Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IOC-IUCN-NOAA CONSULTATIVE MEETING ON LARGE MARINE ECOSYSTEMS (LME)

Second Session

Paris, France
15-16 March 1998

UNESCO

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PREFACE

The *ad hoc* Consultative Meeting on Large Marine Ecosystems (LME) was held on 15-16 March 1998. The consultation was convened by The Intergovernmental Oceanographic Commission (IOC), the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) and The World Conservation Union (IUCN). It was sponsored by IUCN and hosted by IOC at UNESCO headquarters, Paris, France. The meeting was co-chaired by Mr. Ole Henrik Haslund (IOC) and Dr. Kenneth Sherman (NOAA). A list of attendees is given in Appendix A.

1. INTRODUCTION

Mr. Haslund welcomed all participants to UNESCO, Paris. Following introductory comments, Dr. Sherman reviewed several publications which were distributed to meeting participants.

Dr. Sherman provided a brief summary of The Report of the Ecological Society of America - Committee on the Scientific Basis for Ecosystem Management (Christensen *et al.* 1996). According to the ESA report, the concept of sustainability has to be viewed in a broader ecosystem context and must also include socio-economic issues. The report argues for a paradigm shift in how natural resources are managed. Ecosystem management is driven by explicit goals, executed by policies, protocols and practices and made adaptable by monitoring and research based on our understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure and function. When ecosystems are degraded, their provision of ecosystem services is compromised. Hence, the paradigm shift represented by ecosystem management involves a number of radically different approaches to management, wherein the overarching principle for guiding decisions is ensuring the intergenerational sustainability of ecosystem goods and services.

Mr. John Waugh (IUCN) reported that during the period covered under this review IUCN restructured its programme as a part of its decentralization effort and terminated the headquarters-based marine and coastal programme. LME programme responsibilities were transferred to IUCN's Washington office at the end of 1997. IUCN's future role in the LME process is expected to concentrate on conservation and sustainable use aspects of LMEs.

2. ACTIVITIES AND ACCOMPLISHMENTS DURING 1997-1998

This section briefly summarizes actions taken over the past year to implement the recommendations of the January 1997 *ad hoc* Consultative Meeting on LMEs.

1. **Recommendation**: IUCN in collaboration with NOAA, IOC, and UNIDO should disseminate LME information more widely using the World Wide Web as one of the delivery mechanisms. LME activities should be planned for the "1998 International Year of the Ocean (IYO) and EXPO 1998".

Action: A draft of LME information prepared by IOC, to be included in a website, was distributed for comment. IOC will maintain a presence at EXPO 1998, Lisbon, Portugal.

2. Recommendation: FAO should consider options for reporting fish statistics by LME areas in addition to present statistical areas.

Action: FAO provides fishery statistics over large statistical areas, not on an ecosystem basis. Dr. Bakun will explore with FAO options for providing this information in the future. It was recognized that financial support to FAO would be required to meet this request.

3. Recommendation: NOAA, IUCN and IOC should update productivity information for each of the LMEs based on available data, both *in situ* and satellite remote sensing where pertinent. Utilize ECOPATH carrying capacity models in collaboration with appropriate experts. Seek GEF funding to support this activity.

Action: A GEF proposal is being developed to provide this information.

4. Recommendation: Existing and future LME projects should consider the application of new technologies and techniques to assess the status and changes in LME coastal habitats. Such technologies include airborne instruments (e.g., compact airborne spectrophotometric instruments), acoustic assessment of sedimentary habitats, GIS, and rapid assessment techniques for biodiversity.

Action: Several advances have been made in the past year. SeaWiFS data is now available. A towed undulating instrument, the Chelsea Instruments' NuShuttle, is now being tested and evaluated by the NOAA/NMFS Laboratory in Narragansett. The system when fully operational should be deployable from ships of opportunity. The SeaSoar, another Chelsea product, is a towed instrument that collects oceanographic data in an undulating mode.

5. Recommendation: The IUCN Marine and Coastal Programme Office in collaboration with WWF, the IUCN Commission of Ecosystem Management and other partners, should provide a report addressing ICAM issues in relation to the LME modular monitoring and assessment approach, taking into account the recent GESAMP report on "The Contribution of Science to Integrated Coastal Management" and the ocean health and assessment network.

