruise in Persian Gulf, Gulf of Oman, Caspian Sea - I.R. of Iran.	Education.	1998	None		
	3. Establish IYO Planning Committee.	Public awareness.	1998	None	All countries	Australia-Chair
IX. REGIONAL COOPERATION	Model study of mangrove ecosystems with ISME.	Protection and management of ecosystem.	1997-1998	$3,000.	IOCINCWIO	Study is in the Gulf of Kutch.
	IOMAC proposal on biodiversity and marine pollution.	Improved management and coordination.	1997-1998	None	All countries of the region except India.	Proposal being submitted to GEF by IOMAC-IOCINDIO conditional endorsement.

X. GLOBAL OCEAN OBSERVING SYSTEM	1. Modernize tide gauge network.	See Programme I.	1997-1998		India and Australia will take the lead	
	2. Initiate storm surge modeling.	Prediction.	1997	$15,000.	India lead. See Programme II.	
	3. Regional workshop on natural hazards.	Prediction awareness.	1997-1998	$25,000.		
	4. Expand capacity for making climate-related observations.	Intra-regional assistance.	1997-1999	$5,000.	See Programme III.	
	5. Inventory marine pollution monitoring.	Enhance management.	1997-1998		See Programme IV.	
	6. Marine Living Resources.	Cooperate with ICRI, GCRMN.	1997-1998		See Programmes V and VI.	
	7. Identify sponsors for region.	Increase resources.	1997-1998			

The Officers of IOCINDIO, together with the National Focal Points for IOCINDIO, function as a coordinating committee for the programme implementation;

A separate coordinating committee for the efforts related to the 1998 International Year of the Ocean will be established; Chair, Dr A. Forbes (Australia);

The establishment of national coordinating mechanisms will be encouraged;

The establishment of NODC's will be encouraged.

Appendix to Table to Annex II.

Proposed Sea Level Programme for the Indian Ocean Region

The GOOS Capacity Building Meeting (18 - 19 November 1996) assigned the highest priority to the Coastal Module of GOOS. The Coastal Module emphasizes the need for sea level monitoring and storm surge prediction in the Indian Ocean region. In this context, a proposal for a modern sea level monitoring network for the detection, analysis, and prediction of storm surges, and the long-term variations in sea level to recover the climate signal representing global warming was presented by India and Australia for the Indian Ocean region. This proposal has direct linkages to the IOC-UNEP-WMO Pilot Activity on Sea Level Changes and associated coastal impacts (IOC/INF-908), under which CMAS, a network of Cells for Monitoring and Analysis of Sea Level, looks after the near-coastal regions.

The main points of this proposal are:

- Enhance the existing operational stations in the region to provide both meteorological and tidal data. Build in communications to provide near real-time requirements of GLOSS.

- GPS anchored tide Buoys for logistically remote sites.

- Use some tide stations to validate satellite altimetry.

The proposal suggests:

- Instrumentation for long-term sea level monitoring with auxiliary measurement of weather parameters.

- Instrumentation for storm surges that take advantage of the improved Global Positioning System and satellite altimetry.

- Measurement of land movement to deduce absolute sea level.

- Data delivery to users.

The following countries have shown high interest in this programme:

Bangladesh, Indonesia, Kenya, Maldives, Sri Lanka, ROPME countries (Bahrain, Islamic Republic of Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates).

REQUIREMENT OF SEA LEVEL STATIONS IN THE INDIAN OCEAN REGION

Country	Gauges in Operation	Existing Gauge Type	Proposed Enhancement	Estimated Cost (in $)**
Islamic Rep. Of Iran	4	Float	Air Acoustic Pressure Met. sensors	$50,000 x 2 ($100,000)
Indonesia	8	Float	Air Acoustic Pressure Met. sensors	$50,000 x 4 ($200,000)
ROPME (Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi Arabia) I.R. of Iran	6-8	Float	Air Acoustic Pressure Met. sensors	$50,000 x 9 ($450,000)
Kenya	4	Float	Air Acoustic, Pressure, Met. sensors	$50,000 x 2 ($100,000)
Bangladesh	6	Storm Surge Float	DGPS(?) Tide Buoys	$50,000 x 2 ($100,000)
Maldives	3	Pressure	Air Acoustic Pressure, Met. sensor	$50,000 x 3 ($150,000)
Sri Lanka	3	Pressure	Acoustic, Met. sensor Pressure	$50,000 x 3 ($150,000)
India	11	3 Acoustic 1 Pressure 7 Float	Pressure Met.	$30,000 x 11 ($330,000)
Saudi Arabia (Red Sea)	2	Float	Pressure	$100,000
			TOTAL	$1,680,000.

** Enhanced Station (Acoustic, Pressure, Met. Package) = $50,000/-

ANNEX III (a)

Address by Dr A.E. Muthunayagam, Secretary, Department of Ocean Development, New Delhi 20 November 1996

Dr Qasim, Dr Kullenberg, Dr Desa, Mr Krishnamurthy, Distinguished Delegates, Invitees, Ladies and Gentlemen:

We are pleased to organize the Second Session of the IOC Regional Committee for the Central Indian Ocean here in Goa beginning from today for 3 days. I thank the Intergovernmental Oceanographic Commission and all concerned officials for giving this opportunity to India. Indeed this meeting provides an excellent opportunity to meet and promote international understanding.

The oceans cover about 71% of the globe. The potential of the ocean towards the socio-economic benefit of society is well recognized all over the world. The thrust is towards the application of S&T for the exploration and exploitation of the vast marine resources on a sustained basis with due attention towards marine environment and its protection.

With the coming into force of UNCLOS in November 1994, the coastal states could extend their jurisdiction in the adjoining sea even beyond the 200 nautical mile exclusive economic zone. They gain access to larger areas in the ocean for exploitation of marine resources. The UNCED 1992 highlights the need for an integrated approach towards development and environment as well as the concept of integrated coastal zone management.

The oceans provide fisheries for food, economy building tourism, shipping for worldwide commerce, beaches for recreation, minerals, energy and also inexpensive waste dumping sites. Ocean also plays a major role in climate and is a source for natural hazards such as cyclone, storm surge, coastal erosion, inundation and so on which have adverse impact on the society.

To beneficially utilize the ocean resources and mitigate natural calamities, one should understand the nature of the ocean and the complex oceanic processes. They are multi-disciplinary, multi-institutional and multi-national as well. The problems of the ocean are complex and will have to be solved, some at the national level, some at the regional level, and some at the global level. There is a need for international cooperation and regional programmes for gainfully utilizing resources for the benefit of the society.

We are all aware of the contribution of IOC in providing marine scientific investigation and related ocean services to learn more about the nature and resources of the ocean through regional and global cooperation. Let us all join hands and pool our resources to apply the results of our science and technology for the benefit of all mankind. I am sure that this second session of the IOC Regional Committee on the Central Indian Ocean will promote understanding among the nations of this region and ensure the success of our regional programmes.

I wish all success to this Second Session of IOCINDIO. Thank you.