Action: While no report has been produced, considerable progress has been made by the GEF-IMO South China Sea programme within integrated coastal management sites in China and the Niger Delta.

6. Recommendation: A matrix should be developed describing the relationships among international programmes, with particular regard to developing GEF-supported LME projects and efforts to encourage close links between the application of science-based ecosystem assessment and management particularly with regard to socio-economic benefits and governance. ICES volunteered to develop this matrix together with other relevant organizations.

Action: This has not been accomplished, however, meeting participants reiterated that an effort should be made to link LME projects to the broader scientific community. It was agreed that a statement would be drafted that clearly defines the LME concept

as it relates to basin-scale studies (GLOBEC, JGOFS, GOOS). It was suggested that funds be solicited from IOC or others to conduct a study on how the LME concept compliments these basin-scale studies. It was also suggested that the LME concept be developed as an outreach activity.

7. Recommendation: As a means to foster science-based management of marine resources for sustainable use, encourage further development of country-driven GEF projects as outlined in the GEF Operational Guidelines and the Monitoring and Evaluation Guidelines of the World Bank. This should be done particularly with respect to the Agulhas Current, Baltic Sea, Benguela Current, Caribbean Sea, Somali Current, South China Sea, Western Indian Ocean Gyre and Yellow Sea LMEs. IUCN, NOAA, IOC and other partners should assist developing countries in preparing GEF projects proposals on these LMEs.

Action: Activities relating to this recommendation are provided under the section on LME Monitoring and Assessment Projects.

8. Recommendation: Recognize the potential for synergy between UNEP's Regional Seas Programme, IOC's regional programmes and LME projects. In areas within an LME, that fall either wholly or partially under a UNEP Regional Sea, collaborative assessment and monitoring should be undertaken by the responsible agencies.
Action: Accommodation has been reached with UNEP on this matter in the development of the Canary Current LME project.

9. Recommendation: The IUCN - Marine and Coastal Programme in collaboration with the World Conservation Monitoring Center, FAO, UNEP and the Commission of Ecosystem Management, should update the description of LMEs within the context of UNEP Regional Sea Programme as well as the LME World Map.

Action: This has been delayed with the restructuring of marine programmes at the IUCN. Participants reaffirmed this as a priority need, and called upon IUCN, in collaboration with other relevant bodies, to update the LME World Map.

10. Recommendation: The Expert Consultative Meeting, taking into account the excellent progress made in implementation of the Gulf of Guinea LME project, encourages IOC and IUCN in collaboration with UNIDO to disseminate initial results to the marine science, policy, and management communities, as well as educational institutes and the general public.

Action: A Gulf of Guinea Newsletter is published regularly and several talks have been presented in international meetings highlighting the results of the projects. Other outreach products are in preparation by the Project Coordination Office in Abidjan.

11. Recommendation: NOAA, IOC and IUCN should continue to prepare summary reviews from ongoing LME monitoring and assessment studies not funded by the GEF.

Action: Effort by NOAA has been continuing on this activity with the preparation of LME volumes on the Gulf of Mexico, Pacific

Rim, and Indian Ocean to be published during 1998 by Blackwell Science. IUCN contributed the funds for the Pacific Rim and Indian Ocean volumes.

12. Recommendation: IOC, IUCN and NOAA will develop the Terms of References (TOR) for an LME Committee to replace the *ad hoc* Committee as soon as possible. The TOR will be reviewed subsequently by FAO, ICES, UNIDO and UNEP and circulated for reviews and comments by the attendees of the 23-24 January 1997 LME Meeting.

Action: Terms of Reference (TOR) for the LME Consultative Committee were drafted, disseminated, revised and accepted at this meeting.

13. Recommendation: The establishment of an LME Committee should not preclude regular contact among the network of parties involved in LMEs, and such regular contact should be encouraged. In this regard the participants agreed to form the nucleus for this network through e-mail.

Action: Routine e-mail communication was conducted among the participants during 1997 to facilitate continued communication among LME Committee members and to involve the broader scientific community, suggestions were solicited for website content and the creation of an e-mail network.

14. Recommendation: Conduct periodic consultations in 1998 to review LME Programme developments, in relation to the practical activities of GLOBEC, LOICZ, GOOS and other science-oriented initiatives on ocean dynamics, like JGOFS, as well as progress made towards closer integration of marine science with socioeconomic and governance activities.