ANNEX III(b)

Address by Dr G. Kullenberg, Executive Secretary IOC-UNESCO
20 November 1996

Dr Qasim; Dr Muthunayagam, Secretary DOD; Dr Desa; Dr Krishnamurthy; Delegates; Ladies and Gentlemen:

I am honoured to be here in this beautiful place to help open the Second Session of IOCINDIO, which stands for IOC Regional Committee for the Central Indian Ocean. On behalf of the Intergovernmental Oceanographic Commission and myself, I wish to thank the Government of India for hosting this session and the Director of NIO and his staff for making all the local arrangements and for organizing the preceding workshop on regional GOOS. Special thanks also to Dr Krishnamurthy of DOD and the Secretary DOD for their unfailing support at the national level and to Drs Sumitra and Desa for their unfailing local and regional organization. I wish to welcome all participants from Member States and observers from cooperating organizations as well as participants from neighbouring regional bodies of the IOC, namely IOCINCWIO and WESTPAC. I am also very happy to welcome Dr Qasim as the living grandfather of Indian Ocean oceanography.

I wish to make some reflections at this time on developments in IOCINDIO so far. IOCINDIO, as IOCINCWIO, resulted basically from the IOC-UNESCO Workshop held in July 1985 on Regional Cooperation in Marine Sciences in the Central Indian Ocean and Adjacent Seas and Gulfs. The IOCINDIO was subsequently formally established by Resolution XII-14 of the IOC Assembly and its first session was hosted by the Government of Pakistan in Islamabad in July 1988. The Committee adopted a rather ambitious programme which we will look at further during this session. It covered:

- coastal water dynamics, with reference to integrated coastal area management;
- oceanography and pelagic living resources with studies of algal blooms;
- geological survey of the continental shelf and sediment budget of the Indus Cone;
- marine pollution problems in relation to ICAM;
- sea level observations;
- storm surge predictions.

Several actions have been taken to implement parts of this programme and the Committee also decided that it should meet again in 1990. However, this never happened, and we may ask why.

The IOCINCWIO Committee which covers the Western Indian Ocean has managed to take off in a more efficient way and has developed a strong programme. It has established a close cooperation with some donor agencies, in particular, Swedish SIDA (SAREC), but also Belgium and the Netherlands. This cooperation is established through a tripartite partnership involving the IOC itself, the regional body of IOC, i.e., IOCINCWIO, and the donor, in this particular case SIDA(SAREC). This partnership was initiated in 1990/91 and is now running for its third period confirmed until 1999 (1997-1999). The funds provided from SIDA are mostly for the implementation of the agreed regional cooperative programme established by the regional committee, IOCINCWIO, on the basis of national priorities and needs, forming a cooperative regional programme. This is attractive for all the partners; it has a substantial cost-benefit structure; it aims for and can obtain sustained effort through commitments at the national and institutional levels. National resources are pooled, data exchanged, and supplementary or complementary training achieved. This cooperation also enlarges the community and can help achieve a more balanced political priority in the

problems of the marine environment. An adequate balance can perhaps gradually be achieved. A similar partnership is also being developed for other IOC regional subsidiary bodies: the IOCARIBE in the Caribbean and WESTPAC in the Western Pacific.

The funds being made available from donors vary: for the IOCINCWIO region, we have about/300,000USD per year; for WESTPAC in the range of 150-200,000USD, and for the Caribbean about 100,000USD. This can be compared to what the IOC-UNESCO regular programme can provide, i.e., approximately 50,000USD per year at most for each region. Hence, the advantages for regional cooperation are evident. There is benefit to all concerned. Therefore, what support could we, or might we obtain for a viable regional cooperation programme of IOCINDIO?

This region comprises several sub-regions as regards participation of Member States. The First Session of the Committee agreed on its composition and that the Member States of the region essentially were (para 161 of the report): Oman, UAE, Qatar, Saudi Arabia, Kuwait, Iraq, Islamic Republic of Iran, Pakistan, India, Sri Lanka, Maldives, Bangladesh, Myanmar, Thailand, Malaysia, Indonesia, Australia, UK and France. This covers a wide range and is extremely heterogeneous. I do not think there is any donor who could accept to provide support for this whole range of states. The donor would rather choose part of this region and a group of Member States. In view of this, I suggest that we seriously consider if we can have subregional programmes or projects. We may be able in this way to obtain support from donors for specific actions. We have made several attempts and it appears that we have finally succeeded in obtaining donor support for part of the region. The UK-ODA has agreed to provide support for the development of the regional component of the Global Coral Reef Monitoring Network for India, Sri Lanka and the Maldives. An Associate Professional Officer will be seconded to the IOC to be stationed in Sri Lanka for 18 months to develop and initiate the programme. This will be done in close association with the other efforts in this field as regards the Indian Ocean. I hope that this session of IOCINDIO will endorse this approach and include it as a specific part of the regional cooperative programme for the coming years.

Another effort which would certainly benefit from regional cooperation is the development off GOOS. Considerable progress has been achieved in establishing and substantiating GLOSS for the Indian Ocean. Several activities have been implemented and stations have been put into place and are operating. This effort appears to be a regional priority activity for the whole Indian Ocean region. It relates to several major issues of our time: climate change, regional implications of such, and coastal area development and protection; and it closely relates to the overall problem of coastal area development and integrated coastal area management perspective. This is a common problem and a priority of most nations, globally and regionally. Why not focus on some selected actions in this area for the programme of regional cooperation for these years - possibly at a subregional level. We have had a number of actions in this region which are part of such an effort: GLOSS actions; the workshop on ICAM in Karachi in 1994; the training course in Pakistan supported by Germany, 1994; the training course in India on coastal pollution dispersion is another example, running now for the third year in sequence.

What about regional inter-annual change or variability, the monsoon? Do we know enough about it to make adequate forecasting, or would we benefit from additional cooperative research? What about marine living resources?

We have seen UNCED 1992 and UNCLOS entering into force at the end of 1994. Several international legal instruments like that of the Framework Convention on Climate Change, Biological Diversity, and the Global Programme of Action on LBA resulted from UNCED. UNCLOS marks the greatest transfer of resources in history through the adoption of EEZ's. How do we help this region benefit the most from these actions? How do we achieve a balance? There are now ample opportunities for south-south cooperation, and for sharing various experiences. I hope these can be used. We need to relate our ocean and coastal

areas research to the issues of society and show its usefulness. This was attempted in the preparations for UNCED, and we did achieve the endorsement of GOOS and many other initiatives. The IOC Medium Term Plan clearly relates the IOC programmes to issues, so we should do the same here and now! An important public awareness creation exercise is the 1998 International Year of the Ocean. We need to use this event to help achieve our goals at the public and political levels. Recent global environmental changes have drawn attention to their potential socio-economic implications all over the world, and the role of oceans is broadly acknowledged with related importance of ocean research and adequate ocean observations. Operational oceanography is here. Clearly this requires cooperation in order for the benefits to be fully achieved. Cooperation does not only include nations, but also international organizations, and we (the IOC) do have considerable such, globally and in this region. We need to account for this and use it and enlarge it.

Ladies and Gentlemen, I wish this session of IOCINDIO every success and look forward to achieving a balanced, viable programme which can be implemented over the coming couple of years.

ANNEX IV

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ANNEX V

This summarizes inter-sessional actions taken by IOC for the Programme Areas of IOCINDIO I:

I. COASTAL WATER DYNAMICS, AS WELL AS REGIONAL PARTICIPATION IN TOGA, WOCE

Several of the Member States in the region participated in TOGA and are participating in WOCE; some countries are continuing their interest in TOGA-TAO and are also involved with CLIVAR (of WCRP). The IOC has also been a co-sponsor of WCRP since 1993. Other activities specifically addressing coastal zone problems which have been carried out in the region include workshops on integrated coastal zone management (Karachi, Pakistan 1994; Bali, Indonesia, 1994); training courses on modelling and dispersion of pollutants in the coastal zone (MAMCOMP, India 1994, 1995, 1996), workshops on coastal erosion, sea-level changes and their impacts (Mombasa, Kenya 1991; Dhaka, Bangladesh, 1992; Zanzibar, Tanzania, 1994); workshop on nutrient studies in tropical marine waters (Mombasa, Kenya 1994).

Training programmes have also been carried out related to analysis of coastal pollution (Goa, India, 1992) and on non-living marine resources (Karachi, Pakistan, 1994). These activities need to be linked to studies on coastal water dynamics.

2. OCEANOGRAPHY AND PELAGIC LIVING RESOURCES AND THE STUDY OF RED TIDES (ALGAL BLOOMS), OSLR

Several member states from the region are participating in the IOC Harmful Algal Bloom Programme (HAB), including its training courses. Some Member States are also associated with the IGBP project JGOFS which is co-sponsored by IOC and is relevant to the subject. The TOGA and WOCE studies and other elements of WCRP are relevant to the subject area. The studies of coastal zone nutrient-levels and marine pollution are important contributions to the area of marine living resources, and several related activities have already been carried out (see programme areas 1 and 4). The recruitment studies have not been given the attention that was expected, although a workshop on prawn recruitment was carried out in Phuket, Thailand in 1989.

3. GEOLOGICAL SURVEY OF THE CONTINENTAL SHELF AND INPUT OF RIVERINE SEDIMENTS TO THE INDUS CONE (OSNLR)

National studies have been carried out on this subject and the project was discussed in-depth at the integrated coastal zone workshop in Karachi, Pakistan, October 1994, as well as at the IOC-Germany training course on non-living resources also held in Karachi in 1994.

4. MARINE POLLUTION RESEARCH AND MONITORING (GIPME-MARPOLMON)

A workshop on regional aspects of marine pollution was held in Mauritius, 1990; a training course on analysis of marine contaminants was organized at NIO, Goa, India in 1992; and a training course on modelling and dispersion of pollutants in the coastal zone was organized in 1994, 1995 and 1996 at the IIT, Delhi, India.

In the ROPME Sea Area, studies and assessments of marine pollution with emphasis on petroleum hydrocarbon pollution were organized by IOC after the Gulf War. These actions have been implemented in close cooperation with ROPME. Contributions have also been made on this subject to the study of the PERSGA region; the IOC prepared a review of the regional marine environment situation there (1990-91), organized a preparatory workshop and presented an overview and a proposal for an oceanographic monitoring project to the Sea-to-Sea Conference in Saudi Arabia in 1995.

5. SEA-LEVEL OBSERVATIONS IN THE FRAMEWORK OF THE IOC GLOBAL SEA LEVEL OBSERVING SYSTEM (GLOSS AND GOOS)

This subject area may be seen as a gradual development of a regional component of the Global Ocean Observing System (GOOS). As you are aware, GOOS was formally adopted as a development programme by IOC in 1989; was presented to and endorsed by the Second World Climate Conference in 1990; and was endorsed by the United Nations Conference on Environment and Development (UNCED) in Chapter 17 of Agenda 21 in 1992. A regional workshop on capacity building with respect to GOOS was organized here in Goa preceding this session of IOCINDIO.

Data exchange and data management policy are intimately linked with the development and establishment of operational oceanography, which essentially is GOOS. This matter includes awareness creation of the importance of data management and the retrieval of relevant ocean data. The global data archeology and rescue project of IOC in cooperation with ICSU and US-NOAA (GODAR) is a highly relevant programme in this context as an effort of the IODE. The Third Regional GODAR workshop was held here at NIO, Goa, India in 1994.

The GLOSS project has developed steadily over the last ten years since its inception in 1985. Several activities have been carried out in this region. These include a workshop on sea-level observations in relation to coastal problems (see subject area 1 above); training courses in sea-level measurements and analysis; analysis of impacts of sea-level changes on coastal zones; and support to the establishment and maintenance of sea-level observing stations. These actions also form part of the IOC contributions to the establishment of Integrated Coastal Area Management programmes and to the evaluations and studies of climate variability and change which are also part of the implementation of the UN Framework Convention on Climate Change adopted at UNCED 1992. The IOC prepared, in cooperation with UK-UODC and the PSMSL, a CD-ROM on all sea-level data available.

6. REGIONAL STORM SURGE PREDICTION

As requested, a project proposal was submitted to the Member States and UNDP. Support was not rovided since it was not given sufficient priority.

ANNEX VI

NATIONAL PROGRAMMES AND PRIORITIES

AUSTRALIA

Australia's national effort in oceanography is led by three institutions. The largest is the Commonwealth Scientific and Industrial Research Organization's (CSIRO) Division of Marine Research in Hobart, Tasmania. Second is the Australian Institute of Marine Science in Townsville, Queensland, and third is the University of Tasmania's Cooperative Research Centre for Antarctic Studies, also in Hobart. CSIRO's Division of Marine Research conducts research and monitoring programmes around the whole of Australia and collaborates actively with many overseas institutions, while participation in international programmes such as WOCE, JGOFS and ATOC. The other two major oceanographic centres conduct programmes in tropical and Antarctic areas, respectively.

Australia is probably the leading nation in climate assessment and climate monitoring in the southern hemisphere. The CSIRO's Divisions of Marine Research and Atmospheric Research and the Division of Meteorology have active ocean atmospheric observational programmes, which are vested both in operational forecasting and in validating and constraining numerical modelling of coupled ocean atmospheric general circulation models. Monitoring of pollution, environmental parameters and marine living resources is undertaken by the above three institutions as well as by at least nine Australian universities. Monitoring coverage is not uniform around Australia's 36,000 coastline, but is concentrated in areas of known resources near population centres, and in areas where ocean processes contribute to or affect fisheries, industry or recreation. Australia routinely acquires satellite data (SST, altimeter) around the entire continent with state-of-the-art ground stations, and archives these data at CSIRO's DMR in Hobart. All oceanographic data activities in the Australian Oceanographic Data Centre in Sydney. The National Tidal Facility at Flinders University in Adelaide leads Australia's efforts in acquiring and archiving sea level data from the Australian region.

BANGLADESH

Bangladesh has a short coastline of 710 km and its EEZ is 43,232 sq. Km. In the Bay of Bengal. Severe cyclones, storm surges, heavy sediment flux, probable coastal inundation in the event of sea level rise, are some of the ocean related phenomena in Bangladesh.

Different organizations and universities carry out research and ocean observation activities but no institution is available to carry out integrated studies.