Action: This recommendation was approved by the Committee.

3. REPORTS ON THE IMPLEMENTATION OF REGIONAL LME MONITORING AND ASSESSMENTS PROJECTS

Invited speakers provided presentations on the status of ongoing and developing LME monitoring and assessment programmes.

3.1 YELLOW SEA LME PROJECT (Dr. Ned Cyr and Dr. Qisheng Tang)

Two projects are being developed in this region: a World Bank Project for South Korea which is in the implementation stage and a larger bilateral Korea-China project which is in the planning stages with support from the GEF. The World Bank Project comprises a productivity module, fisheries module, and pollution module, and began implementation in March 1998. The bilateral GEF project has been awarded a $350K Block B PDF grant to support a transboundary diagnostic analysis (TDA). Dr. Tang presented data from the Bohai area of the Yellow Sea ecosystem showing significant changes in the fish community over the past several years.

3.2 GULF OF GUINEA LME PROJECT (Dr. Chidi Ibe)

The Gulf of Guinea LME Project continues to make progress. A mid-point review was positive, and a workshop was held in October 1997 to present and discuss results from the project's first two years. Major developments include the participation of Togo in the project, and the investment of major funding toward environmental issues in the Niger Delta region by petroleum producing corporations. The first Regional Symposium on the Large Marine Ecosystem in the Gulf of Guinea was held in Abidjan, Côte d'Ivoire in January 1998.

The Gulf of Guinea ecosystem provides resources that represent an annual contribution of about 3.8 billion US dollars to the developing economies of the adjacent West African countries. With the introduction of more sustainable resource-use practices, the experts estimate that the annual contribution to the economies of the countries in the region could be increased to approximately 9 billion dollars.

Among the accomplishments of the first two years of the Gulf of Guinea LME project were the consensus reached on methods for restoration of damaged mangroves and other habitats. In addition community-based mangrove restoration projects were initiated. The Environmental Protection Agencies of several of the participating countries agreed to initiate "non-hazardous waste-stock exchange programmes" with important industries including gas, oil, mining, steel, agricultural, and food production enterprises to control pollution and apply new technologies for profitable recycling of wastes as a principal means for protecting the rich fisheries and other living resources of the Gulf of Guinea Ecosystem.

The effort to improve the health of the Gulf of Guinea Ecosystem is the largest single project presently underway in Africa to increase the socioeconomic benefits of the natural productivity of a large marine ecosystem with support from within Africa from the Organization of African Unity and African Development Bank. The joint international effort has mobilized

a task force of 350 specialists from the six countries in the region. They have been recruited from government and non-governmental organizations, community-based organizations, the private sector and academic institutions. The task force has access to the latest technologies for assessing the positive effects of improving the health of the ecosystem, including the use of satellite images of coastal and oceanographic conditions, advanced electronic environmental sensors towed from commercial vessels to measure ecosystem productivity, new techniques of molecular biology to detect declines in the levels of coastal pollution and the availability of fully equipped vessels to conduct systematic surveys of the important fish and fisheries and the entire ecosystem.

3.3 BAY OF BENGAL LME PROJECT (Dr. Barbara Cooney)

The coastal area bordering the Bay of Bengal has a population of approximately 400 million people. Transboundary problems, based on GEF criteria, warrant attention. Monitoring occurs in the Bay of Bengal, but mitigation issues have to originate upstream. Land- and sea-based (tanker route cause oil spills) pollution, terrestrial degradation, inadequate management of marine living resources, and natural disasters (cyclones) are some of the problems that the project will address.

The original objective of the project was to improve the socioeconomic conditions of small-scale fishing communities through development and promotion of new and innovative technologies. This objective has been expanded to include a greater emphasis on the development of community-based fisheries management policies and stakeholder participation.