National Oceanographic and Maritime Institute (NOAMI), a non-governmental organization and focal point of IOC, is carrying out a feasibility study to establish a national Institute of Oceanography and has taken steps to implement its first phase.

GERMANY

Germany participated in the first session of IOCINDIO in Islamabad in 1988, and at several occasions had expressed its concern about the slow progress made in this so important Regional Committee. It had even sympathized with the idea to establish an IOC Subcommission for the whole of the Indian Ocean.

Over decades, German scientists have given high priority to research in the Indian Ocean. The two major research vessels "sonne" and "Meteor" only recently carried out important investigations in relation to JGOFS, WOCE, and OSNLR. From June 1993 to February 1994, RV "Sonne" operated in the Indian Ocean for a study of the Reunion Hotspot, for WOCE, Pakomin, JGOFS, Hydrotrunc at the Rodriguez Triple Point, and an investigation of the Bengal Fan. She will return to the Indian Ocean via Singapore probably in February 1997 for a period of at least five months.

R.V. METEOR entered the Indian Ocean in March 1995 and remained until the end of the year. She conducted research for WOCE and JGOFS, and hosted a training course on bathymetric charting on a cruise beginning in Durban.

Training courses financed by the German Government and sponsored by the IOC were held on many occasions and on diverse subjects. The courses were held in the Indian Ocean and west and south Pacific regions and involved many trainees from IOCINDIO member states.

A training course on sea-level changes and the evolution of coastal environments was held in November 1996 in Jakarta, which included trainees from India, Sri Lanka, Myanmar, Thailand, Malaysia and Indonesia.

INDIA

India's involvement in systematic oceanography goes back to 1946. Recording of sea-level measurements in India is now more than 100 years old. The launching of the International Indian Ocean expedition during 1962-65 resulted in establishment of the National Institute of Oceanography in 1966. An exclusive Department of Ocean Development was set up in 1981 at the central governmental government level to promote and coordinate ocean-related activities.

Major research in physical, chemical, biological, geological studies have been carried out in the seas around India by the National Institute of Oceanography and others. With a strong research base in oceanography and with the launching of satellites by India, several programmes related to ocean services are under implementation.

- Marine Satellite Information Service (MARSIS) utilizes remote sensing data and develops several data products such as sea surface temperature, potential fishing zone information, coastal wetland maps, etc.

- Sea Level Monitoring and Modelling (SELLMAM) is establishing 11 modern tide gauges for accurate measurement of sea level.

- Shore to Fishing Vessel Communication System, a societal project, provides a communication link between coastal fishermen and the shore.

- Marine meteorological services are provided to ships on high seas, ports and cyclone warnings are given through Area Cyclone Warning Centres.

- Data services are provided through Indian National Oceanographic Data Centre and National Ocean Information System.

Continuous monitoring of the health of the coastal waters is done through the programme Coastal Ocean Monitoring and Prediction System. A survey and technology development programme is underway in respect to polymetallic nodules. In response to international programmes, national programmes of Tropical

Ocean Global Atmosphere and Joint Global Ocean Flux Studies have been carried out. India has carried out surveys for minerals in the shelf area and has thus acquired expertise in the field. Work has also been carried out in the emerging technique viz, Ocean Acoustic Tomography. India is at the verge of setting up a national Data Buoy System equivalent to the European Sea watch System. India is also conducting Antarctic research by organizing expeditions to Antarctica. A permanent Indian station is established in Antarctica and 15 expeditions have been sent thus far. India is also conducting Antarctic research by organizing expeditions to Antarctica. A permanent Indian station is established in Antarctica and 15 expeditions have been sent thus far. India is also active in the Law of the Sea and in the International Seabed Authority. India is participating in IOC governing bodies and has interest in implementing the Global Ocean Observing System. Indian priorities are marine and meteorological services, climate, coastal zone, marine pollution, living and non-living resources.

INDONESIA

Indonesia is the world's largest archipelago. The coastline of the Indonesian archipelago is about 81,000 long. It is a complex system with shallow and deep seas. The Indonesian waters fare between the Indian and Pacific Oceans and between the Asian and Australian continents.

Marine research activities in Indonesia include many subjects, i.e., physical, chemical, geology, geophysics, bathymetry, biosystematic inventories, biology and ecology of marine organisms, coastal ecosystems, marine biotechnology, planktonology and productivity, aquaculture, marine microbiology, environmental quality and pollution, remote sensing, cartography and marine meteorology.

In order to support oceanographic research activities in Indonesia for all scientific areas, there are more than 150 scientists. Indonesia also has six vessels for carrying out oceanographic research.

ISLAMIC REPUBLIC OF IRAN

There are fifteen organizations at the national level involved in marine activities, science, training and research. The Iranian National Centre for Oceanography of the Department of the Environment and the Iranian Fisheries (SHILAT) Training and Research Organization are the major institutes. More than ten universities in the country offer good opportunities for marine science and technology studies at the M.Sc. and B.Sc. level.

In general, the oceanographic activities within the country can be described as: identifying and protecting coastal ecological sensitive areas; obtaining baseline data; data collection on oil and non-oil pollution in sediment water and biota; fishery resource stock assessment; fish disease identification; fishing technology; fish processing technology; hydrographic surveying in the coastal areas; weather observation and meteorological data collection, sedimentological and ecological studies; geological survey of estuaries; studies in geochemistry of marine environment.

In 1995, a National Oceanographic Data Centre was established which provides data required by many other national organizations/institutions. A Receiving Satellite Station for Marine Data will be operational in February, 1997. An extensive coastal zone management plan for the entire coastal zone of the country is expected by mid-1997.

REQUIREMENTS:

- To provide consistent oceanographic baseline data.
- To establish an outstanding analytical laboratory at a regional level, with a high standard of intercalibration.
- To install tidal gauge instruments in the required areas to achieve a uniform tidal gauge network.
- To provide research and training facilities specially in coastal zone management and implementation, data processing and analysing and modelling.
- To develop regional cooperation on climate change, sea-level rise and biodiversity.
- To establish permanent stations for oceanic observations.
- To improve the existing marine remote sensing technology.
- To improve the educational status in the field of marine science and technology.
- To develop and promote the Iranian NODC in order to serve as a Regional Data Centre (RNODC) in the north-western part of the Indian Ocean.

MALDIVES

The Maldives is an archipelagic state located in the central Indian Ocean. It is situated on the Chagos-Laccadives Ridge and forms the central and largest part of the ridge. The archipelago consist of atolls, coral islands and associated coral structures. The population of Maldives is about 280,000 and they are distributed in 299 of the 1200 islands. The main industries are fishing and tourism, and both of these industries rely on healthy coral reefs for their survival.

The nature and formation of Maldives makes marine living resources very important for the country and consequently marine research is centered on living marine resources of especially coral reefs and open seas. Management and conservation of marine living resources are given priority in the National Development Plan.

The Marine Research Section of the Ministry of Fisheries and Agriculture was established in 1984, and is the only marine research facility in the Maldives. The Section is divided into 4 units which are the coral reef research unit, the inshore fisheries research unit, the offshore fisheries research unit and information and management services unit.