The complexity of developing a GEF Proposal was discussed. A primary challenge has been to consult a wide range of stakeholders who are reliant on the Bay of Bengal's natural resources and are often represented by different governments in this politically diverse region. The intent of the preparation of a Strategic Action Plan (SAP) as required by the GEF, will be to protect the health of the ecosystem and manage the living resources of the Bay of Bengal in a sustainable manner with a view to improving food and livelihood security of the region's large coastal population. Specific objectives of the SAP include:

- Prioritizing transboundary water related environmental concerns and root causes of problems and threats;
- Agreeing upon actions and priorities required to resolve transboundary problems;
- Identifying responsible parties;
- Setting realistic targets;
- Performing cost-benefits analyses;
- Determining associated incremental costs;
- Generating potential investment, technical assistance and capacity-building interventions—national and transboundary.

Participants in the Bay of Bengal Project recognize that the SAP must be "country driven". The SAP will be based on collaborative efforts of the last 20 years and a broad-based, flexible, action-oriented approach. Elements of the Modular Approach will be used to monitor the Bay of Bengal LME, but the Modular Approach is also considered a stepping stone for future collaboration on a more comprehensive scale.

Results of the Block B grant include eight National reports that will serve as source documents for the TDA, a study of

potential collaborative mechanisms, and a draft Project Document for GEF financing. The proposed project will likely take five years and $9 million.

3.4 BENGUELA CURRENT LME PROJECT (Dr. Michael O'Toole)

The Benguela Current LME (BCLME) encompasses one of the four eastern boundary upwelling systems in the world. Its high level of primary productivity (exceeded only by the Humboldt Current) supports an important global reservoir of biodiversity and biomass of fish, crustaceans, sea birds and marine mammals. The near-shore and shelf sediments hold rich deposits of diamonds, phosphorite and diatomite as well as reserves of oil and natural gas. The BCLME is subject to considerable environmental variability which is manifest in regime shifts, species flips and fluctuation in the distribution and abundance of its marine resources. During recent years, environmental perturbations have had a severe impact on the northern Benguela ecosystem leading to a marked decline in the abundance and availability of pelagic and demersal fish. Increased fishing pressure together with widespread occurrence of toxic algal blooms and the high pollution risk associated with ongoing seabed mining and petrogenic energy exploration and production has also been of local and regional concern. In addition, other issues of common concern such as straddling fish stocks, pollution control, coastal zone developments and delineation of maritime borders have arisen between the three countries (Angola, Namibia and South Africa) which border the BCLME and need to be addressed. This has led to the need for an integrated and coordinated approach to ecosystem management.

The BCLME Project proposal aims to enhance national and regional efforts for sustainable integrated management. This will be accomplished by establishing a regional cooperative mechanism, undertaking a review of existing knowledge of the status and threats to the BCLME and developing a SAP to address both these threats and gaps in knowledge essential to the sustainable management of the ecosystem. The BCLME Project proposal has been approved by the GEF/UNDP office in New York and a schedule of activities has been planned. A project development grant of $344K has been allocated to the project. Implementation will be coordinated on behalf of the three participating countries from offices in the Ministry of Fisheries and Marine Resources in Namibia. The BCLME Project is being managed by a steering committee representing marine development institutions and stakeholders from Angola, Namibia and South Africa under the direction of Dr. Michael O'Toole, Acting Regional Coordinator. Project funds are administered by the UNDP Windhoek Office. Activities in the BCLME Project proposal include:

- Regional Workshop 22-24 July 1998 Cape Town, South Africa;
- Establishment of mechanisms for ongoing communication and coordination;
- Synthesis and assessment of existing information on the BCLME;
- Identification and analysis of key issues, alternatives and options;

- Development of a Strategic Action Programme (SAP);
- Donor consultations and donor conference;
- Development of a GEF Proposal.

The BCLME Project will be executed by the national governments with UNDP support. It is expected that the phase between the completion of the PDF proposal and the approval of the full GEF project will be short, with full funding by the end of 1998.

3.5 CARIBBEAN SEA LME PROJECT (Dr. Rafael Steer-Ruiz)

The CLME has been seriously damaged from loss of critical coral reef and mangrove habitat; diminishing food security from overexploitation of coastal fisheries; and growing eutrophication and degradation of coastal waters from excessive nutrient loading and chronic oil spills. The objectives of the project to be developed under the GEF Block B grant are to enhance national and regional efforts toward collaborative assessment, monitoring, and management of the CLME. The initial effort will be the establishment of a mechanism for regional cooperation, a review of the existing knowledge of the threats to the CLME, and the development of a SAP to redress the damage to the ecosystem and overcome the gaps in the knowledge essential to the sustainability and management of the ecosystem. The GEF project will also be focussed on strengthening coordination for the assessment and monitoring of ecosystem changes, the development of institutional capacity, direct support of priority activities identified in the SAP and support for leveraging national and international activities directed toward the long-term sustainability and economic development of marine resources of the ecosystem.