The main functions are coral reef research, coral reef monitoring, coral taxonomy, impacts on coral reefs, fish stock assessment - tuna/sharks/baitfish/reef fish, fisheries biology, fishing technology, fish taxonomy and development of mariculture capability in the country.

The Marine Research Section has about 20 staff of which 10 are technical and the remainder are support staff. It does not own a research vessel but has smaller boats for coastal survey work. It has scuba diving facilities and about 6 certified divers. A small library and information centre, and a laboratory for simple analytical work is part of the section. A major program on coastal management has been formulated recently, the "Integrated Reef Resources Management Program".

The Department of Meteorology is the organization responsible for the maintenance and management of tide gauges and tide data in the Maldives. There are 3 TOGA tide stations in the Maldives and data are analysed in Hawaii. No specific oceanographic institute is found in the Maldives but there are plan's to establish a facility within the Department of Meteorology.

The Environment Research Unit of the Ministry of Planning Human Resources and Environment undertakes environment research. It has facilities for studies of various ocean parameters such as sea surface temperatures, currents, suspended matter and salinity. Further coastal erosion work is conducted by ORV.

A weather station to measure ocean parameters is maintained by the University of Newcastle upon Tyne in the Maldives in cooperation with MRS. Other international and regional cooperation includes the International Coral Reef Initiative, South Asia Cooperative Environment Programme. Projects on coral reefs and biodiversity are undertaken through regional programmes.

QATAR

Qatar, being a peninsula with a long shoreline compared to its area, pays special attention to the sustainable development of its marine resources and the protection of its environment. Realizing that this can only be achieved through careful planning based on research programmes. Qatar has established the following institution:

- The Department of Marine Science of the University of Qatar is a teaching/research institution which offers under graduate courses in all disciplines of marine science. It has a staff of 8 PhD specialists assisted by 12 young scientists and technicians. The Department has modern laboratories supplied with adequate facilities for teaching and research in addition to a well-equipped research vessel of 25m length, capable of accommodating 10 scientists. The Department implements short and long term programmes that include continuous monitoring of state of the Qatari marine environment, surveys of sea fauna and flora as well as research mark that covers larger sectors of the Gulf waters. The results are published in specialized regional and international journals.

- The Scientific and Applied Research Centre (SARC) of Qatar University occasionally conducts research relevant to the marine environment, especially water pollution.

- The Directorate of Environment, the Ministry of Agriculture and Municipality, is responsible for the protection of the environment in Qatar including the marine and coastal areas.

- The Fisheries Department monitors the commercial catch, carries out studies on stock assessment, population dynamics, statistical analysis and proposes regulations relevant to fishing gear with a view to preserving and developing the living resources in Qatari waters.

PRIORITIES

Training of Qatari nationals in the following fields:

- Processing and analysis of oceanographic data and the establishment of an oceanographic data centre.

- Applying modern techniques in the study of the marine environment such as remote sensing, mooring of equipment at sea for recording oceanographic parameters, modelling, etc.

SAUDI ARABIA

King Abdul Aziz University, Faculty of Marine Science was first established in 1972.

- It has a number of staff members including 40 professors, supporting staff of 6 and the total number who graduate are 10-15 per year.
- The faculty has four departments that offer courses and conduct research in all disciplines of marine sciences.
- The faculty has very good facilities represented in modern laboratories and a research vessel of 18m.
- The Faculty issues one journal in which their research findings are published.

Institutes in Saudi Arabia that teach and conduct research in marine science:

- King Abdul Aziz University - Faculty of Marine Science
- Ministry of Agriculture and Water
- KACST - King Abdul Aziz City of Science and Technology
- KFUPM - Research Centre
- King Faisal University
- MEPA

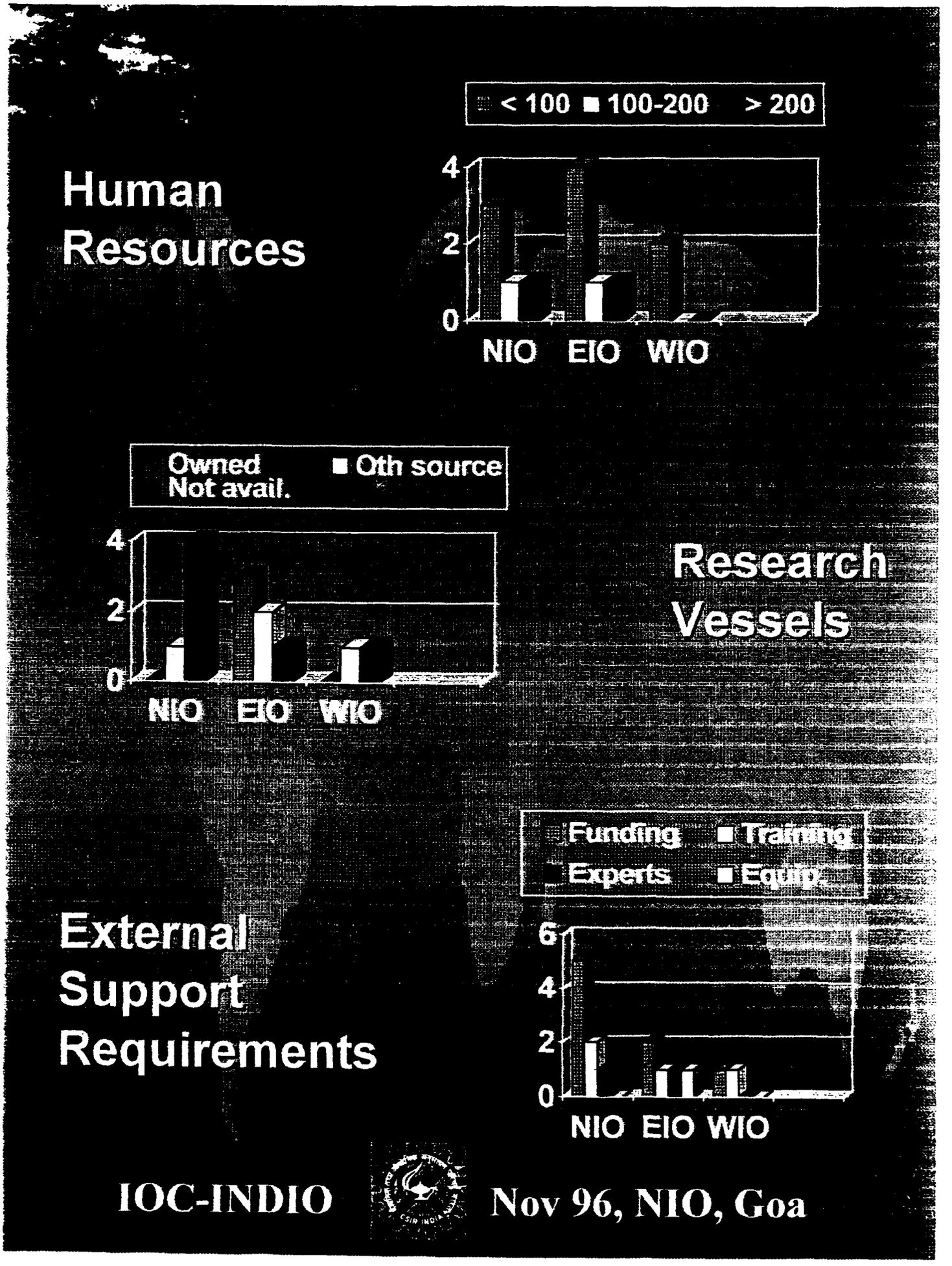
Many projects have been conducted in the Red Sea covering the fauna and flora distribution along various coastal areas of the Red Sea. Additionally research on water quality and sediment types of the Red Sea are conducted. Other research has been considered with pollutant distribution along the coastal area in general and in residential and industrial places in particular with reference to the affect of those pollutants on marine habitats. There is also research on fish stocks and migration of the different commercial stocks.