The significant conservation and management problems that face Caribbean countries may be broadly categorized by the following categories: environmental problems, resource utilization and institutional issues. Environmental problems include naturally occurring phenomena (e.g., tropical storms, hurricanes, coastal flooding) and anthropogenic changes in the coastal areas (e.g., land-based sources of pollution). Resource utilization issues derive from the manner and rate of exploitation of coastal resources and intersectoral uses and conflicts. Specific issues are: petroleum refineries versus tourism and protection of threatened species; sustainable fisheries development; tourism and development use/conflicts; use of renewable and non-renewable resources; and impacts of land and marine uses (e.g., urbanization and settlement). The institutional issues relate to the effective management of the coastal and offshore resources. There is a critical need to enhance regional institutions for the management of transboundary resources. Specific concerns include the need for multi-sectoral integration and coordination for decision-making, institutional capabilities and appropriate human resources, access to relevant data and information, public awareness and participation, and adequate legislative framework and machinery for implementation.

A workshop was held in 1997 that began formulating a Caribbean Sea LME (CLME) proposal. The CLME Project will require an organizational framework, due to the many different languages and states. IOC is currently experimenting with a new and innovative institutional structure for the project. A project proposal has been submitted for review to the UNDP/GEF coordination office in New York.

3.6 HUMBOLDT CURRENT AND CENTRAL AMERICA COASTAL PACIFIC LMES (Dr. Rafael Steer-Ruiz)

In a 1995 workshop, four members of IOCARIBE (Costa Rica, Columbia, Mexico, Panama) drafted a recommendation to be presented to the IOC assembly that suggested a study be conducted off the west coast of Central America and Mexico. It was noted that negotiations among the Ministries of Foreign Affairs of Chile, Peru and Ecuador have yet to allow establishment of a Humboldt Current LME Project. It was suggested that IOCARIBE draft a Block A grant ($25K) for purposes of a workshop to address the preparation of a Humboldt Current LME project. It was also suggested that IOCARIBE assist in the preparation of a scientific assessment of the Central America Coastal Pacific area as a distinctive LME area.

3.7 BALTIC SEA LME

Countries east and west of the Baltic have participated in several workshops to discuss the ecosystem approach. The GEF has indicated interest in supporting a joint ICES-HELCOM International Baltic Sea Fisheries Commission initiative for the Baltic Sea LME. ICES is convening a coordination meeting in an effort to bring forward a project proposal from the Baltic countries for submission to the GEF.

A UNEP proposal to the GEF to fund a Canary Current LME Project was rejected last year because the proposal did not emphasize an ecosystem approach. UNEP later revised the proposal, resubmitted and was funded to support a TDA. NOAA will be working with UNEP and IUCN to assist in the effort.

3.8 CANARY CURRENT LME (Dr. Kenneth Sherman)

A proposal to the GEF International Waters Programme submitted by the countries adjacent to the Canary Current LME including Guinea, Guinea-Bissau, Cape Verde, Gambia, Senegal, Mauritania and Morocco. The proposal was submitted by UNEP's International Waters Coordination Office for the GEF in Nairobi. It was approved by the GEF Council as a PDF Block B grant to support the preparation of a TDA for the Protection of the Canary Current LME.

3.9 SOMALI CURRENT LME PROJECT (Dr. Ezekiel Okemwa)

Somalia, Kenya and Tanzania have applied for a PDF Block B grant, but have yet to receive feedback from the GEF. A workshop on the Somali Current LME will be held in late 1998. Regional scientists have also suggested that the Mascarene Plateau (east of Madagascar) be deemed an LME area, and that a GEF project be proposed for the area.

4. OTHER ACTIVITIES

4.1 TERMS OF REFERENCE FOR AN LME CONSULTATIVE COMMITTEE

Based on a recommendation from the January 1997 *ad hoc* Consultative Meeting on LMEs, terms of reference (TOR) for an LME Consultative Committee were drafted, disseminated and discussed among meeting participants. The TOR states the principal goal of the LME Consultative Committee and broadly outlines the strategy for the advancement of the "LME Approach". Comments and suggestions have been addressed and a consensus was reached on the, TOR which is included as Appendix B.