King Abdul Aziz University, Saudi Arabia and UNESCO/IOC are organizing a training workshop on the application of remote sensing in marine research and coastal management. The course will be held in Jeddah, Saudi Arabia in the next five months and will result in training for about 25 specialists applying this technique in studying the marine environment.

SRI LANKA

National Aquatic Resources Agency (NARA) is the only government marine research institute in Sri Lanka. In addition, there are universities such as Kelaniya, Ruhuna, Colombo, Rajarata and departments such as Coastal Conservation, Meteorology, Fisheries, involved in ocean activities.

NARA in the past 15 year period carried out national as well as international scale projects in the field of marine living resources, coastal oceanographic surveys, coastal zone monitoring programmes and land fishery surveys.


Human Resources
< 100 ■ 100-200 > 200
4
2
0
NIO EIO WIO
Owned ■ Oth source
Not avail.
4
2
0
NIO EIO WIO
Research Vessels
Funding ■ Training
Experts ■ Equip.
External Support Requirements
6
4
2
0
NIO EIO WIO
IOC-INDIO
Nov 96, NIO, Goa

Status of Marine Sciences in the Indian Ocean Region (IOR)

Countries responded to the Questionnaire :

- ***Northern Indian Ocean (NIO)***
  - *Bangladesh, India, Maldives, Pakistan & Sri Lanka*
- ***Eastern Indian Ocean (EIO)***
  - *Australia, Indonesia & Thailand*
- ***Western Indian Ocean (WIO)***

IOC-INDIO **Nov 96, NIO, Goa**

STATUS OF MARINE SCIENCES IN THE REGION: SUMMARY BASED ON RESPONSES TO QUESTIONNAIRE

PRIORITY PROJECTS

(Most institutions identified more than one area)

AREA/FIELD	NIO	EIO	WIO
Living resources management	2	1	1
Marine biology	2	-	-
EIA/Pollution	2	2	-
Sea Level/Climate	2	3	1
Physical Oceanography	2	2	-
Interdisciplinary Oceanography	1	1	-
Data/Info. Mgmt & Software development	1	1	-
Boat/ Ship Building	1	-	-
Tourism	-	-	1
Not mentioned	-	1	-

FUTURE AREAS OF CONCERN

Management of Living & non-living resources, biodiversity within EEZ	4	3	1
EIA/Pollution	3	-	1
Climate studies	-	1	-
Productivity studies	1	-	-

NIO = Northern Indian Ocean
EIO = Eastern Indian Ocean
WIO = Western Indian Ocean

ANNEX VIII

RECOMMENDATIONS OF THE GOOS WORKSHOP

In light of detailed discussions on the priorities and focus of the programmes in the region, the Workshop made the following recommendations for the consideration of IOCINDIO.

Coastal Zone Module

(i) A cooperative programme should be initiated in the IOCINDIO region to modernize and augment the tide gauge network for sea level data and analysis. In view of their expertise, Australia and India could play a leading role in the implementation of the regional programmes.

(ii) A regional cooperative programme should be initiated for the development of storm surge models for prediction of the storm surge height and realistic assessments of the extent of inundation of the coastal areas, and for the preparation of high resolution coastal and near shore maps. In view of its expertise, India could take a leading role in the programme.

(iii) A regional workshop on coastal natural hazards such as cyclones should be organized through IOCINDIO to discuss various aspects of data requirements, software, etc., for the development of models.

Climate Module

(I) The capacities for making climate related ocean observations using techniques such as XBT's, XCTD's, moored met-ocean data buoys should be increased in many of the countries of the IOCINDIO region.

(ii) The countries with well-developed capacities to carry out and interpret ocean observations should work towards enhancing regional cooperation in the transfer of the expertise through training, etc., to other countries in the region.

Health of the Ocean Module

The IOCINDIO region should identify activities in the region related to marine pollution monitoring and also identify through the IOC other regional and international programmes which support the development of marine pollution monitoring activities in the countries of the IOCINDIO region.

Marine Living Resources Module

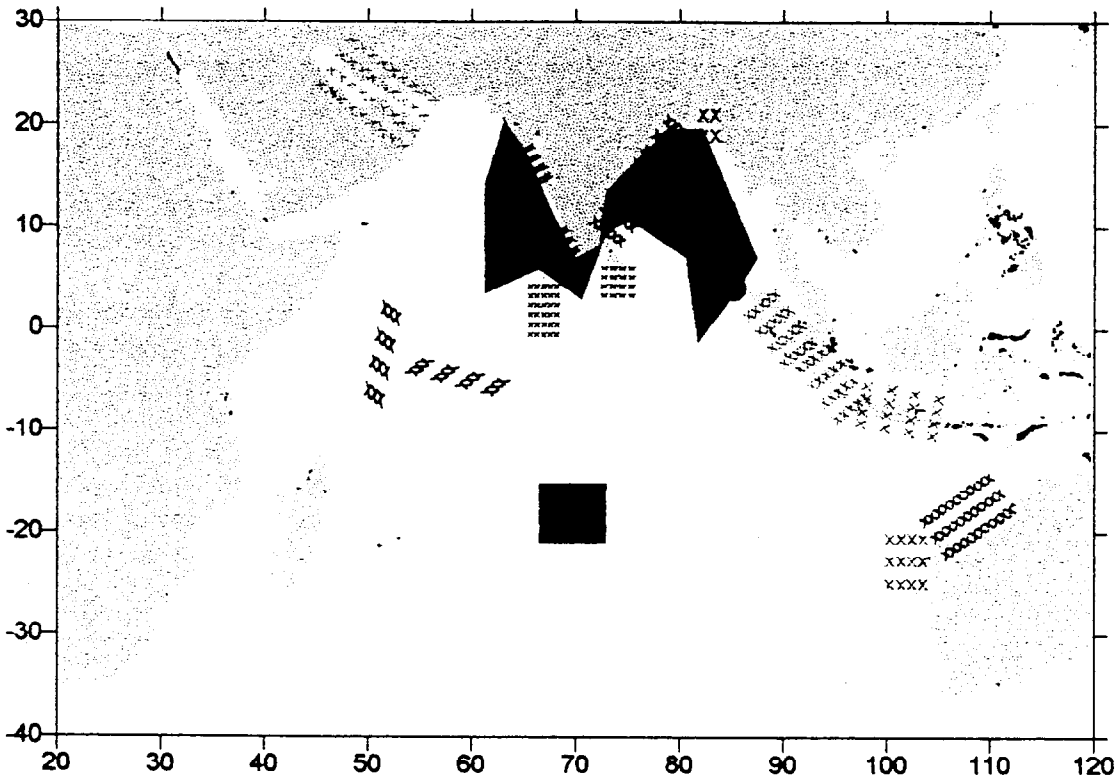
The IOCINDIO region should cooperate with international programmes such as ICRI, GCRMN, in the development of the national programmes for the protection and conservation of coral reefs and mangroves.