4.2 OUTREACH

It was noted that IOC has a growing Homepage which is intended to be the official LME Homepage. Because the LME world map defines 49 ecosystems and does not incorporate all the world's coastal areas, it was recommended that as more information becomes available, additional ecosystems can be defined and included in an updated world map of LMEs.

It was also recommended that the website include information on GEF-funded monitoring and assessment programmes and the LME concept in general. The LME concept should be broadly described and then linked to examples of LME implementation. The document "The LME Approach" tabled by NOAA will be used as a source document for further website development.

It was suggested that an e-mail list would best facilitate on-line LME discussions. The Committee discussed the advantages and pitfalls of such a network and agreed that the dialogue would have to be tightly managed. A list of frequently asked questions and their respective answers could be published on IOC's LME Homepage.

4.3 ICES-LME SCIENCE PROGRAMME MATRIX

Meeting participants unanimously agreed that an effort should be made to insure collaboration between LME projects and large, international, science-based ecosystem studies and assessments. Because it was also agreed that this would be a daunting task, it was suggested that funds be solicited from IOC and others to produce a report on how the LME concept complements basic-scales studies, such as GLOBEC, JGOFS and GOOS.

4.4 GLOBAL INTERNATIONAL WATERS ASSESSMENT

"Geographic Framework for Global International Waters Assessment (GIWA)" is a report of an UNEP working group meeting

that was held in Geneva last summer. GEF has provided UNEP $7 million to conduct a global assessment of international waters. The adoption of the LME as a geographic unit for ocean assessment by UNEP as a means to do these assessments is of particular interest to the IOC-LME Consultative Committee. Managers and scientists associated with LME projects should at least be cognizant of this project.

4.5 FAO AND LME FISHERY STATISTICS

FAO may be able to provide fishery statistics on an LME basis, but is constrained by limited technical staff resources. Member states have agreed to report catch data (tonnage and location). The data that FAO receives from countries is often not applicable to biodiversity assessments, ECOPATH studies, or LME projects. FAO would certainly collaborate with LME studies if funds to support the effort were available. It was suggested that FAO apply for a medium-sized grant that would address global applications and/or technological advancements. Because this funding would certainly be finite, FAO would have to secure funding following grant expiration if the work were to continue.

4.6 LMES AND MARINE PROTECTED AREAS (MPA)

The Committee discussed the recommendation by Pauley et al. (1998) that large marine areas should be closed to fishing to protect spawning fish stocks and their habitat. The Committee recognized the dichotomy that often exists between poor and affluent countries with regard to setting aside marine protected areas (MPA)—the latter are more likely to establish MPAs, whereas the former are generally heavily dependent upon adjacent marine areas for community livelihood. It was noted that China is willing to set aside relatively small marine protected areas within fairly industrialized areas. Governments in developing countries (e.g., Colombia and Caribbean governments) are eager to develop economic valuations of regional ecosystems as tools for effective management. It was noted that the US National Research Council will conduct a study of the utility of MPAs for marine fishery management, and that the NMFS is developing a proposal to study the ecological and fisheries management marine reserves. Because MPAs decrease the amount of available fishing grounds, there is concern that unprotected areas will suffer habitat damage due to increased fishing activity.

The Committee agreed that MPAs are not a panacea for global fishing problems and that temporal and spatial scales must be considered when creating MPAs. It was agreed that the Committee would draft a statement about MPAs within the context of a marine ecosystem management plan and that IUCN would work to further elaborate the development of systems of MPAs within an ecosystem context.

5. RECOMMENDATIONS

The Committee recommends implementation of outreach activities to ensure the public and scientific visibility of the LME concept be increased by preparation of material for publication, and brief reports including the establishment of a web-site containing information on regional LME developments, meetings and latest news.

IUCN, in collaboration with other relevant bodies, should be encouraged to update the LME world map.

Recognizing that fishery statistics yield valuable information on LME status, FAO is asked to consider development

of a mechanism to produce fishery statistics on an LME basis. A collaborative proposal (e.g., with ICLARM/University of British Columbia) for a medium-sized GEF grant, which also incorporates activities to apply the ECOPATH model, is suggested as a possible way to fund this effort.