Concerning all Modules

IOCINDIO should request the IOC to identify other regional and international bodies and agencies which could give scientific and financial support for the implementation of identified regional programmes for GOOS in the IOCINDIO region.

(No recommendations were decided for the Marine Services Module).

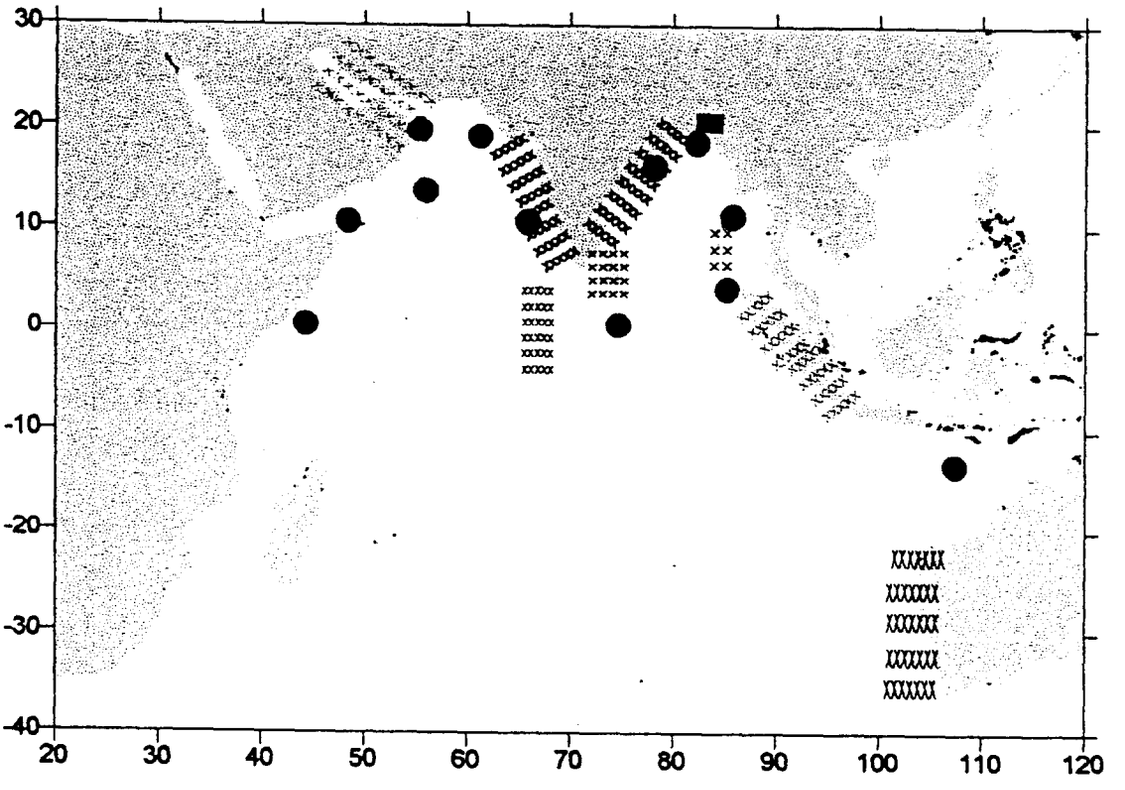
NLMR Module
(GEOPHYSICAL)



Australia
Bangladesh
India
Indonesia
Maldives
ROPME (Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, S.Arabia & U.A.E.)
Sri Lanka

LMR Module

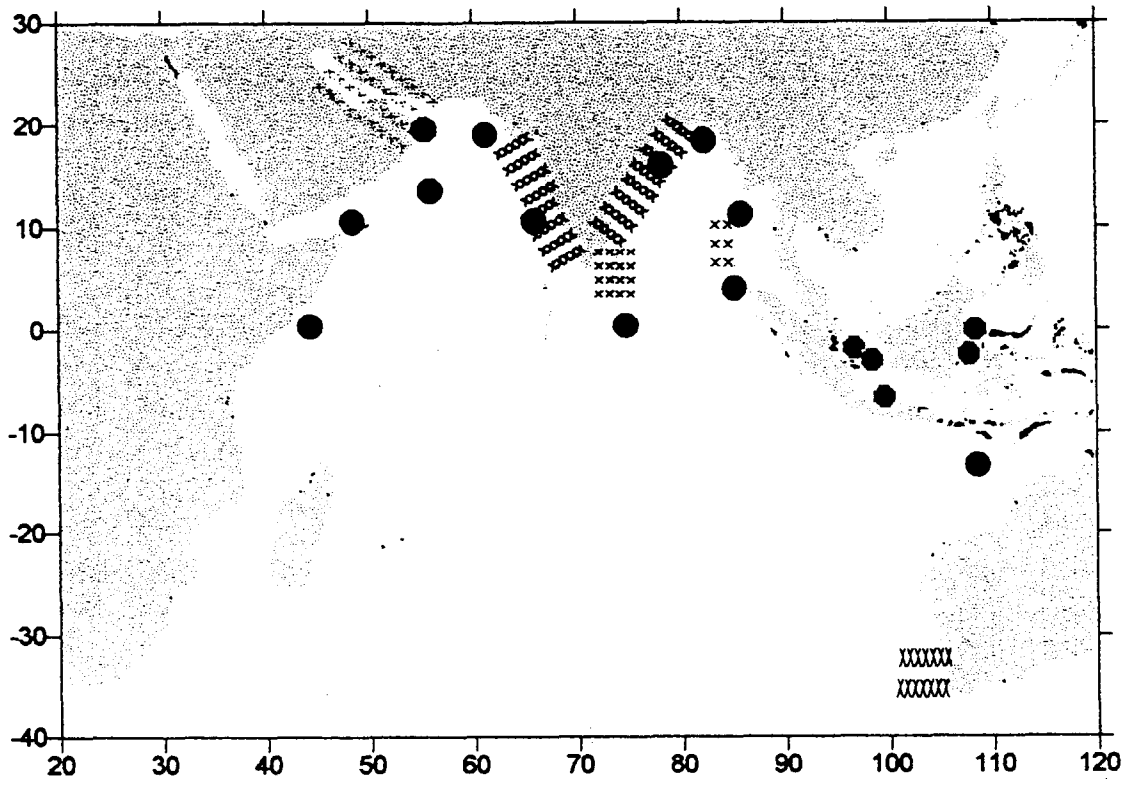
● Station proposed for Systematic Observation



Australia
Bangladesh
India
Indonesia
Maldives
ROPME (Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, S.Arabia & U.A.E.)
Sri Lanka