Existing and future LME projects should continue to consider the applications of new technologies and techniques to assess the status and changes in LMEs, including the SeaWiFS satellite ocean colour sensor and towed undulating oceanographic sensors and recorders, including the NuShuttle and SeaSoar.

In recognition of the critical role of science in providing information to support effective management and sustainable development of marine resources and ecosystems, the Committee encourages LME projects to improve linkages between science-based resource assessments and estimates of socioeconomic benefits of sustainable management. It also encourages partners in the LME activities to further elaborate mechanisms for making those linkages.

Meeting participants recognize the potential of marine protected areas (MPA) as one of the tools for the management of marine resources within the context of the large marine ecosystems. The Committee recommends a process be set in motion by IUCN and others to review the role of MPAs
within the context of broader management objectives of LMEs and where appropriate, encourages development of case studies and demonstration projects and linkages with existing pertinent projects.

The Committee recommends that an analysis be undertaken to identify and describe the relationships among LMEs and other international marine science programmes, with the express purpose of developing means to ensure that monitoring and data assessment from LME projects reported to IOC will be made known to the marine science community. Mechanisms to undertake this analysis should be explored further by NOAA and IOC.

In recognition of the importance of strengthening the scientific basis for improving the assessment, monitoring, and management of LMEs, consultations should be undertaken with UNEP Regional Sea Programme and other large-scale and long-term oceanographic and environmental programmes focussed on monitoring global changes in the oceans and improving the understanding of marine ecosystem structure and function (e.g., GLOBEC, GOOS and JGOFS). The consultations would be arranged by the IOC Secretariat with the express purpose of promoting, where appropriate, the identification of linkages between national and regional programmes and LME projects that are operational and/or in advanced stages of planning.

The LME projects supported through grants from the GEF are, according to the GEF Operational Strategy, "to assist countries in changing the ways that human activities are conducted in different economic sectors so that the particular LME and its multi-country drainage basin can sustainably support the new patterns of human activities." The GEF places priority on changing sectoral policies and activities responsible for the

root causes of the most serious transboundary environmental problems. To ensure that new practices and activities are balanced and integrated, it is recommended that countries participating in LME projects ensure that science-based assessments of ecosystem productivity, fish and fisheries, pollution and ecosystem health are appropriately integrated with socioeconomic and governance considerations leading to the long-term sustainability of marine resources.

The Committee, taking into account the excellent progress made in implementation of the Gulf of Guinea LME Project and the potential to learn from that project, encourages strengthened cooperation between the Gulf of Guinea project and other LME projects in Africa, including the developing Benguela Current and Canary Current projects. The meeting further noted that the first regional workshop of the Benguela Current LME Project will take place in Cape Town, 22-24 July 1998.

The Committee notes the interest in and opportunity to undertake a Pan-African LME consultation in 1998 with IUCN support.

The Committee took note of the progress made in developing the Bay of Bengal, Benguela Current and Yellow Sea LME projects for GEF financing and encourages the exchange of information on project implementation. The Committee notes the value of exchanging experiences and of collaboration among LME projects on a regional or thematic basis and encourages such efforts.

Recognizing the pressing regional environmental issues, and the need for cooperation on marine resources assessment and management, and taking into account the recommendations made at the 1993 Mombasa LME Symposium, the countries of the Western Indian Ocean are encouraged to continue planning for an LME monitoring and assessment project for the Somali Current ecosystem and to secure a GEF Block B grant to support planning efforts. In this regard, the Committee is pleased to take notice of, and recommend support for the convening of a consultation on the Somali Current LME. The consultation will bring together regional marine experts to revise as necessary an earlier proposal for a GEF/LME project prepared by the countries of the region in 1995. Revision will be formulated in accordance with the most recent GEF Operational Guidelines for LME projects. Funds to support the consultation will be sought from IOC, IUCN and other international agencies to augment funding from the governments of Kenya and Tanzania.

The Committee, taking into account the programmes within the Caribbean LME and the interest expressed by Latin American countries, requests that IOC, through its regional IOCARIBE Sub-Commission in Cartagena, Colombia, encourages: 1) the continuation of planning for an LME monitoring and assessment project in the Caribbean, to secure a GEF Block B grant to support planning efforts, and 2) the initiation of activities to encourage and advise countries in the region to begin developing projects in the Humboldt Current LME and the Pacific Central American LME.

ANNEX I

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ANNEX II

TERMS OF REFERENCE FOR THE LARGE MARINE ECOSYSTEM (LME) CONSULTATIVE COMMITTEE

The participants at the first International LME meeting in Monaco in 1990 agreed that the LME concept provides a useful framework for the assessment, monitoring, and management of ocean and marine resources. Since the Monaco meeting, a growing number of countries have moved the LME approach forward by agreeing to pursue regional cooperation in the implementation of "country-driven" LME resource assessment and management projects following the Operational Guidelines of the Global Environment Facility. In recognition of the utility of the LME approach in support of sustainable resource development and management, and to further encourage regional cooperation in the development and sustainable use of marine resources, it was recommended at the last IOC consultation meeting on LMEs that an LME Committee be organized. The principal goal of The Committee would be to advance the LME approach through the coordination of a network of scientists, policy experts, economists, and other marine specialists under the auspices of IOC, IUCN, and NOAA with the following terms of reference:

. To assist countries and international organizations in the development and implementation of projects to assess and manage natural resources at an ecosystem scale through the LME approach.

. To continue development of innovative strategies and new technologies for measuring the changing states of LMEs with respect to linking scientifically-based assessments to long term socio-economic benefits from natural resources.

. To increase the understanding of the application of the LME assessment and management approach to the scientific community, policy makers, resource managers, and other stakeholders.

. To ensure that the LME approach effectively addresses global priorities for the conservation and sustainable use of marine resources consistent with Convention on Biological Diversity, UNCLOS, UN. Fisheries Agreement, IGBP Global Climate Change Programmes, GEF Operational Programmes, UNEP Regional Seas Programme, GOOS Global Ocean Observing System, GLOBEC Global Ocean Ecosystems Dynamics and other relevant international agreements.

. To report regularly to IOC, IUCN, UNEP, UNDP, FAO, GEF, and other interested parties on the development, implementation, and results of LME projects.

The Committee will meet periodically to hold consultations on topics in accordance with its Terms of Reference.

ANNEX III

LIST OF ACRONYMS

BCLME	Benguela Current LME Project
CLME	Caribbean sea LME Project
ESA	European Space Agency
EXPO 98	World Exhibition in Lisbon in 1998
FAO	The Food and Agriculture Organization of the United Nations
GEF	Global Environmental Facility of The World Bank
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GIS	Geographic Information System
GIWA	UNEP's Global International Waters Assessment
GLOBEC	Global Ocean Ecosystem Dynamic (IGBP/IOC/SCOR)
GOG	Gulf of Guinea Project
GOOS	Global Ocean Observing System (IOC/ICSU/WMO)
GOOS-LMR	Living Marine Resources Module of GOOS
ICAM	Integrated Coastal Area Management
ICES	International Council for the Exploitations
IGBP	International Geosphere-Biosphere Programme (ICSU)
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IOCEA	IOC Regional Committee for the Central Eastern Atlantic
IOCINCWIO	Regional Committee for the Co-operation Investigation in the North and Central Western Indian Ocean.
IOCINDIO	IOC Regional Committee for the Central Indian Ocean
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IUCN	The World Conservation Union
IYO	1998 International Year of the Ocean
HELCOM	Baltic Marine Environment Protection Commission
ICLARM	International Centre for Living Aquatic Resources Management
JGOFS	Joint Global Ocean Flux Study (IGBP)
LOICZ	Land-Ocean Interactions in the Coastal Zone (IGBP)
NMFS-NOAA	National Marine Fisheries Service, National Oceanographic Atmospheric Administration (USA)

MPA	Marine Protected Areas
NOAA	US National Oceanographic Atmospheric Administration
SAP	Strategic Action Programme of GEF
TDA	Transboundary Diagnostic Analysis
TOR	Terms of References
UN	United Nations
UNCED	United Nations Conference on Environmental and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organization
WESTPAC	IOC Sub-Commission for the Western Pacific
WMO	World Meteorological Organization
WWF	World Wildlife Foundation
YSFRI	Yellow Sea Fisheries Research Institute

ANNEX IV

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