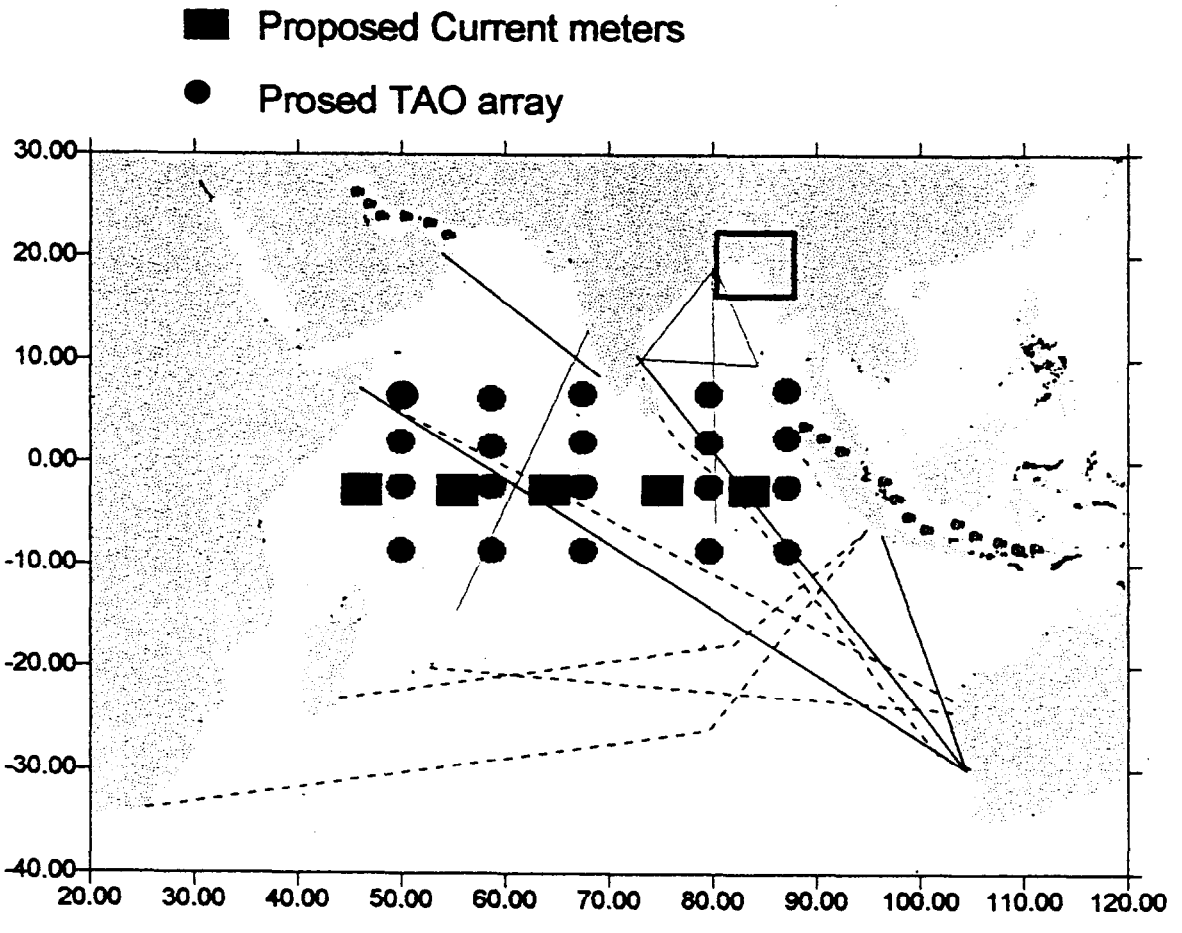
HOTO Module

● Station proposed for Systematic Observation



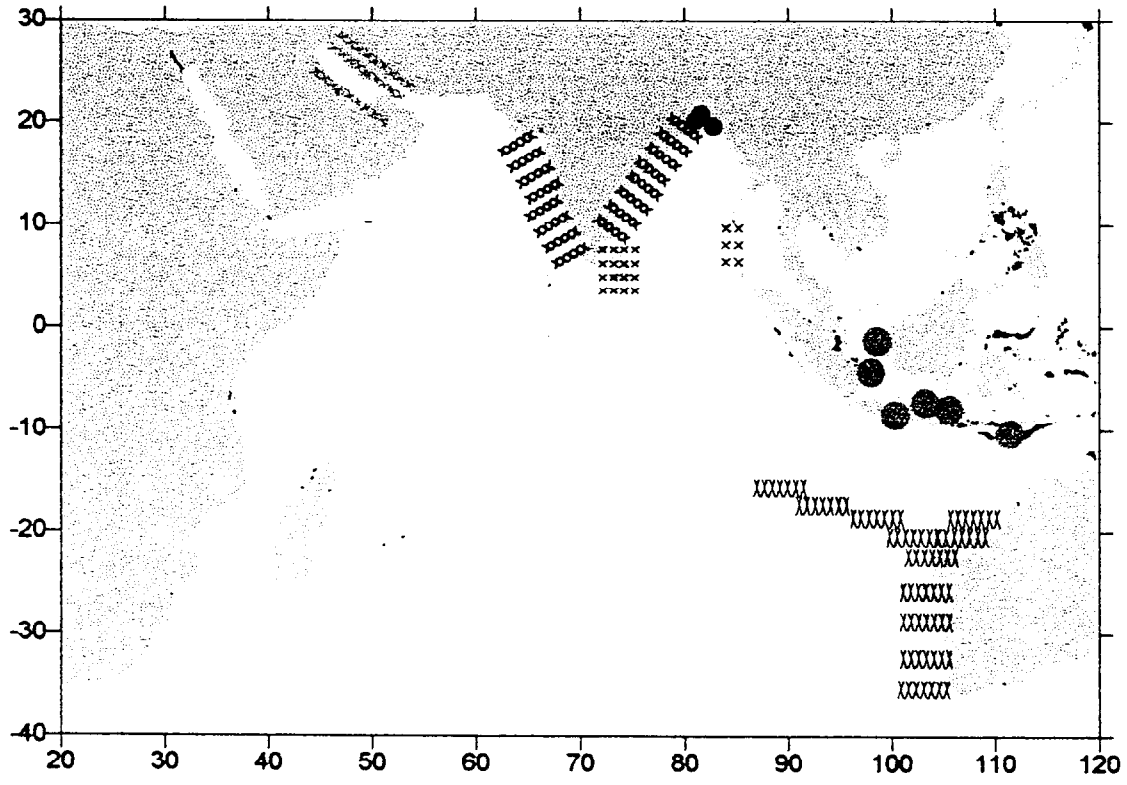
Australia
India
ROPME (Baharain, Iran, Iraq, Kuwait, Oman, Qatar, S.Arabia & U.A.E.)
Sri Lanka

CLIMATE Module



Australia
Bangladesh
India
Indonesia
ROPME (Baharain, Iran, Iraq, Kuwait, Oman, Qatar, S.Arabia & U.A.E.)

COASTAL Module



Australia
Bangladesh
India
Indonesia
ROPME (Baharain. Iran, Iraq, Kuwait, Oman, Qatar, S.Arabia & U.A.E.)
Sri Lanka